MONTROSE AIR QUALITY SERVICES

# *Montrose Report Submittal Transmission:*

*Company:* ArcelorMittal Monessen LLC

Ms. Traci Self
345 Donner Avenue
Monessen PA 15062

No. of Paper Copies:

*Emailed PDF*

*Montrose Contact:*

Project Manager:
William Cowell
Senior Engineer I
wcowell@montrose-env.com
(412) 826-3636

The Following Project is Attached: Click on the report link below to access the PDF version:

*Date Sent:* 1/13/2017 | *Method Sent:* Other

| Project # | Task Name | Location | Project Type | Test Date |
|---|---|---|---|---|
| 16-167 | Pushing Baghouse ICR Test Report | Monessen, PA | Report | October 25-November 3, 2016 |

*Comments:* PDF sent via one drive to Traci Self and Rich Zavoda, cc John Hill



1050 William Pitt Way
Pittsburgh, PA 15238
412-826-3636
412-826-3640 fax

# EPA INFORMATION COLLECTION REQUEST
# PUSHING BAGHOUSE STACK TEST REPORT
# ARCELORMITTAL MONESSEN LLC
# MONESSEN COKE PLANT
# MONESSEN, PENNSYLVANIA

PFID: 256899
Source IDs: Pushing Baghouse Stack
Permit #: TV-65-00853

Test Dates: October 25-November 3, 2016

Report Date: January 13, 2016

**Prepared for:**

ArcelorMittal Monessen LLC
345 Donner Avenue
Monessen, Pennsylvania 15062

**Prepared by:**

Montrose Air Quality Services, LLC.
1050 William Pitt Way
Pittsburgh, Pennsylvania 15238
(412) 826-3636

PA Lab Registration #02-04775

Project No. 16-167

MONTROSE AIR QUALITY SERVICES

## CERTIFICATION STATEMENT

This statement certifies that "to the best of their knowledge," based on state and federal regulations, operating permits, plan approvals applicable to each source tested, and reasonable inquiry, the statements and information presented in the attached document are true, accurate, and complete.

**EPA INFORMATION COLLECTION REQUEST**
**PUSHING BAGHOUSE STACK TEST REPORT**
**ARCELORMITTAL MONESSEN LLC**
**MONESSEN COKE PLANT**
**MONESSEN, PENNSYLVANIA**

Test Dates: October 25-November 3, 2016

Project No. 16-167

1/13/17

William P. Cowell, QSTI
Client Project Manager
Montrose Air Quality Services, LLC.

Date

1/13/17

Matthew Dallesasse
District Manager
Montrose Air Quality Services, LLC.

Date

1/13/17

Randy E. Shelton
Division Manager
ArcelorMittal Monessen LLC

Date

Disclaimer – This document is intended solely for the use of the individual
to whom it is addressed and others authorized to receive it.

# TABLE OF CONTENTS

Page


1 INTRODUCTION ..... 1
2 COMPANY AND TESTING FIRM INFORMATION ..... 3
3 ANALYTICAL LABORATORY INFORMATION ..... 4
4 TEST DATES AND PERSONNEL INFORMATION ..... 4
5 PROCESS DESCRIPTION AND PROCESS DATA ..... 4
5.1 Process Description ..... 4
5.2 Process Data ..... 5
6 TEST PROCEDURES ..... 6
6.1 Deviations from Standard Test Methodologies and Abnormalities ..... 6
6.2 Testing Station and Traverse Locations – USEPA Method 1 ..... 7
6.3 Gas Flow and Temperature Measurements – USEPA Method 2 ..... 7
6.4 Moisture Content Sampling – USEPA Method 4 ..... 7
6.5 Filterable PM, Mercury and Metal Emissions – USEPA Method 5/29 ..... 7
6.5.1 Sample Train Setup ..... 7
6.5.2 Sample Recovery and Analysis ..... 9
6.6 Semi-Volatile Organics and Dioxin/Furan Concentration – USEPA Methods 23 and 0010 ..... 10
6.6.1 Sampling Train Setup and Operation ..... 10
6.6.2 Testing Procedures ..... 11
6.6.3 Sample Recovery ..... 11
6.7 Formaldehyde Emissions – USEPA Method 316 ..... 13
6.7.1 Sampling Train Setup and Operation ..... 13
6.7.2 Testing Procedures ..... 13
6.7.3 Sample Recovery ..... 14
6.8 Speciated Volatile Organic HAPs – SW-846 Method 0031 ..... 14
6.8.1 Testing Procedures ..... 14
6.8.2 Sample Recovery ..... 15
6.9 Determination of Gaseous Emissions (Continuous Emissions Monitoring) ..... 15
6.9.1 Sampling System Setup ..... 15
6.9.2 Testing Procedures ..... 16
6.9.3 Carbon Dioxides and Oxygen Determination – USEPA Method 3A ..... 17
6.10 Hydrogen Sulfide Emissions – USEPA Method 15 GC Methodology ..... 17
6.11 Hydrogen Fluoride and Cyanide – USEPA Method 320 ..... 18
6.11.1 Sampling System Setup and Operation ..... 18
6.12 Opacity Emissions – USEPA Methods 9 ..... 19
6.13 Pushing Baghouse Dust, COG, and Coal Sampling ..... 20
6.14 Quality Assurance/Quality Control ..... 20
6.15 Calculations ..... 20
7 TEST RESULTS ..... 20
8 CONCLUSION ..... 21

# TABLE OF CONTENTS (continued)

## FIGURES

1. Block Diagram of Coke Manufacturing Process
2. Stack Sampling Schematic and Sample Point Location, Pushing Baghouse Stack

## TABLES

1. Filterable Particulate Matter Test Results, Pushing Baghouse Stack
2. Metal Test Results, Pushing Baghouse Stack
3. Dioxin/Furan Test Results, Pushing Baghouse Stack
4. Semi-Volatile Organics Test Results, Pushing Baghouse Stack
5. Formaldehyde Test Results, Pushing Baghouse Stack
6. Speciated Volatile Organic HAP Test Results, Battery 2 Combustion Stack
7. Gaseous Emissions Test Results, Pushing Baghouse Stack
8. Acidic Gas Emissions Test Results, Pushing Baghouse Stack
9. Baghouse Dust, COG, and Coal Analyses Results
10. Static Process Data (non-test specific information)
11. Table Nomenclature

## APPENDICES

A. Process Data
B. Montrose Field Data Sheets
C. Laboratory Data
D. Quality Assurance/Quality Control Data
E. Sample Calculations

**EPA INFORMATION COLLECTION REQUEST**
**PUSHING BAGHOUSE STACK TEST REPORT**
**ARCELORMITTAL MONESSEN LLC**
**MONESSEN COKE PLANT**
**MONESSEN, PENNSYLVANIA**

# 1 INTRODUCTION

ArcelorMittal Monessen LLC (AM Monessen) contracted Montrose Air Quality Services, LLC. (Montrose) to quantify emissions from Pushing Baghouse Stack for the ArcelorMittal Monessen Coke Plant in Monessen, Pennsylvania. Testing was performed at the request of the April 4, 2016 United States Environmental Protection Agency (USEPA) Coke Information Collection Request (ICR), as detailed in Enclosure 2.

USEPA specified a list of pollutants required to be tested for this source, including:

**Individual Air Pollutants/Parameters (and CAS No., where available)**

- Carbon Dioxide (124-38-9)
- Carbon Monoxide (630-08-0)
- Hydrogen Chloride (7647010)
- Hydrogen Cyanide (74908)
- Hydrogen Fluoride (7664393)
- Hydrogen Sulfide (7783-06-4)
- Opacity
- Oxygen (7782-44-7)
- Particulate Matter, filterable
- Particulate Matter$_{2.5}$, condensable
- Particulate Matter$_{2.5}$, filterable
- Sulfur Dioxide (7446-09-5)
- Toluene-Soluble Organics
- Visible Emissions (leaks)

**HAP Metals (and CAS No.'s)**

- Antimony (7440-36-0)
- Arsenic (7440-38-2)
- Beryllium (7440-41-7)
- Cadmium (7440-43-9)
- Chromium, Total (7440-47-3)
- Cobalt (7440-48-4)
- Lead (7439-92-1)
- Manganese (7439-96-5)
- Mercury (7439-97-6)
- Nickel (7440-02-0)
- Selenium (7782-49-2)

**Semi-volatile HAP (Semi-Vol) and CAS No.'s**

- Acenaphthene (83-32-9)
- Acenaphthylene (208-96-8)
- Anthracene (120-12-7)
- Benz[a]anthracene (56-55-3)
- Benzo[a]pyrene (50-32-8)
- Benzo[b]fluoranthene (205-99-2)
- Benzo[g,h,i]perylene (191-24-2)
- Benzo[k]fluoranthene (207-08-9)
- Chrysene (218-01-9)
- Dibenz[a,h]anthracene (53-70-3)
- Fluoranthene (206-44-0)
- Fluorene (86-73-7)
- Indeno (1,2,3-cd) pyrene (193-39-5)
- Naphthalene (91-20-3)
- Phenanthrene (85-01-8)
- Perylene (198-55-0)
- Pyrene (129-00-0)

**Dioxins/Furans as 2,3,7,8-TCDD TEQs and CAS No.'s**

- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (67562394)
- 1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin (35822469)
- 1,2,3,4,7,8,9-Heptachlorodibenzofuran (55673897)
- 1,2,3,4,7,8-Hexachlorodibenzofuran (70648269)
- 1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin (39227286)
- 1,2,3,6,7,8-Hexachlorodibenzofuran (57117449)
- 1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin (57653857)
- 1,2,3,7,8,9-Hexachlorodibenzofuran (72918219)
- 1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin (19408743)
- 1,2,3,7,8-Pentachlorodibenzofuran (57117416)
- 1,2,3,7,8-Pentachlorodibenzo-p-Dioxin (40321764)
- 2,3,4,6,7,8-Hexachlorodibenzofuran (60851345)
- 2,3,4,7,8-Pentachlorodibenzofuran (57117314)
- 2,3,7,8-Tetrachlorodibenzofuran (51207319)
- 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (1746016)

**Speciated Volatile Organic Compounds**

- Formaldehyde (50-00-0)
- Acrylonitrile (107-13-1)
- Benzene (71-43-2)
- Bromoform (75-25-2)
- Bromomethane (74-83-9)
- Carbon disulfide (75-15-0)
- Carbon tetrachloride (56-23-5)
- Chlorobenzene (108-90-7)

- Chloroethane (75-00-3)
- Chloroform (67-66-3)
- Chloromethane (74-87-3)
- 1,2-Dichloroethane (107-06-2)
- 1,1-Dichloroethene (75-35-4)
- 1,2-Dichloropropane (78-87-5)
- Ethylbenzene (100-41-4)
- Iodomethane (74-88-4)
- Methylene chloride (75-09-2)
- Styrene (100-42-5)
- 1,1,2,2-Tetrachloroethane[b] (79-34-5)
- Tetrachloroethene (127-18-4)
- Toluene (108-88-3)
- 1,1,1-Trichloroethane (71-55-6)
- 1,1,2-Trichloroethane (79-00-5)
- Trichloroethene (79-01-6)
- Vinyl chloride (75-01-4)
- Xylenes (1330-20-7)

Sampling was performed in accordance with provisions USEPA Test Methods as outlined in the ICR Enclosure 2. On June 24, 2016 US EPA approved previously submitted testing at the facility which exempted them from conducting additional testing for Toluene Soluble Organics, Hydrogen Chloride, Particulate Matter2.5, condensable PM, Sulfur Dioxide, and Carbon Monoxide at the Pushing Baghouse Stack.

## 2 COMPANY AND TESTING FIRM INFORMATION

| Company Contact | Testing Contact |
|---|---|
| Ms. Traci Self<br>ArcelorMittal Monessen LLC<br>345 Donner Avenue<br>Monessen, Pennsylvania 15062<br>(724) 684-1009 – Telephone<br>traci.self@arcelormittal.com | Mr. William P. Cowell, QSTI<br>Montrose Air Quality Services, LLC.<br>1050 William Pitt Way<br>Pittsburgh, Pennsylvania 15238<br>(412) 826-3636 – Telephone<br>wcowell@montrose-env.com |

# 3 ANALYTICAL LABORATORY INFORMATION

Samples were collected and analyzed for each analyte according to the applicable method; analyses were performed by the following:

| USEPA Method 15 | USEPA 5/29, 0010-23, 0031 and 316 |
|---|---|
| Montrose Air Quality Services, LLC.<br>Mr. Frank Barton<br>1050 William Pitt Way<br>Pittsburgh, Pennsylvania 15238<br>(412) 826-3636 – Telephone<br>fbarton@montrose-env.com<br>PA Lab Registration #02-04775 | Maxxam Analytics Inc.<br>Mr. Clayton Johnson<br>5555 North Service Road<br>Burlington, Ontario, Canada L7L5H7<br>(905) 332-8788 –Telephone<br>Clayton.Johnson@maxxamanalytics.com<br>PA Lab Registration #06-01745 |

# 4 TEST DATES AND PERSONNEL INFORMATION

Testing was performed October 25-November 3, 2016. Key personnel involved in the test include:

| Organization | Personnel | Responsibility |
|---|---|---|
| ArcelorMittal Monessen | Ms. Traci Self | Client Representative—Liaison to Test Company |
| Montrose | William P. Cowell, QSTI, Client Project Manager | Client Project Manager. Field Crew Test Leader, Method 320 and CEMS Operator, Report Writer |
| | Frank M. Barton, Project Manager | Method 15 Operator |
| | Christopher Burkovich | Method 9 Observer |
| | John E. Wilson, QSTI, Scientist II | Stack Tester, Sample Method Recovery |
| | Tyler C. Larson, Technician I | Stack Tester |
| | Terrence J. Mulhern, Technician I | Stack Tester |

# 5 PROCESS DESCRIPTION AND PROCESS DATA

## 5.1 Process Description

ArcelorMittal Monessen LLC operates a by-product recovery cokemaking plant to produce metallurgical coke. The facility includes two coke oven batteries – Battery 1B has 37 slot-type coke ovens and Battery 2 has 19 slot-type coke ovens. Figure 1 shows a block diagram of the coke manufacturing process.

Coke oven gas (COG), primarily composed of hydrogen and methane, from the by-products recovery process is used to underfire coke oven Battery 1B and Battery 2. The exhaust gas is then exhausted through a separate combustion stack from each of the two batteries. The batteries were operated at representative conditions during the testing program.

Pushing operations are controlled by the Pushing Emissions Control System which includes a suction hood that is stationed above the coke hot car during coke pushing and a baghouse which removes PM from the gas stream prior to discharge to the atmosphere. The Pushing Baghouse Stack only operates for approximately 2.5 minutes immediately before and during a push, so sampling was limited to a 2.5 minute time frame for each push.

## 5.2 Process Data

AM Monessen and Montrose personnel recorded pertinent process operating and production parameters for each day during the testing program. Other parameters as dictated in the Enclosure 2 package were also requested to be collected. Process parameters that were recorded are:

- ID numbers of ovens pushed/charged (from P&EF submitted as part of Enclosure 1)
- Number of ovens pushed during testing
- Type of coal charged during testing
- Average coking time per oven(s) tested (hours)
- Average temperature of coking per oven(s) tested (degrees Fahrenheit)
- Dry coal processed per oven(s) during testing (tons)
- Coke produced during test period (tons)
- Pushing period during testing (minutes)
- Charging period during testing (minutes)
- Quantity of coke oven gas generated
- Quantity of coke oven gas burned in coke battery
- Quantity of coke oven gas burned in boilers
- Quantity of natural gas burned in coke battery
- Higher heating value of coke oven gas
- Higher heating value of natural gas
- Yearly quantity of coke oven gas burned in boilers
- Yearly quantity of coke oven gas burned in coke battery
- Yearly quantity of natural gas burned in coke battery
- Yearly quantity of coke oven gas generated

Process data can be found in Appendix A. A summary of the process data is also included on each Summary Table for each run of testing.

# 6 TEST PROCEDURES

Testing was conducted in accordance with USEPA, Title 40, Code of Federal Regulations (CFR), Part 60, Appendix A and the procedures described below. Additional information for test procedures and sample recovery methods is contained in each listed Method and Enclosure 2. All field data sheets for testing methodologies are located in Appendix B.

## 6.1 Deviations from Standard Test Methodologies and Abnormalities

During Method 0031 on the combustion stack, a condensate site field blank was collected. The results of the condensate site field blank showed an elevated toluene presence of very high magnitude (24,000 micrograms/liter). It is believed the deionized water in the field cleanup area was exposed to toluene from the recovery efforts of the Method 23 sampling train. 2 of the individual condensate samples on the pushing baghouse stack also showed high toluene results, with no indication of elevated toluene on the trap analysis. Only the two condensate samples were contaminated, as the other 7 condensate fractions and the traps were very consistent on the 9 sets analyzed, and showed no signs of contamination. To account for the high toluene results, the lab was forced to dilute the samples, which resulted in increased MDL's for all target compounds. Field personnel recall no observable condensate in the knockout impinger, so the 40 mL VOA vial was filled entirely with the DI water which may have been contaminated. To avoid over reporting of target compounds, for the two condensate fractions that are determined to potentially be contaminated, Speciated Volatile Organic Compounds are calculated using only the trap fractions for this source.

Due to limited times when pushing operations were occurring, and the time involved to accurately find the null point at each traverse point location, a cyclonic flow check could not be conducted at the PECs baghouse stack.

## 6.2 Testing Station and Traverse Locations – USEPA Method 1

The principles of USEPA Method 1, *Sample and Velocity Traverses for Stationary Sources*, were utilized to determine the number and location of the traverse points. Figure 2 shows a stack sampling schematic and sample point location.

## 6.3 Gas Flow and Temperature Measurements – USEPA Method 2

The gas flow rate and temperature profiles for the gas stream were measured by conducting simultaneous velocity and temperature traverses during each sampling run. Gas velocity head was measured with a calibrated Type S Pitot tube that was connected to a digital low-flow manometer. The static pressure was measured using the same Pitot tube and manometer. A Chrome-Alumel thermocouple attached to a digital indicator was used to measure the gas temperature at each of the traverse points. The gas flow and temperature measurements followed the principles of USEPA Method 2, *Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube).*

## 6.4 Moisture Content Sampling – USEPA Method 4

Moisture content sampling was conducted concurrently with each sampling run using the principles presented in USEPA Method 4, *Determination of Moisture Content in Stack Gases.* Parameters evaluated, in order to determine the gas stream moisture content, were sample gas volume, temperature, pressure and impingers, and silica gel moisture gain.

## 6.5 Filterable PM, Mercury and Metal Emissions – USEPA Method 5/29

USEPA Method 5 and the sampling train of USEPA Method 29, *Determination of Metals Emissions from Stationary Sources* were used to measure Total Filterable PM, Hg and various other metal emissions.

### 6.5.1 Sample Train Setup

Prior to sampling, all glassware was cleaned with soap and water, rinsed with tap water, and deionized water (DI $H_2O$). After cleaning, the glassware was soaked in a 10% nitric acid solution for at least 4 hours. Following soaking, the glassware was then rinsed with DI $H_2O$, and then finally rinsed with acetone and allowed to air dry.

The sampling apparatus contained a glass-lined temperature-controlled probe equipped with a Type S Pitot tube and a sharp-edged borosilicate glass button-hook nozzle. The probe liner and nozzle were connected utilizing a glass-coated stainless-steel union and graphite ferrules.

The exit of the probe was connected to a tared quartz fiber filter supported in a glass-filter holder inside an oven heated to 248°F ± 25°F, as measured by an in-stack thermocouple. The exit of the filter holder was connected to a series of six impingers. The first (modified Greenburg-Smith) and second (standard Greenburg-Smith) impingers each contained 100 milliliters (ml) of 5% nitric acid ($HNO_3$) / 10% hydrogen peroxide ($H_2O_2$), the third (modified Greenburg-Smith) was empty, the fourth and fifth (both modified Greenburg-Smith) contained 100 ml of acidic potassium permanganate ($KMnO_4$), and the sixth impinger contained pre-weighed silica gel. All six impingers were weighed to the nearest ± 0.1 gram (g) using a calibrated field balance prior to the start of sampling for determination of moisture content in the gas stream. By weighing the impingers instead of measuring the liquid using a graduated cylinder, there was less potential for contamination of the sample.

The impinger train was connected to a commercially available metering system. Prior to sampling, the dry gas meter was calibrated utilizing the critical orifice procedures detailed in Section 16.2 of USEPA Method 5. A calibrated critical orifice set covering the anticipated sampling rates was utilized. Along with pre-test and post-test meter calibrations, the Type S Pitot, thermocouple and nozzle was also calibrated prior to and following use in the field according to USEPA Method 5 procedures. .

The sample train was assembled, allowed to reach operating temperature, and leak checked by plugging the nozzle and pulling a vacuum of approximately 15" of Hg. Once an acceptable leak check on the entire system of less than 0.02 cubic feet per minute (cfm) was achieved, the sampling train was placed at the first traverse point and sampling began immediately.

The sampling train was operated at an isokinetic rate with an isokinetic variation of 90% to 110%. At the conclusion of each test run, the sampling train was leak-checked at a vacuum equal to or greater than the maximum value reached during sampling. An acceptable leakage rate of less than 0.02 cfm was achieved.

### 6.5.2 Sample Recovery and Analysis

The filter (Container 1) was removed from the filter holder and placed in a labeled polystyrene Petri dish. The filter was desiccated for a minimum of 24 hours and weighed to a constant weight. The term constant weight means a difference of no more than 0.5 milligrams (mg) or 1% of total weight less tare weight (whichever is greater) between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

An acetone rinse (Container 2) consisting of the nozzle, probe, and front half of the filter holder was performed a minimum of 3 times, and consisted of 100 ml. The rinse was then evaporated to dryness in a glass 250 ml pre-weighed beaker, desiccated, and weighed to a constant weight. The total FPM catch was the sum of the acetone rinse plus the filter catch. FPM analysis results are contained in Appendix C.

Following the acetone rinse, the nozzle, probe, front-half of the filter holder and connections were rinsed with 100 ml of 0.1 N $HNO_3$. The rinses were stored in a labeled, sealed amber glass bottle (Container 3) for shipment to the laboratory.

The liquid in the first two impingers were weighed to the nearest ± 0.1 g using a calibrated field balance. The contents were transferred to an amber glass sample bottle. The back half of the filter holder, connecting glassware and impingers were rinsed with 100 ml 0.1 N $HNO_3$; these rinses were added to the same sample bottle (Container 4). The bottle was labeled and stored for shipment to the laboratory for analysis.

The liquid in the third impinger was weighed to the nearest ± 0.1 g using a calibrated field balance. The contents were transferred to an amber glass sample bottle. The impinger was rinsed with 100 ml 0.1 N $HNO_3$ and transferred to the same sample bottle (Container 5a). The bottle was labeled and stored for shipment to the laboratory for analysis.

The liquid in the fourth and fifth impingers was weighed to the nearest ± 0.1 g using a calibrated field balance. The contents were transferred to an amber glass sample bottle. The impingers were rinsed three times with 100 ml of fresh acidified $KMnO_4$. These rinses were added to the same sample bottle. Similarly, three rinses of the same impingers were performed using exactly

100 ml of DI $H_2O$. These rinses were also added to the same sample bottle (Container 5b). The bottle was labeled and stored for shipment to the laboratory for analysis.

An additional rinse of 25 ml of 8N hydrochloric acid (HCl) was conducted. The 25 ml of 8N HCl was added to Impinger 4, swirled, and then transferred to Impinger 5 and swirled. This rinse was placed in an amber glass sample bottle containing 200 ml of DI $H_2O$. The bottle (Container 5c) was labeled and stored for shipment to the laboratory for analysis.

Sample blanks of 300 ml of 0.1 N $HNO_3$ (Container 8a), 100 ml of DI $H_2O$ (Container 8b), 200 ml of 5% $HNO_3$/10% $H_2O_2$ (Container 9), 100 ml acidified $KMnO_4$ (Container 10), 25 ml of 8N HCl in 200 ml of DI $H_2O$ (Container 11), and 3 unused blank filters (Container 12) were prepared during the field test, labeled and stored for shipment to the laboratory for analysis.

All lab data is contained in Appendix C. The individual lab Hg fractions and the other metals front and back half fractions are reported as mg/dscm and lb/hr.

Total FPM emissions were reported as mg/dscm, gr/dscf, and lb/hr.

## 6.6 Semi-Volatile Organics and Dioxin/Furan Concentration – USEPA Methods 23 and 0010

The D/F emissions were determined in accordance with USEPA Method 23, *Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from Municipal Waste Combustors*. The Semi-Volatile Organic Compounds were combined in the same train using the principles of USEPA SW-846 Test Method 0010: Modified Method 5 Sampling Train.

### 6.6.1 Sampling Train Setup and Operation

The sampling apparatus contains a glass-lined temperature-controlled probe equipped with a Type S Pitot tube and a sharp-edged stainless-steel buttonhook nozzle. The exit of the probe was connected to a high-efficiency glass fiber filter supported in a glass-filter holder inside an oven heated to 248°F ± 25°F (as measured by an in-gas thermocouple at the filter exit). The exit of the filter holder was connected to a water-jacketed condenser followed by a water-jacketed packed column of adsorbent material (XAD-2) and a knock-out impinger followed by a series of four full-sized impingers. The condenser and XAD-2 trap were continually cooled with a water

circulating pump inserted in the ice bath and tubing leading to the two glass pieces. Temperature entering the XAD-2 trap was monitored with an in-gas thermocouple and maintained at a temperature below 68°F. The knockout impinger was empty and the second and third impingers each contained 100 milliliters (ml) of deionized water. The fourth impinger was empty and the fifth impinger contained a pre-weighed amount of silica gel.

The impinger train was connected to a commercially available metering system. Prior to sampling, the dry gas meter was calibrated utilizing the procedures detailed in USEPA Method 5.

The sample train was assembled, allowed to reach operating temperature, and leak checked by plugging the nozzle with a rubber septum and pulling a vacuum of approximately 15" of mercury (Hg). Sampling did not proceed until an acceptable leak check of less than 0.02 cubic feet per minute (cfm) was achieved.

### 6.6.2 Testing Procedures

Once an acceptable leak check was achieved, the sampling train was placed at the first traverse point and sampling began immediately. The sampling train was operated at an isokinetic rate with an isokinetic variation greater than 90% and less than 110%. Three runs were performed; each run was at least 180 minutes in duration and had a minimum sample volume of 140 dry standard cubic feet (DSCF). At the conclusion of each test run, the sample train was cooled sufficiently, utilizing ambient air or ice, to allow the nozzle to be plugged with the rubber septum. The sampling train was leak-checked at a vacuum equal to or greater than the maximum value reached during sampling.

### 6.6.3 Sample Recovery

Container 1 – The filter was removed from the filter holder and placed in a labeled glass petri dish and sealed with Teflon® tape.

Adsorbent Module – The module was removed for the sample train, sealed with Teflon® tape, and labeled. The module was stored on ice for transport to the laboratory.

Container 2A – Material in the nozzle, probe, front and back halves of the filter holder, impingers and connecting glassware was quantitatively rinsed with acetone. Acetone rinses were performed a minimum of 3 times. The volume of each rinse was added to Container No. 2, an amber glass sample bottle. The contents of Container 2 were sealed and submitted to the laboratory for Method 23 analysis. A methylene chloride rinse followed the acetone rinse, and was added to the same Container No. 2A.

Container 2B – Material in the probe, nozzle, probe fitting, probe liner, and front half of the filter holder by was washed with methanol/methylene chloride (1:1 v/v), and collecting into a glass container. Rinses were performed a minimum of 3 times. The volume of each rinse was added to Container No. 2B, an amber glass sample bottle. The contents of Container 2B were sealed and submitted to the laboratory for Method 0010 analysis.

Container 3 – Material in the nozzle, probe, both halves of the filter holder, impingers and connecting glassware was quantitatively rinsed with toluene three times. The volumes of these rinses were recorded and stored in an amber glass sample bottle designated as Container 3. As permitted, the toluene rinse was combined at the laboratory with the acetone rinse.

Container 4 – The volume of condensate collected in the condensate knockout section of the organic module was measured to within +1 mL by using a graduated cylinder and transferred to a prelabeled glass sample container 4. Any liquid in the back half of the filter housing and the condenser section was also added to the condensate knockout-trap catch.

Container 5 -- All sampling train components located between the high-efficiency glass- or quartz-fiber filter and the first wet impinger or the final condenser system were rinsed with methanol/methylene chloride (1:1 v/v) and the rinses combined. This rinse shall be separated from the condensate. The contents of Container 5 were sealed and submitted to the laboratory for Method 0010 analysis.

Impinger Contents – The impinger contents were measured to within 1 ml, utilizing a graduated cylinder, and discarded. The volume was recorded to calculate moisture content of the effluent gas.

Silica Gel – The silica gel was transferred to the original container and weighed to the nearest ± 0.5 gram (g).

All samples were maintained at 39°F or lower and protected from light. Each fraction was recorded on the sample chain of custody and transported to the laboratory for analysis, along with one complete blank sample train. The polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF) were extracted from the sample, separated by high-resolution gas chromatography, and measured by high-resolution mass spectroscopy. Analytical results are included in Appendix C.

## 6.7 Formaldehyde Emissions – USEPA Method 316

Formaldehyde emissions were determined by using Method 316, *Sample and Analysis for Formaldehyde Emissions from Stationary Sources in the Mineral Wool and Wool Fiberglass Industries*.

### 6.7.1 Sampling Train Setup and Operation

The sampling apparatus contains a glass-lined temperature-controlled probe equipped with a Type S Pitot tube and a sharp-edged stainless-steel buttonhook nozzle. The exit of the probe was connected to a series of impingers. The first (modified Greenburg-Smith) and second impingers (Greenburg-Smith) were filled with 100mL high purity water. The third impinger (modified Greenburg-Smith) was empty and the fourth impinger was contained a pre-weighed amount of silica gel.

### 6.7.2 Testing Procedures

Once an acceptable leak check was achieved, the sampling train was placed at the first traverse point and sampling began immediately. The sampling train was operated at an isokinetic rate with an isokinetic variation greater than 90% and less than 110%. Gaseous and particulate pollutants were withdrawn isokinetically from the source and collected in high purity water. At the conclusion of each test run, the sample train was cooled sufficiently, utilizing ambient air or ice, to allow the nozzle to be plugged with the rubber septum. The sampling train was leak-

checked at a vacuum equal to or greater than the maximum value reached during sampling. Each test run was 120 minutes in duration and collected a minimum of 35 dry standard cubic feet. Three test runs were performed at the Pushing Baghouse Stack.

6.7.3 Sample Recovery

Container 1 – Probe and Impinger Catches. All surfaces to which the sample was exposed (including the probe nozzle, probe fitting, probe liner, first three impingers, and impinger connectors) were rinsed with up to 400 mL of water and added to Container #1.Then, using a graduated cylinder, the volume of the solution in the first three impingers was measured to the nearest 0.5g, and recorded. The combined impinger solution from the graduated cylinder was transferred the same storage container as the water rinse. The container was put on ice during the entire time from collection until shipment to lab.

Container 2 – Once a test series, a sample blank of the same volume as Container 1 was prepared and handled as described above.

Silica Gel – The silica gel was transferred to the original container and weighed to the nearest ± 0.5 gram (g).

The high purity water containing formaldehyde was analyzed using the modified pararosaniline method.

## 6.8 Speciated Volatile Organic HAPs – SW-846 Method 0031

Speciated Volatile Organic HAP emissions were determined by using SW-846 Method 0031

6.8.1 Testing Procedures

Method 0031 employs a sampling module, a glass lined heated probe, and meter box to withdraw a nominal 20 liter sample of effluent gas containing volatile organic compounds from a stationary source at a flow rate of 0.5 L/min, using a glass-lined probe heated to 130 ± 5°C and a sampling method for volatile organic compounds (SMVOC) train. The gas stream is cooled to 20°C by passage through a water-cooled condenser and volatile organic compounds are collected on a set of sorbent traps (Tenax®-GC/Tenax®- GC/Anasorb®-747). Liquid condensate was

collected in an impinger placed between the two Tenax®- GC traps and the Anasorb®-747 trap. The first and second traps contained 1.6 g of Tenax®-GC each and the third trap (back trap) contained 5.0 g of Anasorb®-747. 3 sets of traps and condensate were collected every 40 minutes of sampling time, with each set collecting approximately 20 liters of sample. A leak check of the system was performed prior to starting with an acceptable leak rate of 4% of the sample rate allowed. The probe was placed at a centrally located point in the stack. Flows and moistures were run concurrently in a separate train to determine mass emission rates. A post-test leak check was performed at the highest recordable vacuum during the test.

### 6.8.2 Sample Recovery

Upon finishing each 40 minute sample set, the tubes were sealed and placed in a teller bag and put on ice for shipment to the lab. The condensate was recovered by transferring any liquid contained in the knock-out trap to a 40-mL VOA vial and rinsing the knock-out trap three times with a minimum volume of organic-free reagent water and adding the rinses to the VOA vial. The VOA vial was filled to the top with water to avoid any air bubbles, and then placed on ice for shipment to the lab. The volatile organic compounds are desorbed from the analytical traps and separated by temperature-programmed gas chromatography and detected by continuously-scanning low resolution mass spectrometry (Method 8260).

## 6.9 Determination of Gaseous Emissions (Continuous Emissions Monitoring)

### 6.9.1 Sampling System Setup

The sampling system was comprised of a 3/8" heated stainless-steel or Inconel sheathed probe, a glass-fiber 30 x 100 millimeters (mm) heated filter, a calibration "T", a heated sample line, a gas conditioner, a gas distribution manifold, and pollutant specific analyzers. Sampling components prior to the gas conditioner (i.e., probe, filter, sample line) were heated to maintain temperatures above the dew point of the exhaust gas. Prior to sampling, the entire system was leak checked by capping off the end of the sample probe and drawing a vacuum on the entire system. An acceptable leak check of 0.0 liters per minute (lpm) at 15" mercury (Hg) vacuum was measured. Data acquisition was conducted with a multi-channel Yokagawa Model HR MX100 data acquisition system (DAS) collecting data continuously at 2-second intervals, then calculating 1-minute averages from those readings.

### 6.9.2 Testing Procedures

To the extent practicable, instrument spans were between 20 to 100% of the measured emissions. At the beginning of each sampling day, an internal calibration error (CE) check was performed; a zero gas and calibration gases at 40 to 60% of span and 100% of span were introduced to the analyzers. The internal calibration responses were checked against the known cylinder gas values. The difference between the cylinder values and analyzer responses was divided by the span value of the gas to give the CE. An allowable CE is 2% of analyzer span. Each analyzer demonstrated acceptable CE at all times.

The CEM system was then placed in a system calibration bias mode. Zero and upscale gases were introduced at the probe exit to allow evaluation of the sampling line, gas conditioner, and analyzer in a normal sampling mode. No adjustments to the sampling system were made and the response of each gas was recorded on the CEM bias sheets. The difference between the sampling system response in the bias mode minus the analyzer response during the internal calibration check was divided by the analyzer span value. This calculated value represents the sampling system bias. System bias did not exceed ± 5% for any analyzer at any time.

After each test run was complete, a post-test sampling system bias check was conducted. No adjustments to the sampling system were made and the response of each gas was recorded on the CEM bias sheet. The difference between the sampling system response in the bias mode minus the analyzer response during the internal check was divided by the analyzer span value. This calculated value represented the sampling system bias and did not exceed ±5% for any analyzer at any time.

The responses from the post-test bias check were compared with those from the pre-test system bias check. The difference between the post-test and pre-test bias check responses were divided by the analyzer span value. This value was the amount of drift between the pre-test and post-test bias checks, and did not exceed ±3% for any analyzer at any time.

Emissions data was reported on a parts per million by dry volume ($ppm_{dv}$) and lb/hr basis.

### 6.9.3 Carbon Dioxides and Oxygen Determination – USEPA Method 3A

The principles of USEPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*, were utilized for the determination of oxygen ($O_2$) and carbon dioxide ($CO_2$) for the test program. A Servomex 1440 Paramagnetic Analyzer was used to determine $O_2$ and a Servomex infrared analyzer was used to continuously measure $CO_2$. Nitrogen ($N_2$) was determined by the difference. Concentrations of $O_2$ and $CO_2$ are reported as %, dry, and are used for molecular weight determinations for each test run. Emission rates for $CO_2$ are reported as g/hr, lb/hr and tons/hr.

## 6.10 Hydrogen Sulfide Emissions – USEPA Method 15 GC Methodology

USEPA Method 15, *Determination of Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide Emissions from Stationary Sources*, was used to measure hydrogen sulfide using an on-site direct gas chromatograph (GC) sampling approach.

A GC with a Flame Photometric Detector (FPD) system consisting of an SRI Model 8610C field GC with a heated gas sampling valve, column oven and detector was used to quantify hydrogen sulfide. A separate sample line from the CEMs unit was used for this method. A heated sampling probe with a heated out-of-stack filter was used to convey the sample to a $SO_2$ scrubber system (using Teflon® impingers) that was in place after the heated probe and prior to the unheated sampling line leading to the GC/FPD detector. A sampling pump was used to continuously purge the sampling line in between injections.

Six injections were made each test run. A QA recovery study was performed for by running a calibration gas standard up through the calibration line which is connected to a "T" at the back of the sampling probe. The calibration gas traversed through the sampling system in the same manner that stack gas samples travel, and passed through the heated sample line, the sampling pump, the $SO_2$ scrubber and into the GC detector.

Three sampling runs were performed concurrently with $SO_2$ emission measurement. A concurrent flow and moisture test was performed with each test run to determine mass emission

rates. Laboratory results of these tests are provided in Appendix C. Emissions are reported on a $ppm_v$, and lb/hr basis.

## 6.11 Hydrogen Fluoride and Cyanide – USEPA Method 320

USEPA Method 320, *Vapor Phase Organic & Inorganic Emissions by Extractive FTIR,* was used to measure HF and HCN emissions. The FTIR analyzer determines individual concentrations by measuring the infrared spectrum produced by atomic motion that is unique to each compound. The FTIR uses an infrared spectral-reference library that has been validated against the on-line Environmental Protection Agency (EPA) library or against National Institute for Standards and Technology (NIST) traceable gas mixtures.

### 6.11.1 Sampling System Setup and Operation

The system was operated by a trained analyst with understanding of the analyzer and operating methodology. The FTIR sampling system uses the same probe, filter and heated line as the CEM sampling system. The gas conditioner was placed downstream of the FTIR analyzer, however. Sampling components prior to the FTIR (i.e., probe, filter, sample line) were heated to 350°F to prevent condensation. A slipstream sample of exhaust gas was analyzed hot/wet by an MKS Model 2030 FTIR system gas cell. The analyzer output was recorded on the MKS data acquisition system (DAS), using MKS's own MG2000 software package.

Infrared spectrum readings were recorded 64 times each minute continuously during each 60-minute test run. The FTIR analyzer determines individual concentrations for HCl, HF and HCN by measuring the infrared spectrum produced by atomic motion that is unique to each compound. The FTIR uses an infrared spectral-reference library that has been validated against the on-line USEPA library or against National Institute for Standards and Technology (NIST) traceable gas mixtures.

### 6.11.2 Quality Assurance / Quality Control Procedures

A surrogate calibration gas of a certified concentration was used for the quality assurance spikes and calibration transfer standard (CTS) checks of the FTIR sampling system. Each gas cylinder contained a known concentration of the tracer gas $SF_6$ (sulfur hexafluoride) to aid in

determination of the dilution coefficient when performing the spiking procedure. The surrogates used for the spike recovery checks were as follows:

- Cyanide with $SF_6$ tracer for Cyanide (also used as the system CTS)
- Hydrogen Chloride with $SF_6$ tracer for HF

For the CTS checks, cyanide calibration gas was introduced directly to the gas inlet of the FTIR. Five independent spectra were recorded for each CTS by first injecting the calibration gas directly to the back of the instrument for a minimum of 5 spectra readings. This procedure was then repeated with the gas being delivered at the back of the sampling probe to verify recovery and line loss of the sampling system. This check was performed prior to the start of sampling, as well as at the end of each test run. Three independent spectra readings were recorded at 1-minute intervals for each pre- and post- CTS measurement. Acceptable criteria between the pre- and post-test CTS were within ± 5% of the mean value. CTS data is included in Appendix D.

The spike recovery was performed by measuring 5 independent spectra while sampling the stack gas in its "native" form. Next, a spike gas was introduced at the back of the sampling probe at a rate of ≤ 10% of the total spike gas flow (this was determined based on the % difference of the "spiked" $SF_6$ concentration versus the instrument-direct $SF_6$ concentration). Once the spike concentration stabilized, 5 independent "spiked" spectra were recorded. This procedure was alternated between "native" and "spiked" measurements a single time for each of the above noted spike gases because this method has been proven to work on this source type previously. Spike recoveries were between 70% and 130% recovery. The spike data is included in Appendix D.

Minimum detection limits (MDLs) were calculated for the compounds by taking a minimum of 5 independent spectra readings while running nitrogen through the entire system. A standard deviation was calculated for the resulting data set, and an MDL of 3 times the standard deviation was set. The reportable amount for each compound is the greater of the hourly average or the MDL for the specific compound.

### 6.12 Opacity Emissions – USEPA Methods 9

USEPA Method 9, *Visual Determination of the Opacity of Emissions From Stationary Sources,* was used to opacity coming from the exhaust stack during PM testing events. A certified

observer recorded readings at 15 second intervals for a minimum of 4 pushes and charges during PM testing. USEPA Method 303, *Determination of Visible Emissions From By-Product Coke Oven Batteries*, was used to quantify visual emissions during PM testing events. Results are reported as average % opacity.

### 6.13 Pushing Baghouse Dust, COG, and Coal Sampling

As part of the ICR, during Pushing Baghouse testing of Metals and PAHs, a dust sample was collected from the baghouse dust. During the Method 5/29 testing, a glass jar provided by Test America was filled 1/3 of the way during each test run, and submitted for analysis of Mercury. The test runs were spaced out so that the first and last runs were greater than 20 pushes as required by the ICR. During the Method 0010/23 sampling , a glass jar provided by Test America was filled 1/3 of the way during each test run, and submitted for analysis of PAHs. Also during the PECs testing, a sample of coal was collected and analyzed for mercury, and 3 samples of COG were tested for and analyzed for mercury. Lab results can be found in Appendix C.

### 6.14 Quality Assurance/Quality Control

The following field equipment calibrations are contained in Appendix D:

- Pitot and Thermocouple
- Nozzle
- Dry gas meter and orifice
- Interference data
- Calibration gas certificates
- USEPA Method 320 QA checks
- Qualified Source Testing Individual (QSTI) certifications
- Opacity Observer Certification

### 6.15 Calculations

Emission calculations were completed by using a computer spreadsheet format. The results of each pertinent parameter are detailed on a spreadsheet for each sampling run and provided in Appendix B. A sample calculation for one complete test run of each parameter is included in Appendix E.

## 7 TEST RESULTS

Test results for the Pushing Baghouse Stack are contained in the following tables:

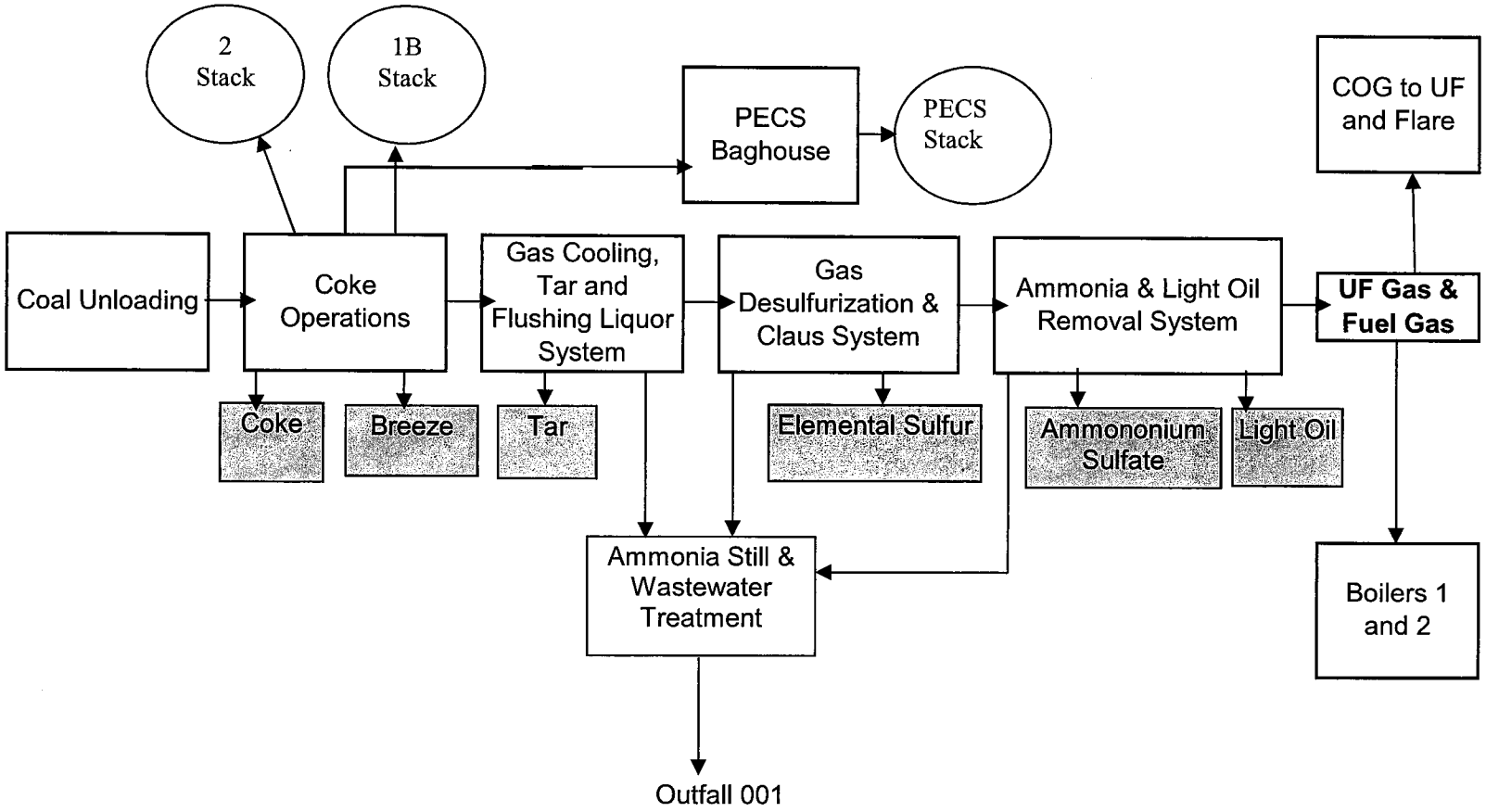
Table 1 – Filterable Particulate Matter Test Results (Opacity and VE included)
Table 2 – Metal Test Results
Table 3 –Dioxin/Furan Test Results
Table 4 – Semi-Volatile Organic Test Results
Table 5 – Formaldehyde Test Results
Table 6 – Speciated Volatile Organic Compounds
Table 7 – Gaseous Emissions Test Results
Table 8 – Acidic Gas Emission Test Results
Table 9 – Baghouse Dust, COG, and Coal Analysis
Table 10 – Static Process Data (not test run specific)
Table 11 – Table Nomenclature.

# 8 CONCLUSION

The ICR test program has been conducted for ArcelorMittal Monessen LLC on the Pushing Baghouse Stack at their Monessen Coke Plant on October 25-November 3, 2016. Test results represent data that is considered to be representative of the emission rates at the prevailing operating conditions.

To the best of Montrose's knowledge, this source test report has been checked for completeness and the results contained herein are accurate, error-free, and representative of the actual emissions measured during testing.

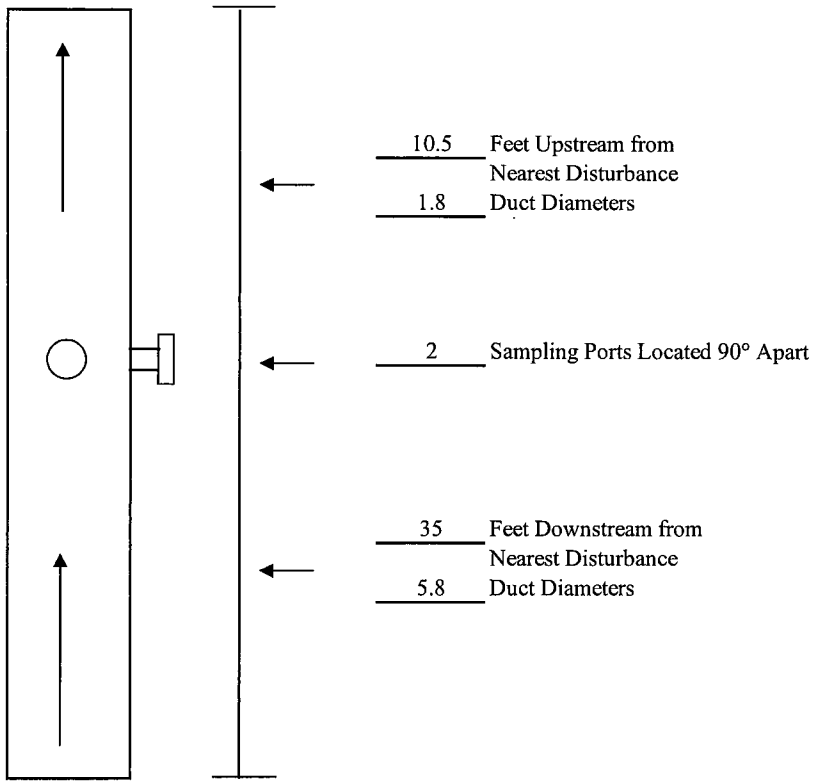
# REPORT – FIGURES

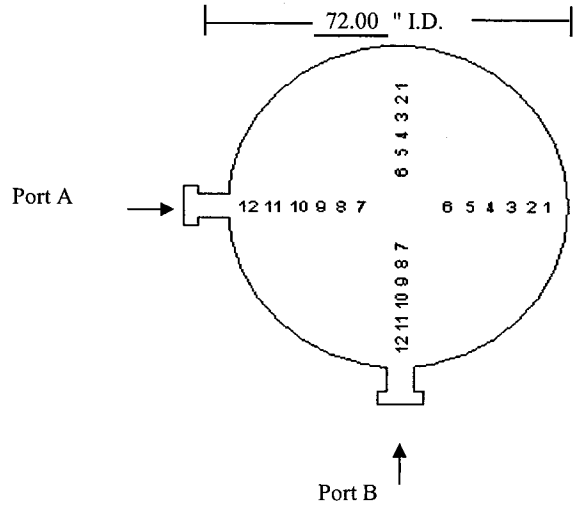



MONTROSE AIR QUALITY SERVICES

| SIMPLE BLOCK DIAGRAM for COKE MANUFACTURING PROCESS<br>ARCELORMITTAL MONESSEN, MONESSEN COKE PLANT | Figure<br>1 |
|---|---|

# AIR/COMPLIANCE CONSULTANTS, INC.
# USEPA METHOD 1 DATA SHEET




| Point Number Each Port | Method 1 Value (inches) |
|---|---|
| 1 | 70.49 |
| 2 | 67.18 |
| 3 | 63.50 |
| 4 | 59.26 |
| 5 | 54.00 |
| 6 | 46.37 |
| 7 | 25.63 |
| 8 | 18.00 |
| 9 | 12.74 |
| 10 | 8.50 |
| 11 | 4.82 |
| 12 | 1.51 |

MONTROSE

| PUSHING BAGHOUSE STACK SAMPLING LOCATION SCHEMATIC<br>ARCELORMITTAL MONESSEN LLC | Figure<br>2 |
|---|---|

# REPORT – TABLES

Table 1. Filterable Particulate Matter Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | Run 1 | Run 2 | Run 3 | Average |
|---|---|---|---|---|---|
| Date | | October 28, 2016 | October 31, 2016 | Oct. 31-Nov. 1, 2016 | |
| Start Time | | 3:28 AM | 8:23 AM | 10:58 PM | |
| End Time | | 5:01 PM | 10:04 PM | 1:27 PM | |
| Duration | (minutes) | 120 | 120 | 120 | |
| Flow Rate | (ACFM) | 87,735 | 87,939 | 87,895 | 87,857 |
| Flow Rate | (SCFM) | 77,429 | 78,754 | 77,960 | 78,047 |
| Flow Rate | (DSCFM) | 76,322 | 77,448 | 76,667 | 76,812 |
| Sample Volume | (DSCF) | 118.652 | 121.630 | 121.693 | 120.658 |
| Oxygen | (dry volume %) | 20.03 | 20.15 | 19.96 | 20.05 |
| Carbon Dioxide | (dry volume %) | 0.90 | 0.66 | 0.70 | 0.76 |
| Water Vapor | (volume %) | 1.43 | 1.66 | 1.66 | 1.58 |
| Stack Temperature | (°F) | 126.8 | 119.9 | 123.7 | 123.5 |
| Percent of Isokinetic Sampling | (%) | 103.3 | 104.4 | 105.5 | 104.4 |
| Process Data | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| # of Ovens Pushed during test | | 47 | 48 | 58 | 51 |
| Average coking time per oven(s) tested | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,433 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 545.2 | 556.8 | 672.8 | 591.6 |
| COG generated during test | (mmscf) | 9.13 | 9.22 | 9.76 | 9.37 |
| COG burned in boilers during test | (mmscf) | 2.43 | 2.45 | 2.59 | 2.49 |
| COG burned in batteries during test | (mmscf) | 5.30 | 5.35 | 5.67 | 5.44 |
| Results | | | | | |
| **Particulate Results -- by USEPA Method 5 front-half only** | | | | | |
| Mass Collected | (mg) | 7.90 | 5.40 | 4.40 | 5.90 |
| Emission Concentration | (mg/dscm) | 2.35 | 1.57 | 1.28 | 1.7320 |
| Emission Rate | (lb/push) | 0.028 | 0.019 | 0.015 | 0.021 |
| Emission Rate | (lb/hr) | 0.099 | 0.066 | 0.051 | 0.072 |
| **Opacity Results** | | | | | |
| Average Opacity | (%) | 0.00 | 0.00 | 0.00 | 0.00 |

Table 2. Metal Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | Run 1 | Run 2 | Run 3 | Average |
|---|---|---|---|---|---|
| Date | | Oct. 28, 2016 | Oct. 31, 2016 | Oct. 31-Nov. 1, 2016 | |
| Start Time | | 3:28 AM | 8:23 AM | 10:58 PM | |
| End Time | | 5:01 PM | 10:04 PM | 1:27 PM | |
| Duration | (minutes) | 120 | 120 | 120 | |
| Flow Rate | (ACFM) | 87,735 | 87,939 | 87,895 | 87,857 |
| Flow Rate | (SCFM) | 77,429 | 78,754 | 77,960 | 78,047 |
| Flow Rate | (DSCFM) | 76,322 | 77,448 | 76,667 | 76,812 |
| Sample Volume | (DSCF) | 118.65 | 121.63 | 121.69 | 120.66 |
| Oxygen | (dry volume %) | 20.03 | 20.15 | 19.96 | 20.05 |
| Carbon Dioxide | (dry volume %) | 0.90 | 0.66 | 0.70 | 0.76 |
| Water Vapor | (volume %) | 1.43 | 1.66 | 1.66 | 1.58 |
| Stack Temperature | (°F) | 126.8 | 119.9 | 123.7 | 123.5 |
| Percent of Isokinetic Sampling | (%) | 103.3 | 104.4 | 105.5 | 104.4 |
| **Process Data** | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| # of Ovens Pushed during test | | 47 | 48 | 58 | 51 |
| Average coking time per oven(s) tested | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,433 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 545.2 | 556.8 | 672.8 | 591.6 |
| COG generated during test | (mmscf) | 9.13 | 9.22 | 9.76 | 9.37 |
| COG burned in boilers during test | (mmscf) | 2.43 | 2.45 | 2.59 | 2.49 |
| COG burned in batteries during test | (mmscf) | 5.30 | 5.35 | 5.67 | 5.44 |
| **Results** | | | | | |
| **Mercury** | | | | | |
| Emission concentration (1B Fraction) | (mg/DSCM) | < 4.91E-05 | < 8.71E-06 | < 8.71E-06 | < 2.22E-05 |
| Emission concentration (2B Fraction) | (mg/DSCM) | 5.65E-05 | 5.52E-05 | 4.64E-05 | 5.27E-05 |
| Emission concentration (3B Fraction) | (mg/DSCM) | < 6.85E-06 | 2.00E-05 | < 7.25E-06 | < 1.14E-05 |
| Emission concentration (3C Fraction) | (mg/DSCM) | 5.30E-04 | 2.93E-04 | 3.63E-04 | 3.95E-04 |
| Emission rate (1B Fraction) | (lb/hr) | < 2.07E-06 | < 3.69E-07 | < 3.45E-07 | < 9.29E-07 |
| Emission rate (2B Fraction) | (lb/hr) | 2.39E-06 | 2.34E-06 | 1.84E-06 | 2.19E-06 |
| Emission rate (3B Fraction) | (lb/hr) | < 2.89E-07 | 8.49E-07 | < 2.88E-07 | < 4.75E-07 |
| Emission rate (3C Fraction) | (lb/hr) | 2.24E-05 | 1.24E-05 | 1.44E-05 | 1.64E-05 |
| **Antimony** | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | < 2.38E-04 | < 2.32E-04 | < 2.32E-04 | < 2.34E-04 |
| Emission Concentration Back-Half | (mg/DSCM) | < 1.19E-04 | < 1.16E-04 | < 1.16E-04 | < 1.17E-04 |
| Emission Rate Front-Half | (lb/hr) | < 1.00E-05 | < 9.85E-06 | < 9.21E-06 | < 9.70E-06 |
| Emission Rate Back-Half | (lb/hr) | < 5.02E-06 | < 4.92E-06 | < 4.60E-06 | < 4.85E-06 |
| **Arsenic** | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | < 2.38E-04 | < 2.32E-04 | < 2.32E-04 | < 2.34E-04 |
| Emission Concentration Back-Half | (mg/DSCM) | < 1.19E-04 | < 1.16E-04 | < 1.16E-04 | < 1.17E-04 |
| Emission Rate Front-Half | (lb/hr) | < 1.00E-05 | < 9.85E-06 | < 9.21E-06 | < 9.70E-06 |
| Emission Rate Back-Half | (lb/hr) | < 5.02E-06 | < 4.92E-06 | < 4.60E-06 | < 4.85E-06 |

Table 2. Metal Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | | Run 1 | | Run 2 | | Run 3 | | Average |
|---|---|---|---|---|---|---|---|---|---|
| **Beryllium** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | < | 5.95E-05 | < | 5.81E-05 | | 2.26E-04 | < | 1.15E-04 |
| Emission Concentration Back-Half | (mg/DSCM) | < | 2.98E-05 | < | 2.90E-05 | < | 2.90E-05 | < | 2.93E-05 |
| Emission Rate Front-Half | (lb/hr) | < | 2.51E-06 | < | 2.46E-06 | | 8.98E-06 | < | 4.65E-06 |
| Emission Rate Back-Half | (lb/hr) | < | 1.26E-06 | < | 1.23E-06 | < | 1.15E-06 | < | 1.21E-06 |
| **Cadmium** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | < | 5.95E-05 | < | 5.81E-05 | < | 5.80E-05 | < | 5.85E-05 |
| Emission Concentration Back-Half | (mg/DSCM) | < | 2.98E-05 | < | 2.90E-05 | < | 2.90E-05 | < | 2.93E-05 |
| Emission Rate Front-Half | (lb/hr) | < | 2.51E-06 | < | 2.46E-06 | < | 2.30E-06 | < | 2.43E-06 |
| Emission Rate Back-Half | (lb/hr) | < | 1.26E-06 | < | 1.23E-06 | < | 1.15E-06 | < | 1.21E-06 |
| **Chromium** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | | 1.05E-02 | | 1.25E-02 | | 1.09E-02 | | 1.13E-02 |
| Emission Concentration Back-Half | (mg/DSCM) | | 1.38E-03 | | 1.07E-03 | | 1.15E-03 | | 1.20E-03 |
| Emission Rate Front-Half | (lb/hr) | | 4.42E-04 | | 5.29E-04 | | 4.33E-04 | | 4.68E-04 |
| Emission Rate Back-Half | (lb/hr) | | 5.84E-05 | | 4.56E-05 | | 4.57E-05 | | 4.99E-05 |
| **Cobalt** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | | 2.77E-04 | | 1.60E-04 | | 1.51E-04 | | 1.96E-04 |
| Emission Concentration Back-Half | (mg/DSCM) | | 9.23E-05 | < | 2.90E-05 | | 2.90E-05 | < | 5.01E-05 |
| Emission Rate Front-Half | (lb/hr) | | 1.17E-05 | | 6.77E-06 | | 5.98E-06 | | 8.14E-06 |
| Emission Rate Back-Half | (lb/hr) | | 3.89E-06 | < | 1.23E-06 | | 1.15E-06 | < | 2.09E-06 |
| **Lead** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | | 2.56E-04 | | 2.03E-04 | | 2.15E-04 | | 2.25E-04 |
| Emission Concentration Back-Half | (mg/DSCM) | | 1.90E-04 | | 1.63E-04 | | 2.00E-04 | | 1.84E-04 |
| Emission Rate Front-Half | (lb/hr) | | 1.08E-05 | | 8.62E-06 | | 8.52E-06 | | 9.31E-06 |
| Emission Rate Back-Half | (lb/hr) | | 8.04E-06 | | 6.89E-06 | | 7.94E-06 | | 7.62E-06 |
| **Manganese** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | | 4.79E-03 | | 5.98E-03 | | 7.95E-03 | | 6.24E-03 |
| Emission Concentration Back-Half | (mg/DSCM) | | 5.33E-03 | | 3.25E-03 | | 1.10E-02 | | 6.52E-03 |
| Emission Rate Front-Half | (lb/hr) | | 2.02E-04 | | 2.54E-04 | | 3.15E-04 | | 2.57E-04 |
| Emission Rate Back-Half | (lb/hr) | | 2.25E-04 | | 1.38E-04 | | 4.35E-04 | | 2.66E-04 |
| **Nickel** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | | 6.37E-03 | | 5.69E-03 | | 5.66E-03 | | 5.91E-03 |
| Emission Concentration Back-Half | (mg/DSCM) | | 2.61E-03 | | 8.25E-04 | | 6.65E-04 | | 1.37E-03 |
| Emission Rate Front-Half | (lb/hr) | | 2.69E-04 | | 2.41E-04 | | 2.24E-04 | | 2.45E-04 |
| Emission Rate Back-Half | (lb/hr) | | 1.10E-04 | | 3.50E-05 | | 2.64E-05 | | 5.71E-05 |
| **Selenium** | | | | | | | | | |
| Emission Concentration Front-Half | (mg/DSCM) | < | 5.95E-04 | < | 5.81E-04 | < | 5.80E-04 | < | 5.85E-04 |
| Emission Concentration Back-Half | (mg/DSCM) | | 3.87E-04 | | 8.42E-04 | | 5.80E-04 | | 6.03E-04 |
| Emission Rate Front-Half | (lb/hr) | < | 2.51E-05 | < | 2.46E-05 | < | 2.30E-05 | < | 2.43E-05 |
| Emission Rate Back-Half | (lb/hr) | | 1.63E-05 | | 3.57E-05 | | 2.30E-05 | | 2.50E-05 |

Table 3. Dioxin/Furan Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | Run 1 | Run 2 | Run 3 | Average |
|---|---|---|---|---|---|
| Date | | Oct. 25-26, 2016 | Oct. 26-27, 2016 | Oct. 27-28, 2016 | |
| Start Time | | 8:27 AM | 7:33 AM | 5:49 AM | |
| End Time | | 6:12 AM | 5:02 AM | 2:22 AM | |
| Duration | (minutes) | 180 | 180 | 180 | |
| Flow Rate | (ACFM) | 83,117 | 82,330 | 79,908 | 81,785 |
| Flow Rate | (SCFM) | 75,040 | 73,820 | 70,576 | 73,145 |
| Flow Rate | (DSCFM) | 73,823 | 72,779 | 69,516 | 72,039 |
| Sample Volume | (DSCF) | 152.0 | 171.0 | 164.4 | 162.4 |
| Oxygen | (dry volume %) | 19.86 | 19.94 | 20.02 | 19.94 |
| Carbon Dioxide | (dry volume %) | 0.93 | 0.90 | 0.82 | 0.89 |
| Water Vapor | (volume %) | 1.62 | 1.41 | 1.50 | 1.51 |
| Stack Temperature | (°F) | 115.6 | 121.1 | 123.4 | 120.0 |
| Percent of Isokinetic Sampling | (%) | 91.2 | 104.1 | 104.8 | 100.0 |
| Process Data | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| Ovens Pushed during test | (#) | 71 | 76 | 73 | 73.3 |
| Average coking time per oven(s) tested | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,432 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 823.6 | 881.6 | 846.8 | 850.7 |
| COG generated during test | (mmscf) | 14.66 | 14.48 | 13.85 | 14.33 |
| COG burned in boilers during test | (mmscf) | 3.89 | 3.84 | 3.68 | 3.81 |
| COG burned in batteries during test | (mmscf) | 8.51 | 8.40 | 8.04 | 8.32 |
| **Results** | | | | | |
| **Dioxins and Furans** | | | | | |
| TEF Mass Collected | (ng) | < 0.010 | < 0.019 | < 0.009 | < 0.013 |
| TEF Emission Concentration | (ng/m$^3$) | < 0.0024 | < 0.0038 | < 0.0020 | < 0.0027 |
| TEF Emission Rate | (ng/hr) | < 42 | < 66 | < 34 | < 47 |
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | | | | | |
| | (raw μg/m$^3$) | < 7.9E-07 | < 7.6E-07 | < 7.3E-07 | < 7.6E-07 |
| | (raw lb/hr) | < 3.0E-11 | < 2.9E-11 | < 2.8E-11 | < 2.9E-11 |
| | (TEF μg/m$^3$) | < 7.9E-07 | < 7.6E-07 | < 7.3E-07 | < 7.6E-07 |
| | (TEF lb/hr) | < 3.0E-11 | < 2.9E-11 | < 2.8E-11 | < 2.9E-11 |
| 1,2,3,7,8-Pentachlorodibenzo-p-Dioxin | | | | | |
| | (raw μg/m$^3$) | < 7.4E-07 | < 7.8E-07 | < 6.4E-07 | < 7.2E-07 |
| | (raw lb/hr) | < 2.8E-11 | < 3.0E-11 | < 2.4E-11 | < 2.8E-11 |
| | (TEF μg/m$^3$) | < 3.7E-07 | < 3.9E-07 | < 3.2E-07 | < 3.6E-07 |
| | (TEF lb/hr) | < 1.4E-11 | < 1.5E-11 | < 1.2E-11 | < 1.4E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin | | | | | |
| | (raw μg/m$^3$) | < 7.4E-07 | < 6.8E-07 | < 6.4E-07 | < 6.9E-07 |
| | (raw lb/hr) | < 2.8E-11 | < 2.6E-11 | < 2.4E-11 | < 2.6E-11 |
| | (TEF μg/m$^3$) | < 7.4E-08 | < 6.8E-08 | < 6.4E-08 | < 6.9E-08 |
| | (TEF lb/hr) | < 2.8E-12 | < 2.6E-12 | < 2.4E-12 | < 2.6E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin | | | | | |
| | (raw μg/m$^3$) | < 7.4E-07 | < 6.8E-07 | < 6.4E-07 | < 6.9E-07 |
| | (raw lb/hr) | < 2.8E-11 | < 2.6E-11 | < 2.4E-11 | < 2.6E-11 |
| | (TEF μg/m$^3$) | < 7.4E-08 | < 6.8E-08 | < 6.4E-08 | < 6.9E-08 |
| | (TEF lb/hr) | < 2.8E-12 | < 2.6E-12 | < 2.4E-12 | < 2.6E-12 |

Table 3. Dioxin/Furan Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | Run 1 | Run 2 | Run 3 | Average |
|---|---|---|---|---|---|
| 1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin | | | | | |
| | (raw μg/m$^3$) | < 6.7E-07 | < 6.2E-07 | < 6.0E-07 | < 6.3E-07 |
| | (raw lb/hr) | < 2.6E-11 | < 2.4E-11 | < 2.3E-11 | < 2.4E-11 |
| | (TEF μg/m$^3$) | < 6.7E-08 | < 6.2E-08 | < 6.0E-08 | < 6.3E-08 |
| | (TEF lb/hr) | < 2.6E-12 | < 2.4E-12 | < 2.3E-12 | < 2.4E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin | | | | | |
| | (raw μg/m$^3$) | 1.3E-06 | 1.2E-06 | 1.1E-06 | 1.2E-06 |
| | (raw lb/hr) | 5.0E-11 | 4.7E-11 | 4.1E-11 | 4.6E-11 |
| | (TEF μg/m$^3$) | 1.3E-08 | 1.2E-08 | 1.1E-08 | 1.2E-08 |
| | (TEF lb/hr) | 5.0E-13 | 4.7E-13 | 4.1E-13 | 4.6E-13 |
| 2,3,7,8-Tetrachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | 8.8E-06 | 7.4E-06 | 8.4E-07 | 5.7E-06 |
| | (raw lb/hr) | 3.3E-10 | 2.8E-10 | 3.2E-11 | 2.2E-10 |
| | (TEF μg/m$^3$) | 1.7E-07 | 7.4E-07 | 8.4E-08 | 3.3E-07 |
| | (TEF lb/hr) | 6.6E-12 | 2.8E-11 | 3.2E-12 | 1.3E-11 |
| 1,2,3,7,8-Pentachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 1.0E-06 | 9.3E-07 | < 5.8E-07 | < 8.4E-07 |
| | (raw lb/hr) | < 3.8E-11 | 3.5E-11 | < 2.2E-11 | < 3.2E-11 |
| | (TEF μg/m$^3$) | < 5.0E-08 | 4.6E-08 | < 2.9E-08 | < 4.2E-08 |
| | (TEF lb/hr) | < 1.9E-12 | 1.8E-12 | < 1.1E-12 | < 1.6E-12 |
| 2,3,4,7,8-Pentachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 1.0E-06 | 1.9E-06 | < 5.8E-07 | < 1.2E-06 |
| | (raw lb/hr) | < 3.8E-11 | 7.3E-11 | < 2.2E-11 | < 4.4E-11 |
| | (TEF μg/m$^3$) | < 5.0E-07 | 9.6E-07 | < 2.9E-07 | < 5.8E-07 |
| | (TEF lb/hr) | < 1.9E-11 | 3.7E-11 | < 1.1E-11 | < 2.2E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 6.7E-07 | 3.6E-06 | < 7.1E-07 | < 1.7E-06 |
| | (raw lb/hr) | < 2.6E-11 | 1.4E-10 | < 2.7E-11 | < 6.3E-11 |
| | (TEF μg/m$^3$) | < 6.7E-08 | 3.6E-07 | < 7.1E-08 | < 1.7E-07 |
| | (TEF lb/hr) | < 2.6E-12 | 1.4E-11 | < 2.7E-12 | < 6.3E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 6.3E-07 | 1.1E-06 | < 6.9E-07 | < 8.2E-07 |
| | (raw lb/hr) | < 2.4E-11 | 4.3E-11 | < 2.6E-11 | < 3.1E-11 |
| | (TEF μg/m$^3$) | < 6.3E-08 | 1.1E-07 | < 6.9E-08 | < 8.2E-08 |
| | (TEF lb/hr) | < 2.4E-12 | 4.3E-12 | < 2.6E-12 | < 3.1E-12 |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 7.0E-07 | 1.1E-06 | < 7.5E-07 | < 8.6E-07 |
| | (raw lb/hr) | < 2.7E-11 | 4.3E-11 | < 2.9E-11 | < 3.3E-11 |
| | (TEF μg/m$^3$) | < 7.0E-08 | 1.1E-07 | < 7.5E-08 | < 8.6E-08 |
| | (TEF lb/hr) | < 2.7E-12 | 4.3E-12 | < 2.9E-12 | < 3.3E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 7.4E-07 | < 8.7E-07 | < 7.7E-07 | < 7.9E-07 |
| | (raw lb/hr) | < 2.8E-11 | < 3.3E-11 | < 2.9E-11 | < 3.0E-11 |
| | (TEF μg/m$^3$) | < 7.4E-08 | < 8.7E-08 | < 7.7E-08 | < 7.9E-08 |
| | (TEF lb/hr) | < 2.8E-12 | < 3.3E-12 | < 2.9E-12 | < 3.0E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | 9.5E-07 | 3.1E-06 | 6.7E-07 | 1.6E-06 |
| | (raw lb/hr) | 3.6E-11 | 1.2E-10 | 2.5E-11 | 6.0E-11 |
| | (TEF μg/m$^3$) | 9.5E-09 | 3.1E-08 | 6.7E-09 | 1.6E-08 |
| | (TEF lb/hr) | 3.6E-13 | 1.2E-12 | 2.5E-13 | 6.0E-13 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | | | | | |
| | (raw μg/m$^3$) | < 7.7E-07 | < 6.4E-07 | < 6.7E-07 | < 6.9E-07 |
| | (raw lb/hr) | < 2.9E-11 | < 2.4E-11 | < 2.5E-11 | < 2.6E-11 |
| | (TEF μg/m$^3$) | < 7.7E-09 | < 6.4E-09 | < 6.7E-09 | < 6.9E-09 |
| | (TEF lb/hr) | < 2.9E-13 | < 2.4E-13 | < 2.5E-13 | < 2.6E-13 |

Table 4. Semi-Volatile Organic Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | Run 1 | Run 2 | Run 3 | Average |
|---|---|---|---|---|---|
| Date | | Oct. 25-26, 2016 | Oct. 26-27, 2016 | Oct. 27-28, 2016 | |
| Start Time | | 8:27 AM | 7:33 AM | 5:49 AM | |
| End Time | | 6:12 AM | 5:02 AM | 2:22 AM | |
| Duration | (minutes) | 180 | 180 | 180 | |
| Flow Rate | (ACFM) | 83,117 | 82,330 | 79,908 | 81,785 |
| Flow Rate | (SCFM) | 75,040 | 73,820 | 70,576 | 73,145 |
| Flow Rate | (DSCFM) | 73,823 | 72,779 | 69,516 | 72,039 |
| Sample Volume | (DSCF) | 152.0 | 171.0 | 164.4 | 162.4 |
| Oxygen | (dry volume %) | 19.86 | 19.94 | 20.02 | 19.94 |
| Carbon Dioxide | (dry volume %) | 0.93 | 0.90 | 0.82 | 0.89 |
| Water Vapor | (volume %) | 1.62 | 1.41 | 1.50 | 1.51 |
| Stack Temperature | (°F) | 115.6 | 121.1 | 123.4 | 120.0 |
| Percent of Isokinetic Sampling | (%) | 91.2 | 104.1 | 104.8 | 100.0 |
| Process Data | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| Ovens Pushed during test | (#) | 71 | 76 | 73 | 73.3 |
| Average coking time per oven(s) tested | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,432 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 823.6 | 881.6 | 846.8 | 850.7 |
| COG generated during test | (mmscf) | 14.66 | 14.48 | 13.85 | 14.33 |
| COG burned in boilers during test | (mmscf) | 3.89 | 3.84 | 3.68 | 3.81 |
| COG burned in batteries during test | (mmscf) | 8.51 | 8.40 | 8.04 | 8.32 |
| **Results** | | | | | |
| **Semi-Volatiles** | | | | | |
| **Acenaphthene** | | | | | |
| Mass Collected | (µg) | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Emission Concentration | (mg/m$^3$) | < 0.0046 | < 0.0041 | < 0.0043 | < 0.0044 |
| Emission Rate | (lb/hr) | < 1.8E-04 | < 1.6E-04 | < 1.6E-04 | < 1.7E-04 |
| **Acenaphthylene** | | | | | |
| Mass Collected | (µg) | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Emission Concentration | (mg/m$^3$) | < 0.0046 | < 0.0041 | < 0.0043 | < 0.0044 |
| Emission Rate | (lb/hr) | < 1.8E-04 | < 1.6E-04 | < 1.6E-04 | < 1.7E-04 |
| **Anthracene** | | | | | |
| Mass Collected | (µg) | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Emission Concentration | (mg/m$^3$) | < 0.0046 | < 0.0041 | < 0.0043 | < 0.0044 |
| Emission Rate | (lb/hr) | < 1.8E-04 | < 1.6E-04 | < 1.6E-04 | < 1.7E-04 |
| **Benz[a]anthracene** | | | | | |
| Mass Collected | (µg) | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Emission Concentration | (mg/m$^3$) | < 0.0046 | < 0.0041 | < 0.0043 | < 0.0044 |
| Emission Rate | (lb/hr) | < 1.8E-04 | < 1.6E-04 | < 1.6E-04 | < 1.7E-04 |
| **Benzo[a]pyrene** | | | | | |
| Mass Collected | (µg) | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Emission Concentration | (mg/m$^3$) | < 0.0046 | < 0.0041 | < 0.0043 | < 0.0044 |
| Emission Rate | (lb/hr) | < 1.8E-04 | < 1.6E-04 | < 1.6E-04 | < 1.7E-04 |
| **Benzo[b]fluoranthene** | | | | | |
| Mass Collected | (µg) | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Emission Concentration | (mg/m$^3$) | < 0.0046 | < 0.0041 | < 0.0043 | < 0.0044 |
| Emission Rate | (lb/hr) | < 1.8E-04 | < 1.6E-04 | < 1.6E-04 | < 1.7E-04 |

Table 4. Semi-Volatile Organic Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | | Run 1 | | Run 2 | | Run 3 | | Average |
|---|---|---|---|---|---|---|---|---|---|
| **Benzo[g,h,i]perylene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 0.0002 | < | 0.0002 | < | 0.0002 | < | 0.0002 |
| **Benzo[k]fluoranthene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.00465 | < | 0.00413 | < | 0.00430 | < | 0.00436 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Chrysene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Dibenz[a,h]anthracene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Fluoranthene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Fluorene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Indeno (1,2,3-cd) pyrene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Naphthalene** | | | | | | | | | |
| Mass Collected | (µg) | | 128.0 | | 184.0 | | 301.0 | | 204.3 |
| Emission Concentration | (mg/m$^3$) | | 0.0297 | | 0.0380 | | 0.0647 | | 0.0441 |
| Emission Rate | (lb/hr) | | 1.1E-03 | | 1.4E-03 | | 2.5E-03 | | 1.7E-03 |
| **Phenanthrene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |
| **Perylene** | | | | | | | | | |
| Mass Collected | (µg) | < | 15.0 | < | 15.0 | < | 15.0 | < | 15.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0035 | < | 0.0031 | < | 0.0032 | < | 0.0033 |
| Emission Rate | (lb/hr) | < | 1.3E-04 | < | 1.2E-04 | < | 1.2E-04 | < | 1.2E-04 |
| **Pyrene** | | | | | | | | | |
| Mass Collected | (µg) | < | 20.0 | < | 20.0 | < | 20.0 | < | 20.0 |
| Emission Concentration | (mg/m$^3$) | < | 0.0046 | < | 0.0041 | < | 0.0043 | < | 0.0044 |
| Emission Rate | (lb/hr) | < | 1.8E-04 | < | 1.6E-04 | < | 1.6E-04 | < | 1.7E-04 |

Table 5. Formaldehyde Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| **Test Data** | | | **Run 1** | **Run 2** | **Run 3** | | **Average** |
|---|---|---|---|---|---|---|---|
| Date | | | Nov. 1-2, 2016 | Nov. 2, 2016 | Nov. 2-3, 2016 | | |
| Start Time | | | 2:13 PM | 5:13 AM | 7:49 PM | | |
| End Time | | | 4:40 AM | 7:10 PM | 10:56 AM | | |
| Test Duration | (minutes) | | 120 | 120 | 120 | | |
| Flow Rate | (ACFM) | | 88,026 | 86,517 | 88,770 | | 87,771 |
| Flow Rate | (SCFM) | | 77,002 | 74,839 | 77,944 | | 76,595 |
| Flow Rate | (DSCFM) | | 74,863 | 73,204 | 75,785 | | 74,617 |
| Sample Volume | (DSCF) | | 44.9 | 43.5 | 46.2 | | 44.9 |
| Oxygen | (dry volume %) | | 20.09 | 20.11 | 20.05 | | 20.08 |
| Carbon Dioxide | (dry volume %) | | 0.63 | 0.63 | 0.59 | | 0.62 |
| Water Vapor | (volume %) | | 2.78 | 2.18 | 2.77 | | 2.58 |
| Stack Temperature | (°F) | | 131.9 | 131.3 | 128.3 | | 130.5 |
| Percent of Isokinetic Sampling | (%) | | 107.9 | 106.9 | 109.6 | | 108.2 |
| Process Data | | | | | | | |
| ID #'s of Ovens Pushed/Charged | | | | See Appendix A | | | |
| # of Ovens Pushed during test | | | 50 | 48 | 51 | | 50 |
| Average coking time per oven(s) tested | (hours) | | 16.19 | 16.19 | 16.19 | | 16.19 |
| Average temperature of coke walls | (°F) | | 2,432 | 2,432 | 2,432 | | 2,432 |
| Coal processed during testing | (tons/oven) | | 16.2 | 16.2 | 16.2 | | 16.2 |
| Coke produced during test period | (tons) | | 580 | 556.8 | 591.6 | | 576.1 |
| COG generated during test | (mmscf) | | 9.74 | 9.40 | 10.19 | | 9.78 |
| COG burned in boilers during test | (mmscf) | | 2.59 | 2.50 | 2.71 | | 2.60 |
| COG burned in batteries during test | (mmscf) | | 5.65 | 5.46 | 5.91 | | 5.67 |
| **Results** | | | | | | | |
| **Formaldehyde** | | | | | | | |
| Emission Mass | (mg) | < | 0.0085 | 0.0140 | 0.0120 | < | 0.0115 |
| Emission Concentration | (mg/DSCM) | < | 0.0067 | 0.0114 | 0.00918 | < | 0.0091 |
| Emission Rate | (lb/push) | < | 0.00008 | 0.00013 | 0.00011 | < | 0.00011 |
| Emission Rate | (lb/hr) | < | 0.00026 | 0.00045 | 0.00034 | < | 0.00035 |

Table 6. Speciated Volatile Organic HAP Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | Run 1 | Run 2 | Run 3 | Average |
|---|---|---|---|---|---|
| Date | | Nov. 1-2, 2016 | Nov. 2, 2016 | Nov. 2-3, 2016 | |
| Start Time | | 2:13 PM | 5:13 AM | 7:49 PM | |
| End Time | | 4:40 AM | 7:10 PM | 10:56 AM | |
| Test Duration | (minutes) | 120 | 120 | 120 | |
| Flow Rate | (ACFM) | 88,026 | 86,045 | 88,765 | 87,612 |
| Flow Rate | (SCFM) | 77,002 | 75,245 | 77,940 | 76,729 |
| Flow Rate | (DSCFM) | 74,863 | 73,613 | 75,866 | 74,781 |
| VOST Sample Volume | (liters, dry standard) | 60.61 | 59.57 | 59.84 | 60.01 |
| Oxygen ($O_2$) | (dry volume %) | 20.09 | 20.11 | 20.24 | 20.15 |
| Carbon Dioxide ($CO_2$) | (dry volume %) | 0.63 | 0.63 | 0.48 | 0.58 |
| Water Vapor ($H_2O$) | (volume %) | 2.78 | 2.17 | 2.66 | 2.54 |
| Stack Temperature | (°F) | 131.9 | 131.3 | 128.3 | 130.5 |
| Process Data | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| # of Ovens Pushed during test | | 50 | 48 | 51 | 50 |
| Average coking time per oven(s) tested | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,432 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 580 | 556.8 | 591.6 | 576.1 |
| COG generated during test | (mmscf) | 9.74 | 9.40 | 10.19 | 9.78 |
| COG burned in boilers during test | (mmscf) | 2.59 | 2.50 | 2.71 | 2.60 |
| COG burned in batteries during test | (mmscf) | 5.65 | 5.46 | 5.91 | 5.67 |
| **Semi-volatile Results** | | | | | |
| **Acrylonitrile (107-13-1)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 0.70 | < 1.37 | < 1.36 | < 1.14 |
| Emission Concentration | (mg/DSCM) | < 0.012 | < 0.023 | < 0.023 | < 0.019 |
| Emission Rate | (lb/hr) | < 0.0004 | < 0.0057 | < 0.0058 | < 0.0040 |
| **Benzene** | | | | | |
| Emission Mass Collected | (µg)[1] | < 2.02 | < 3.76 | < 2.49 | < 2.76 |
| Emission Concentration | (mg/DSCM) | < 0.03 | < 0.06 | < 0.04 | < 0.05 |
| Emission Rate | (lb/hr) | < 0.001 | < 0.016 | < 0.011 | < 0.009 |
| **Bromoform (75-25-2)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 0.55 | < 1.09 | < 1.08 | < 0.91 |
| Emission Concentration | (mg/DSCM) | < 0.009 | < 0.018 | < 0.018 | < 0.015 |
| Emission Rate | (lb/hr) | < 0.0004 | < 0.0046 | < 0.0046 | < 0.0032 |
| **Bromomethane (74-83-9)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 4.06 | < 8.06 | < 8.02 | < 6.71 |
| Emission Concentration | (mg/DSCM) | < 0.07 | < 0.14 | < 0.13 | < 0.11 |
| Emission Rate | (lb/hr) | < 0.003 | < 0.034 | < 0.034 | < 0.024 |
| **Carbon disulfide (75-15-0)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 0.82 | < 1.51 | < 1.47 | < 1.27 |
| Emission Concentration | (mg/DSCM) | < 0.014 | < 0.025 | < 0.025 | < 0.021 |
| Emission Rate | (lb/hr) | < 0.0005 | < 0.0063 | < 0.0063 | < 0.0044 |
| **Carbon tetrachloride (56-23-5)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 0.69 | < 1.36 | < 1.35 | < 1.13 |
| Emission Concentration | (mg/DSCM) | < 0.011 | < 0.023 | < 0.023 | < 0.019 |
| Emission Rate | (lb/hr) | < 0.0004 | < 0.0057 | < 0.0058 | < 0.0040 |
| **Chlorobenzene (108-90-7)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 0.68 | < 1.35 | < 1.34 | < 1.13 |
| Emission Concentration | (mg/DSCM) | < 0.011 | < 0.023 | < 0.022 | < 0.019 |
| Emission Rate | (lb/hr) | < 0.0004 | < 0.0057 | < 0.0057 | < 0.0040 |
| **Chloroethane (75-00-3)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 1.36 | < 2.69 | < 2.68 | < 2.24 |
| Emission Concentration | (mg/DSCM) | < 0.022 | < 0.045 | < 0.045 | < 0.037 |
| Emission Rate | (lb/hr) | < 0.0009 | < 0.0113 | < 0.0114 | < 0.0079 |
| **Chloroform (67-66-3)** | | | | | |
| Emission Mass Collected | (µg)[1] | < 0.55 | < 1.08 | < 1.08 | < 0.90 |
| Emission Concentration | (mg/DSCM) | < 0.009 | < 0.018 | < 0.018 | < 0.015 |
| Emission Rate | (lb/hr) | < 0.0003 | < 0.0046 | < 0.0046 | < 0.0032 |

Table 6. Speciated Volatile Organic HAP Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Test Data | | | Run 1 | | Run 2 | | Run 3 | | Average |
|---|---|---|---|---|---|---|---|---|---|
| **Chloromethane (74-87-3)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 2.75 | < | 5.41 | < | 5.37 | < | 4.51 |
| Emission Concentration | (mg/DSCM) | < | 0.045 | < | 0.091 | < | 0.090 | < | 0.075 |
| Emission Rate | (lb/hr) | < | 0.0017 | < | 0.0228 | < | 0.0229 | < | 0.0158 |
| **1,2-Dichloroethane (107-06-2)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.68 | < | 1.35 | < | 1.34 | < | 1.12 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.022 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0057 | < | 0.0057 | < | 0.0039 |
| **1,1-Dichloroethene (75-35-4)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.55 | < | 1.08 | < | 1.08 | < | 0.90 |
| Emission Concentration | (mg/DSCM) | < | 0.009 | < | 0.018 | < | 0.018 | < | 0.015 |
| Emission Rate | (lb/hr) | < | 0.0003 | < | 0.0046 | < | 0.0046 | < | 0.0032 |
| **1,2-Dichloropropane (78-87-5)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.68 | < | 1.35 | < | 1.34 | < | 1.13 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.022 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0057 | < | 0.0057 | < | 0.0040 |
| **Ethylbenzene (100-41-4)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.689 | < | 1.394 | < | 1.348 | < | 1.144 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.023 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0059 | < | 0.0057 | < | 0.0040 |
| **Iodomethane (74-88-4)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.82 | < | 1.62 | < | 1.62 | < | 1.35 |
| Emission Concentration | (mg/DSCM) | < | 0.014 | < | 0.027 | < | 0.027 | < | 0.023 |
| Emission Rate | (lb/hr) | < | 0.0005 | < | 0.0068 | < | 0.0069 | < | 0.0047 |
| **Methylene chloride (75-09-2)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 2.09 | < | 4.70 | < | 3.12 | < | 3.30 |
| Emission Concentration | (mg/DSCM) | < | 0.03 | < | 0.08 | < | 0.05 | < | 0.06 |
| Emission Rate | (lb/hr) | < | 0.0013 | < | 0.0198 | < | 0.0133 | < | 0.0115 |
| **Styrene (100-42-5)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.73 | < | 1.49 | < | 1.37 | < | 1.19 |
| Emission Concentration | (mg/DSCM) | < | 0.012 | < | 0.025 | < | 0.023 | < | 0.020 |
| Emission Rate | (lb/hr) | < | 0.0005 | < | 0.0063 | < | 0.0058 | < | 0.0042 |
| **1,1,2,2-Tetrachloroethane (79-34-5)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 1.36 | < | 2.69 | < | 2.68 | < | 2.25 |
| Emission Concentration | (mg/DSCM) | < | 0.022 | < | 0.045 | < | 0.045 | < | 0.037 |
| Emission Rate | (lb/hr) | < | 0.0009 | < | 0.0113 | < | 0.0114 | < | 0.0079 |
| **Tetrachloroethene (127-18-4)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.69 | < | 1.37 | < | 1.35 | < | 1.14 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.023 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0058 | < | 0.0058 | < | 0.0040 |
| **Toluene (108-88-3)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | | 8.00 | | 22.29 | | 20.28 | | 16.85 |
| Emission Concentration | (mg/DSCM) | | 0.13 | | 0.37 | | 0.34 | | 0.28 |
| Emission Rate | (lb/hr) | | 0.005 | | 0.094 | | 0.087 | | 0.062 |
| **1,1,1-Trichloroethane (71-55-6)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.69 | < | 1.35 | < | 1.35 | < | 1.13 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.023 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0057 | < | 0.0057 | < | 0.0040 |
| **1,1,2-Trichloroethane (79-00-5)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.69 | < | 1.36 | < | 1.35 | < | 1.13 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.023 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0057 | < | 0.0058 | < | 0.0040 |
| **Trichloroethene (79-01-6)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.68 | < | 1.35 | < | 1.34 | < | 1.13 |
| Emission Concentration | (mg/DSCM) | < | 0.011 | < | 0.023 | < | 0.022 | < | 0.019 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0057 | < | 0.0057 | < | 0.0040 |
| **Vinyl chloride (75-01-4)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.55 | < | 1.09 | < | 1.08 | < | 0.91 |
| Emission Concentration | (mg/DSCM) | < | 0.009 | < | 0.018 | < | 0.018 | < | 0.015 |
| Emission Rate | (lb/hr) | < | 0.0004 | < | 0.0046 | < | 0.0046 | < | 0.0032 |
| **Xylenes (total) (1330-20-7)** | | | | | | | | | |
| Emission Mass Collected | (µg)[1] | < | 0.76 | < | 1.62 | < | 1.41 | < | 1.26 |
| Emission Concentration | (mg/DSCM) | < | 0.012 | < | 0.027 | < | 0.024 | < | 0.021 |
| Emission Rate | (lb/hr) | < | 0.000 | < | 0.007 | < | 0.006 | < | 0.004 |

[1] Due to sample sets 1C and 3C condensate fraction having toluene results that our outliers when compared to the other 9 condensate fractions, only the tube fractions are reported for those two sets.

Table 7. Gaseous Emissions Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| **Test Data** | | **Run 1** | **Run 2** | **Run 3** | **Average** |
|---|---|---|---|---|---|
| Date | | Nov. 1-2, 2016 | Nov. 2, 2016 | Nov. 2-3, 2016 | |
| Start Time | | 2:13 PM | 5:13 AM | 7:49 PM | |
| End Time | | 4:40 AM | 7:10 PM | 10:56 AM | |
| Test Duration | (minutes) | 120 | 120 | 120 | |
| Flow Rate | (ACFM) | 88,026 | 86,517 | 88,752 | 87,765 |
| Flow Rate | (SCFM) | 77,002 | 74,839 | 77,928 | 76,589 |
| Flow Rate | (DSCFM) | 74,863 | 73,204 | 75,854 | 74,641 |
| Sample Volume | (DSCF) | 44.9 | 43.5 | 48.1 | 45.5 |
| Oxygen ($O_2$) | (dry volume %) | 20.09 | 20.11 | 20.05 | 20.08 |
| Carbon Dioxide ($CO_2$) | (dry volume %) | 0.63 | 0.63 | 0.59 | 0.62 |
| Water Vapor ($H_2O$) | (volume %) | 2.78 | 2.18 | 2.66 | 2.54 |
| Stack Temperature | (°F) | 131.9 | 131.3 | 128.3 | 130.5 |
| Process Data | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| Ovens Pushed during test | (#) | 50 | 48 | 51 | 49.7 |
| Average coking time per oven(s) teste | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,432 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 580 | 556.8 | 591.6 | 576.1 |
| COG generated during test | (mmscf) | 9.74 | 9.40 | 10.19 | 9.78 |
| COG burned in boilers during test | (mmscf) | 2.59 | 2.50 | 2.71 | 2.60 |
| COG burned in batteries during test | (mmscf) | 5.65 | 5.46 | 5.91 | 5.67 |
| **Results** | | | | | |
| **Hydrogen Sulfide ($H_2S$)** | | | | | |
| Emission Concentration | ($ppm_{wv}$) | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Emission Concentration | ($ppm_{dv}$) | < 0.51 | < 0.51 | < 0.51 | < 0.51 |
| Emission Rate | (lb/hr) | < 0.028 | < 0.028 | < 0.027 | < 0.028 |
| **Carbon Dioxide (CO2)** | | | | | |
| Emission Concentration | ($ppm_{dv}$) | 6,268 | 6,308 | 5,883 | 6,153 |
| Emission Rate | (g/hr) | 201,836 | 205,741 | 183,479 | 197,019 |
| Emission Rate | (lb/hr) | 445 | 454 | 405 | 434 |
| Emission Rate | (tons/hr) | 0.22 | 0.23 | 0.20 | 0.22 |

CEM results have been bias calibration corrected.

Table 8. Acidic Gas Emissions Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| **Test Data** | | **Run 1** | **Run 2** | **Run 3** | **Average** |
|---|---|---|---|---|---|
| Date | | Nov. 1, 2016 | Nov. 2, 2016 | Nov. 2-3, 2016 | |
| Start Time | | 2:38 PM | 8:05 AM | 7:49 PM | |
| End Time | | 10:51 PM | 6:34 PM | 4:15 AM | |
| Flow Rate | (ACFM) | 88,024 | 86,463 | 89,144 | 87,877 |
| Flow Rate | (SCFM) | 77,000 | 74,876 | 77,591 | 76,489 |
| Flow Rate | (DSCFM) | 74,862 | 73,243 | 75,517 | 74,541 |
| Sample Volume | (DSCF) | 44.9 | 43.6 | 47.9 | 45.4 |
| Oxygen ($O_2$) | (dry volume %) | 20.06 | 20.08 | 20.07 | 20.07 |
| Carbon Dioxide ($CO_2$) | (dry volume %) | 0.64 | 0.66 | 0.58 | 0.63 |
| Water Vapor ($H_2O$) | (volume %) | 2.78 | 2.18 | 2.67 | 2.54 |
| Stack Temperature | (°F) | 131.9 | 131.3 | 128.3 | 130.5 |
| Process Data | | | | | |
| ID #'s of Ovens Pushed/Charged | | | See Appendix A | | |
| Ovens Pushed during test | (#) | 50 | 48 | 51 | 49.7 |
| Average coking time per oven(s) teste | (hours) | 16.19 | 16.19 | 16.19 | 16.19 |
| Average temperature of coke walls | (°F) | 2,432 | 2,432 | 2,432 | 2,432 |
| Coal processed during testing | (tons/oven) | 16.2 | 16.2 | 16.2 | 16.2 |
| Coke produced during test period | (tons) | 580 | 556.8 | 591.6 | 576.1 |
| COG generated during test | (mmscf) | 5.54 | 7.07 | 5.68 | 6.10 |
| COG burned in boilers during test | (mmscf) | 1.47 | 1.88 | 1.51 | 1.62 |
| COG burned in batteries during test | (mmscf) | 3.21 | 4.10 | 3.30 | 3.54 |
| **Results** | | | | | |
| **Hydrogen Flouride (HF)** | | | | | |
| Emission Concentration | ($ppm_{wv}$) | 0.062 | 0.064 | 0.072 | 0.066 |
| Emission Concentration | ($ppm_{dv}$) | 0.064 | 0.066 | 0.074 | 0.068 |
| Emission Concentration | (mg/dscm) | 0.057 | 0.059 | 0.066 | 0.061 |
| Emission Rate | (lb/hr) | 0.0021 | 0.0022 | 0.0023 | 0.0022 |
| **Hydrogen Cyanide (HCN)** | | | | | |
| Emission Concentration | ($ppm_{wv}$) | 1.12 | 1.06 | 0.98 | 1.05 |
| Emission Concentration | ($ppm_{dv}$) | 1.15 | 1.08 | 1.00 | 1.08 |
| Emission Concentration | (mg/dscm) | 1.39 | 1.31 | 1.21 | 1.30 |
| Emission Rate | (lb/hr) | 0.050 | 0.048 | 0.042 | 0.047 |

CEM results have been bias calibration corrected.

Table 9. Baghouse Dust, COG, and Coal Analyses Test Results, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Pollutant Type | Sample Media | Results | Notes |
|---|---|---|---|
| Mercury (mg/kg) | Coal | 0.17 | B |
| | Dust | 0.43 | |

B = Estimated result. Result is less than the Reporting Limit

| Pollutant Type | Sample Media | Results (ng/g) | Results (mg/kg) | Notes |
|---|---|---|---|---|
| Acenaphthene | Dust | 62 | 0.1 | |
| Acenaphthylene | | 570 | 0.6 | |
| Anthracene | | 230 | 0.2 | |
| Benzo (a) anthracene | | 520 | 0.5 | |
| Benzo (b) fluoranthene | | 2700 | 2.7 | |
| Benzo (k) fluoranthene | | 820 | 0.8 | |
| Benzo (ghi) perylene | | 680 | 0.7 | |
| Benzo (a) pyrene | | 330 | 0.3 | |
| Chrysene | | 2200 | 2.2 | |
| Dibenz (a,h) anthracene | | 120 | 0.1 | |
| Fluorene | | 1300 | 1.3 | |
| Indeno (1,2,3-cd) pyrene | | 1100 | 1.1 | |
| Perylene | | 54 | 0.1 | |
| Pyrene | | 1200 | 1.2 | |

B = Estimated result. Result is less than the Reporting Limit

| Pollutant Type | Sample Media | Run | Results (ng/L) | Results (g/m3) | Notes |
|---|---|---|---|---|---|
| Mercury (mg/kg) | Coke Oven Gas | 1 | NA | NA | Invalid/Over Calibration |
| | | 2 | 76.5 | 7.65E-05 | |
| | | 3 | 56.5 | 5.65E-05 | |

Table 10. Static Process Data, Pushing Baghouse Stack
ArcelorMittal Monessen, LLC., Monessen Coke Plant, Monessen, Pennsylvania

| Process Data | Units | |
|---|---|---|
| Emission Unit ID | | 802, Emission Point 1 |
| Type of Process | | Pushing Emission Control System |
| Type of Air Control Device | | Baghouse |
| Latitude of Stack (5 decimal places) | | 40.16304 |
| Longitue of Stack (5 decimal Places | | -79.88444 |
| Type of Coal Charged During Test | | Metallurgical Bituminous Coal |
| Yearly COG Generated | (mmscf/yr) | 5,904.1 |
| Yearly COG burned in Batteries | (mmscf/yr) | 3,426.9 |
| Yearly COG burned in Boilers | (mmscf/yr) | 1,567.8 |
| Yearly Natural Gas burned in Batteries | (mmscf/yr) | 133.9 |
| Pushing period during testing | (minutes) | 12 |
| Charging period during testing | (minutes) | 11 |
| Higher Heating Value COG | (BTU/scf) | 510 |
| Higher Heating Value Natural Gas | (BTU/scf) | 1,020 |

Table 11.

## TABLE NOMENCLATURE

| SYMBOL | | DESCRIPTION | SYMBOL | | DESCRIPTION | SYMBOL | | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| % | - | Percent | gpm | - | Gallons per minute | $O_2$ | - | Oxygen |
| % Volume | - | Percent by volume | gr/DSCF | - | Grains per dry standard cubic feet | OSHA | - | Occupational Safety & Health Administration |
| °F | - | Degrees Fahrenheit | $H_2O$ | - | Water | PADEP | - | PA Department of Environmental Protection |
| < | - | Less than | $H_2SO_4$ | - | Sulfuric acid | Pb | - | Lead |
| > | - | Greater than | HAP | - | Hazardous air pollutant | PEL | - | Permissible exposure limit |
| AB | - | Acetone Blank | Hg | - | Mercury | PM | - | Particulate matter |
| ACFM | - | Actual cubic feet per minute | HI | - | Heat input | $PM_{10}$ | - | Particulate matter less than 10 microns |
| BACT | - | Best Available Control Technology | Hp | - | Horsepower | ppb | - | Parts per billion |
| BHP | - | Brake horsepower | hr | - | Hour | PPE | - | Personal protective equipment |
| BTU | - | British thermal units | IC | - | Ion chromatography | ppm | - | Parts per million |
| BTU/scf | - | British thermal units per standard cubic feet | in $H_2O$ | - | Inches of Water | $ppm_{dv}$ | - | Parts per million, dry volume |
| $C_3H_8$ | - | Propane | in Hg | - | Inches of Mercury | $ppm_{wv}$ | - | Parts per million, wet volume |
| CE | - | Capture efficiency | Kg | - | Kilograms | psia | - | Pounds per square inch absolute |
| CEMS | - | Continuous emission monitor system | lb | - | Pound | psig | - | Pounds per square inch gauge |
| cf | - | Cubic foot | lb/hr | - | Pound per hour | PTI | - | Permit to Install |
| CFR | - | Code of Federal Regulations | lb/lb-mole | - | Pound per pound mole | PTE | - | Permanent total enclosure |
| $CH_4$ | - | Methane | MACT | - | Maximum Achievable Control Technology | RA | - | Relative Accuracy |
| $C_2H_6$ | - | Ethane | $m^3$ | - | Cubic meters | RATA | - | Relative Accuracy Test Audit |
| $Cl_2$ | - | Chlorine | MDL | - | Minimum detection limit | RM | - | Reference Method |
| CO | - | Carbon monoxide | mg | - | Milligrams | RMD | - | Relative mean difference |
| $CO_2$ | - | Carbon dioxide | mg/g | - | Milligrams per gram | rpm | - | Revolutions per minute |
| COG | - | Coke oven gas | min | - | Minute | S | - | Sulfur |
| DACF | - | Dry actual cubic feet | mL | - | Milliliter | SCF | - | Standard cubic feet |
| DACM | - | Dry actual cubic meters | mm HG | - | Millimeters of mercury | SCFM | - | Standard cubic feet per minute |
| DE | - | Destruction efficiency | MMBtu | - | Million British thermal units | SCM | - | Standard cubic meters |
| DSCF | - | Dry standard cubic feet | MNOC | - | Maximum normal operating capacity | $SO_2$ | - | Sulfur dioxide |
| DSCFM | - | Dry standard cubic feet per minute | MSDS | - | Material Safety Data Sheet | STD | - | Standard |
| FID | - | Flame Ionization Detector | MW | - | Megawatts | TEQ | - | Toxicity Equivalence Quotient |
| ft | - | Foot | $N_2$ | - | Nitrogen | THC | - | Total hydrocarbons |
| ft/sec | - | Feet per second | ND | - | Non-detectable | tph | - | Tons per hour |
| $Ft^2$ | - | Square feet | NDO | - | Natural draft opening | tpy | - | Tons per year |
| $Ft^3$ | - | Cubic feet | NESHAP | - | National Emission Standard for Hazardous Air Pollutants | µg | - | Micrograms |
| $ft^3$/lb-mole | - | Cubic feet per pound mole | ng | - | Nanograms | USEPA | - | United States Environmental Protection Agency |
| g | - | Grams | NMEVOC | - | Non-methane, non-ethane volatile organic compounds | VE | - | Visible emissions |
| g/bhp-hr | - | Grams of brake horsepower per hour | NMVOC | - | Non-methane volatile organic compound | VOC | - | Volatile organic compound |
| g/mL | - | Gram per milliliter | $NO_2$ | - | Nitrous Oxide | vol. | - | Volume |
| GC | - | Gas Chromatography | $NO_x$ | - | Oxides of Nitrogen | w/o | - | With out |

# REPORT - APPENDIX A

## Process Data

# PECS Stack

| | |
|---|---|
| Emission Unit ID (same as Enclosure 1) | **802, Emission Point 1** |
| Type of Process | **Pushing Emission Control System** |
| Type of Air Control Device | **Baghouse** |
| Latitude of Stack (5 decimal places) | **40.16304** |
| Longitue of Stack (5 decimal Places | **-79.88444** |
| Type of Coal Charged During Test | **Metallurgical Bituminous Coal** |
| Yearly COG Generated (MMscf/year | **5,904.10** |
| Yearly COG burned in Batteries | **3,426.90** |
| Yearly COG burned in Boilers | **1,567.80** |
| Yearly Natural Gas burned in Batteries | **133.92** |

| Methods | *0010-23* | | | *0010-23* | | | | *0010-23* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test Data | Run 1 | | | Run 2 | | | | Run 3 | | | |
| Date | 10/25-10/26, 2016 | | | 10/26-10/27, 2016 | | | | 10/27-10/28, 2016 | | | |
| Start Time | 8:27 AM | | | 7:33 AM | | | | 5:49 AM | | | |
| End Time | 6:12 AM | | | 5:02 AM | | | | 2:22 AM | | | |
| | Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) | Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) | Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
| Ovens Push | B24 | 16.19 | 2435 | 12 | C15 | 16.19 | 2426 | 12 | C6 | 16.19 | 2435 | 12 |
| | C24 | 16.19 | 2426 | 12 | B17 | 16.19 | 2435 | 12 | B8 | 16.19 | 2435 | 12 |
| | B26 | 16.19 | 2435 | 12 | C17 | 16.19 | 2426 | 12 | C8 | 16.19 | 2435 | 12 |
| | C26 | 16.19 | 2426 | 12 | B19 | 16.19 | 2435 | 12 | B10 | 16.19 | 2435 | 12 |
| | B28 | 16.19 | 2435 | 12 | C19 | 16.19 | 2426 | 12 | C10 | 16.19 | 2426 | 12 |
| | B1 | 16.19 | 2435 | 12 | B21 | 16.19 | 2435 | 12 | B12 | 16.19 | 2435 | 12 |
| | C1 | 16.19 | 2435 | 12 | C21 | 16.19 | 2426 | 12 | C12 | 16.19 | 2426 | 12 |
| | B3 | 16.19 | 2435 | 12 | B23 | 16.19 | 2435 | 12 | B14 | 16.19 | 2435 | 12 |
| | C3 | 16.19 | 2435 | 12 | C23 | 16.19 | 2426 | 12 | C14 | 16.19 | 2426 | 12 |
| | B5 | 16.19 | 2435 | 12 | B25 | 16.19 | 2435 | 12 | B16 | 16.19 | 2435 | 12 |
| | C5 | 16.19 | 2435 | 12 | C25 | 16.19 | 2426 | 12 | C16 | 16.19 | 2426 | 12 |
| | B7 | 16.19 | 2435 | 12 | B27 | 16.19 | 2426 | 12 | B18 | 16.19 | 2435 | 12 |
| | C7 | 16.19 | 2435 | 12 | C27 | 16.19 | 2426 | 12 | C18 | 16.19 | 2426 | 12 |
| | B9 | 16.19 | 2435 | 12 | B29 | 16.19 | 2435 | 12 | B20 | 16.19 | 2435 | 12 |
| | C9 | 16.19 | 2426 | 12 | B2 | 16.19 | 2435 | 12 | C20 | 16.19 | 2426 | 12 |
| | B11 | 16.19 | 2435 | 12 | C2 | 16.19 | 2435 | 12 | B22 | 16.19 | 2435 | 12 |
| | C11 | 16.19 | 2426 | 12 | B4 | 16.19 | 2435 | 12 | C22 | 16.19 | 2426 | 12 |
| | B13 | 16.19 | 2435 | 12 | C4 | 16.19 | 2435 | 12 | B24 | 16.19 | 2435 | 12 |
| | C13 | 16.19 | 2426 | 12 | B6 | 16.19 | 2435 | 12 | C24 | 16.19 | 2426 | 12 |
| | B15 | 16.19 | 2435 | 12 | C6 | 16.19 | 2435 | 12 | B26 | 16.19 | 2435 | 12 |
| | C15 | 16.19 | 2426 | 12 | B8 | 16.19 | 2435 | 12 | C26 | 16.19 | 2426 | 12 |
| | B17 | 16.19 | 2435 | 12 | C8 | 16.19 | 2435 | 12 | B28 | 16.19 | 2435 | 12 |
| | C17 | 16.19 | 2426 | 12 | B10 | 16.19 | 2435 | 12 | B1 | 16.19 | 2435 | 12 |
| | B19 | 16.19 | 2435 | 12 | C10 | 16.19 | 2426 | 12 | C1 | 16.19 | 2435 | 12 |
| | C19 | 16.19 | 2426 | 12 | B12 | 16.19 | 2435 | 12 | B3 | 16.19 | 2435 | 12 |
| | B21 | 16.19 | 2435 | 12 | C12 | 16.19 | 2426 | 12 | C3 | 16.19 | 2435 | 12 |
| | C21 | 16.19 | 2426 | 12 | B14 | 16.19 | 2435 | 12 | B5 | 16.19 | 2435 | 12 |
| | B23 | 16.19 | 2435 | 12 | C14 | 16.19 | 2426 | 12 | C5 | 16.19 | 2435 | 12 |
| | C23 | 16.19 | 2426 | 12 | B16 | 16.19 | 2435 | 12 | B7 | 16.19 | 2435 | 12 |
| | B25 | 16.19 | 2435 | 12 | C16 | 16.19 | 2426 | 12 | C7 | 16.19 | 2435 | 12 |
| | C25 | 16.19 | 2426 | 12 | B18 | 16.19 | 2435 | 12 | B9 | 16.19 | 2435 | 12 |
| | B27 | 16.19 | 2435 | 12 | C18 | 16.19 | 2426 | 12 | C9 | 16.19 | 2426 | 12 |
| | C27 | 16.19 | 2426 | 12 | B20 | 16.19 | 2435 | 12 | B11 | 16.19 | 2435 | 12 |
| | B29 | 16.19 | 2435 | 12 | C20 | 16.19 | 2426 | 12 | C11 | 16.19 | 2426 | 12 |
| | B2 | 16.19 | 2435 | 12 | B22 | 16.19 | 2435 | 12 | B13 | 16.19 | 2435 | 12 |
| | C2 | 16.19 | 2435 | 12 | C22 | 16.19 | 2426 | 12 | C13 | 16.19 | 2426 | 12 |
| | B4 | 16.19 | 2435 | 12 | B24 | 16.19 | 2435 | 12 | B15 | 16.19 | 2435 | 12 |
| | C4 | 16.19 | 2435 | 12 | C24 | 16.19 | 2426 | 12 | C15 | 16.19 | 2426 | 12 |
| | B6 | 16.19 | 2435 | 12 | B26 | 16.19 | 2435 | 12 | B17 | 16.19 | 2435 | 12 |
| | C6 | 16.19 | 2435 | 12 | C26 | 16.19 | 2426 | 12 | C17 | 16.19 | 2426 | 12 |
| | B8 | 16.19 | 2435 | 12 | B28 | 16.19 | 2435 | 12 | B19 | 16.19 | 2435 | 12 |
| | C8 | 16.19 | 2435 | 12 | B1 | 16.19 | 2435 | 12 | C19 | 16.19 | 2426 | 12 |
| | B10 | 16.19 | 2435 | 12 | C1 | 16.19 | 2435 | 12 | B21 | 16.19 | 2435 | 12 |
| | C10 | 16.19 | 2426 | 12 | B3 | 16.19 | 2435 | 12 | C21 | 16.19 | 2426 | 12 |
| | B12 | 16.19 | 2435 | 12 | C3 | 16.19 | 2435 | 12 | B23 | 16.19 | 2435 | 12 |
| | C12 | 16.19 | 2426 | 12 | B5 | 16.19 | 2435 | 12 | C23 | 16.19 | 2426 | 12 |
| | B14 | 16.19 | 2435 | 12 | C5 | 16.19 | 2435 | 12 | B25 | 16.19 | 2435 | 12 |
| | C14 | 16.19 | 2426 | 12 | B7 | 16.19 | 2435 | 12 | C25 | 16.19 | 2426 | 12 |
| | B16 | 16.19 | 2435 | 12 | C7 | 16.19 | 2435 | 12 | B27 | 16.19 | 2435 | 12 |
| | C16 | 16.19 | 2426 | 12 | B9 | 16.19 | 2435 | 12 | C27 | 16.19 | 2426 | 12 |
| | B18 | 16.19 | 2435 | 12 | C9 | 16.19 | 2426 | 12 | B29 | 16.19 | 2435 | 12 |
| | C18 | 16.19 | 2426 | 12 | B11 | 16.19 | 2435 | 12 | B2 | 16.19 | 2435 | 12 |
| | B20 | 16.19 | 2435 | 12 | C11 | 16.19 | 2426 | 12 | C2 | 16.19 | 2435 | 12 |
| | C20 | 16.19 | 2426 | 12 | B13 | 16.19 | 2435 | 12 | B4 | 16.19 | 2435 | 12 |
| | B22 | 16.19 | 2435 | 12 | C13 | 16.19 | 2426 | 12 | C4 | 16.19 | 2435 | 12 |
| | C22 | 16.19 | 2426 | 12 | B15 | 16.19 | 2435 | 12 | B6 | 16.19 | 2435 | 12 |
| | B24 | 16.19 | 2435 | 12 | C15 | 16.19 | 2426 | 12 | C6 | 16.19 | 2435 | 12 |
| | C24 | 16.19 | 2426 | 12 | B17 | 16.19 | 2435 | 12 | B8 | 16.19 | 2435 | 12 |
| | B26 | 16.19 | 2435 | 12 | C17 | 16.19 | 2426 | 12 | C8 | 16.19 | 2435 | 12 |
| | C26 | 16.19 | 2426 | 12 | B19 | 16.19 | 2435 | 12 | B10 | 16.19 | 2435 | 12 |
| | B28 | 16.19 | 2435 | 12 | C19 | 16.19 | 2426 | 12 | C10 | 16.19 | 2426 | 12 |
| | B1 | 16.19 | 2435 | 12 | B21 | 16.19 | 2435 | 12 | B12 | 16.19 | 2435 | 12 |
| | C1 | 16.19 | 2435 | 12 | C21 | 16.19 | 2426 | 12 | C12 | 16.19 | 2426 | 12 |
| | B3 | 16.19 | 2435 | 12 | B23 | 16.19 | 2435 | 12 | B14 | 16.19 | 2435 | 12 |
| | C3 | 16.19 | 2435 | 12 | C23 | 16.19 | 2426 | 12 | C14 | 16.19 | 2426 | 12 |
| | B5 | 16.19 | 2435 | 12 | B25 | 16.19 | 2435 | 12 | B16 | 16.19 | 2435 | 12 |
| | C5 | 16.19 | 2435 | 12 | C25 | 16.19 | 2426 | 12 | C16 | 16.19 | 2426 | 12 |
| | B7 | 16.19 | 2435 | 12 | B27 | 16.19 | 2435 | 12 | B18 | 16.19 | 2435 | 12 |
| | C7 | 16.19 | 2435 | 12 | C27 | 16.19 | 2426 | 12 | C18 | 16.19 | 2426 | 12 |
| | B9 | 16.19 | 2435 | 12 | B29 | 16.19 | 2435 | 12 | B20 | 16.19 | 2435 | 12 |
| | C9 | 16.19 | 2426 | 12 | B2 | 16.19 | 2435 | 12 | C20 | 16.19 | 2426 | 12 |
| | | | | | C2 | 16.19 | 2435 | 12 | B22 | 16.19 | 2435 | 12 |
| | | | | | B4 | 16.19 | 2435 | 12 | C22 | 16.19 | 2426 | 12 |
| | | | | | C4 | 16.19 | 2435 | 12 | | | | |
| | | | | | B6 | 16.19 | 2435 | 12 | | | | |
| | | | | | C6 | 16.19 | 2435 | 12 | | | | |
| Total # Pushed | 71 | 16.19 | 2432.2 | 12.0 | 76 | 16.19 | 2431.8 | 12.0 | 73 | 16.19 | 2431.8 | 12.0 |

# PECS Stack

| | |
|---|---|
| Emission Unit ID (same as Enclosure 1) | **802, Emission Point 1** |
| Type of Process | **Pushing Emission Control System** |
| Type of Air Control Device | **Baghouse** |
| Latitude of Stack (5 decimal places) | **40.16304** |
| Longitue of Stack (5 decimal Places | **-79.88444** |
| Type of Coal Charged During Test | **Metallurgical Bituminous Coal** |
| Yearly COG Generated (MMscf/year | **5,904.10** |
| Yearly COG burned in Batteries | **3,426.90** |
| Yearly COG burned in Boilers | **1,567.80** |
| Yearly Natural Gas burned in Batteries | **133.92** |

| Methods | *0010-23* | | | *0010-23* | | | *0010-23* | | |
|---|---|---|---|---|---|---|---|---|---|
| Test Data | Run 1 | | | Run 2 | | | Run 3 | | |
| | | | Charging Time | | | Charging Time | | | Charging Time |
| Ovens Charged | B24 | 835 | 11 | C15 | 735 | 11 | C6 | 555 | 11 |
| | C24 | 910 | 11 | B17 | 755 | 11 | B8 | 609 | 11 |
| | B26 | 922 | 11 | C17 | 808 | 11 | C8 | 622 | 11 |
| | C26 | 935 | 11 | B19 | 824 | 11 | B10 | 637 | 11 |
| | B28 | 948 | 11 | C19 | 841 | 11 | C10 | 649 | 11 |
| | B1 | 1042 | 11 | B21 | 923 | 11 | B12 | 701 | 11 |
| | C1 | 1054 | 11 | C21 | 935 | 11 | C12 | 716 | 11 |
| | B3 | 1106 | 11 | B23 | 953 | 11 | B14 | 737 | 11 |
| | C3 | 1121 | 11 | C23 | 1007 | 11 | C14 | 748 | 11 |
| | B5 | 1133 | 11 | B25 | 1020 | 11 | B16 | 802 | 11 |
| | C5 | 1148 | 11 | C25 | 1032 | 11 | C16 | 815 | 11 |
| | B7 | 1215 | 11 | B27 | 1045 | 11 | B18 | 832 | 11 |
| | C7 | 1229 | 11 | C27 | 1057 | 11 | C18 | 846 | 11 |
| | B9 | 1243 | 11 | B29 | 1109 | 11 | B20 | 932 | 11 |
| | C9 | 1257 | 11 | B2 | 1205 | 11 | C20 | 944 | 11 |
| | B11 | 1328 | 11 | C2 | 1224 | 11 | B22 | 955 | 11 |
| | C11 | 1344 | 11 | B4 | 1246 | 11 | C22 | 1007 | 11 |
| | B13 | 1356 | 11 | C4 | 1258 | 11 | B24 | 1020 | 11 |
| | C13 | 1408 | 11 | B6 | 1310 | 11 | C24 | 1037 | 11 |
| | B15 | 1420 | 11 | C6 | 1325 | 11 | B26 | 1049 | 11 |
| | C15 | 1432 | 11 | B8 | 1337 | 11 | C26 | 1106 | 11 |
| | B17 | 1453 | 11 | C8 | 1347 | 11 | B28 | 1118 | 11 |
| | C17 | 1507 | 11 | B10 | 1403 | 11 | B1 | 1212 | 11 |
| | B19 | 1539 | 11 | C10 | 1417 | 11 | C1 | 1233 | 11 |
| | C19 | 1555 | 11 | B12 | 1429 | 11 | B3 | 1244 | 11 |
| | B21 | 1619 | 11 | C12 | 1441 | 11 | C3 | 1300 | 11 |
| | C21 | 1632 | 11 | B14 | 1456 | 11 | B5 | 1312 | 11 |
| | B23 | 1648 | 11 | C14 | 1506 | 11 | C5 | 1324 | 11 |
| | C23 | 1700 | 11 | B16 | 1537 | 11 | B7 | 1338 | 11 |
| | B25 | 1714 | 11 | C16 | 1550 | 11 | C7 | 1349 | 11 |
| | C25 | 1728 | 11 | B18 | 1603 | 11 | B9 | 1359 | 11 |
| | B27 | 1806 | 11 | C18 | 1617 | 11 | C9 | 1412 | 11 |
| | C27 | 1820 | 11 | B20 | 1653 | 11 | B11 | 1445 | 11 |
| | B29 | 1834 | 11 | C20 | 1711 | 11 | C11 | 1456 | 11 |
| | B2 | 1908 | 11 | B22 | 1729 | 11 | B13 | 1532 | 11 |
| | C2 | 1920 | 11 | C22 | 1742 | 11 | C13 | 1543 | 11 |
| | B4 | 1935 | 11 | B24 | 1754 | 11 | B15 | 1557 | 11 |
| | C4 | 1953 | 11 | C24 | 1807 | 11 | C15 | 1609 | 11 |
| | B6 | 2006 | 11 | B26 | 1821 | 11 | B17 | 1624 | 11 |
| | C6 | 2019 | 11 | C26 | 1833 | 11 | C17 | 1636 | 11 |
| | B8 | 2033 | 11 | B28 | 1847 | 11 | B19 | 1653 | 11 |
| | C8 | 2054 | 11 | B1 | 1924 | 11 | C19 | 1704 | 11 |
| | B10 | 2122 | 11 | C1 | 1936 | 11 | B21 | 1754 | 11 |
| | C10 | 2157 | 11 | B3 | 1948 | 11 | C21 | 1806 | 11 |
| | B12 | 2213 | 11 | C3 | 2006 | 11 | B23 | 1821 | 11 |
| | C12 | 2225 | 11 | B5 | 2018 | 11 | C23 | 1835 | 11 |
| | B14 | 2238 | 11 | C5 | 2030 | 11 | B25 | 1848 | 11 |
| | C14 | 2252 | 11 | B7 | 2043 | 11 | C25 | 1902 | 11 |
| | B16 | 2306 | 11 | C7 | 2105 | 11 | B27 | 1915 | 11 |
| | C16 | 2314 | 11 | B9 | 2120 | 11 | C27 | 1935 | 11 |
| | B18 | 2352 | 11 | C9 | 2132 | 11 | B29 | 1947 | 11 |
| | C18 | 8 | 11 | B11 | 2204 | 11 | B2 | 2025 | 11 |
| | B20 | 40 | 11 | C11 | 2215 | 11 | C2 | 2036 | 11 |
| | C20 | 55 | 11 | B13 | 2228 | 11 | B4 | 2048 | 11 |
| | B22 | 109 | 11 | C13 | 2246 | 11 | C4 | 2117 | 11 |
| | C22 | 127 | 11 | B15 | 2259 | 11 | B6 | 2130 | 11 |
| | B24 | 139 | 11 | C15 | 2336 | 11 | C6 | 2143 | 11 |
| | C24 | 153 | 11 | B17 | 2349 | 11 | B8 | 2155 | 11 |
| | B26 | 211 | 11 | C17 | 10 | 11 | C8 | 2207 | 11 |
| | C26 | 227 | 11 | B19 | 29 | 11 | B10 | 2225 | 11 |
| | B28 | 245 | 11 | C19 | 41 | 11 | C10 | 2247 | 11 |
| | B1 | 321 | 11 | B21 | 54 | 11 | B12 | 2300 | 11 |
| | C1 | 342 | 11 | C21 | 107 | 11 | C12 | 2342 | 11 |
| | B3 | 403 | 11 | B23 | 119 | 11 | B14 | 2353 | 11 |
| | C3 | 421 | 11 | C23 | 239 | 11 | C14 | 6 | 11 |
| | B5 | 443 | 11 | B25 | 254 | 11 | B16 | 22 | 11 |
| | C5 | 509 | 11 | C25 | 329 | 11 | C16 | 43 | 11 |
| | B7 | 529 | 11 | B27 | 348 | 11 | B18 | 54 | 11 |
| | C7 | 547 | 11 | C27 | 400 | 11 | C18 | 106 | 11 |
| | B9 | 602 | 11 | B29 | 414 | 11 | B20 | 46 | 11 |
| | C9 | 615 | 11 | B2 | 425 | 11 | C20 | 59 | 11 |
| | | | | C2 | 439 | 11 | B22 | 211 | 11 |
| | | | | B4 | 451 | 11 | C22 | 224 | 11 |
| | | | | C4 | 511 | 11 | | | |
| | | | | B6 | 522 | 11 | | | |
| Coke Produced During test (tons) | 823.6 | | | 881.6 | | | 846.8 | | |
| Avg. Coal Processed/Oven During test(Ton) | 16.2 | | | 16.2 | | | 16.2 | | |
| Higher Heating Value COG | 510 | | | 510 | | | 510 | | |
| Higher Heating Value of N.G. | 1020 | | | 1020 | | | 1020 | | |

*Methods 5 and 29*

Run 1

10/28/16
3:28 AM
5:01 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2435 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| 47 | 16.19 | 2432.5 | 12.0 |

*Methods 5 and 29*

Run 2

10/31/16
8:23 AM
10:04 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| 48 | 16.19 | 2431.6 | 12.0 |

*Methods 5 and 29*

Run 3

10/31-11/1, 2016
8:58 PM
1:27 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| 58 | 16.19 | 2431.9 | 12.0 |

*Methods 5 and 29*

Run 1

| | | Charging Time |
|---|---|---|
| B28 | 333 | 11 |
| B1 | 423 | 11 |
| C1 | 435 | 11 |
| B3 | 446 | 11 |
| C3 | 500 | 11 |
| B5 | 511 | 11 |
| C5 | 525 | 11 |
| B7 | 535 | 11 |
| C7 | 550 | 11 |
| B9 | 641 | 11 |
| C9 | 653 | 11 |
| B11 | 706 | 11 |
| C11 | 719 | 11 |
| B13 | 742 | 11 |
| C13 | 806 | 11 |
| B15 | 817 | 11 |
| C15 | 831 | 11 |
| B17 | 845 | 11 |
| C17 | 900 | 11 |
| B19 | 913 | 11 |
| C19 | 925 | 11 |
| B21 | 1018 | 11 |
| C21 | 1033 | 11 |
| B23 | 1047 | 11 |
| C23 | 1059 | 11 |
| B25 | 1113 | 11 |
| C25 | 1126 | 11 |
| B27 | 1139 | 11 |
| C27 | 1151 | 11 |
| B29 | 1205 | 11 |
| B2 | 1248 | 11 |
| C2 | 1302 | 11 |
| B4 | 1314 | 11 |
| C4 | 1326 | 11 |
| B6 | 1339 | 11 |
| C6 | 1353 | 11 |
| B8 | 1405 | 11 |
| C8 | 1417 | 11 |
| B10 | 1435 | 11 |
| C10 | 1505 | 11 |
| B12 | 1539 | 11 |
| C12 | 1552 | 11 |
| B14 | 1605 | 11 |
| C14 | 1618 | 11 |
| B16 | 1630 | 11 |
| C16 | 1647 | 11 |
| B18 | 1702 | 11 |

545.2
16.2
510
1020

*Methods 5 and 29*

Run 2

| | | Charging Time |
|---|---|---|
| B12 | 827 | 11 |
| C12 | 843 | 11 |
| B14 | 858 | 11 |
| C14 | 913 | 11 |
| B16 | 927 | 11 |
| C16 | 938 | 11 |
| B18 | 950 | 11 |
| C18 | 1001 | 11 |
| B20 | 1051 | 11 |
| C20 | 1103 | 11 |
| B22 | 1116 | 11 |
| C22 | 1130 | 11 |
| B24 | 1142 | 11 |
| C24 | 1157 | 11 |
| B26 | 1210 | 11 |
| C26 | 1225 | 11 |
| B28 | 1240 | 11 |
| B1 | 1332 | 11 |
| C1 | 1345 | 11 |
| B3 | 1358 | 11 |
| C3 | 1410 | 11 |
| B5 | 1422 | 11 |
| C5 | 1435 | 11 |
| B7 | 1449 | 11 |
| C7 | 1500 | 11 |
| B9 | 1545 | 11 |
| C9 | 1601 | 11 |
| B11 | 1640 | 11 |
| C11 | 1655 | 11 |
| B13 | 1713 | 11 |
| C13 | 1739 | 11 |
| B15 | 1759 | 11 |
| C15 | 1812 | 11 |
| B17 | 1825 | 11 |
| C17 | 1838 | 11 |
| B19 | 1851 | 11 |
| C19 | 1903 | 11 |
| B21 | 1950 | 11 |
| C21 | 2004 | 11 |
| B23 | 2017 | 11 |
| C23 | 2031 | 11 |
| B25 | 2044 | 11 |
| C25 | 2056 | 11 |
| B27 | 2107 | 11 |
| C27 | 2120 | 11 |
| B29 | 2133 | 11 |
| B2 | 2145 | 11 |
| C2 | 2207 | 11 |

556.8
16.2
510
1020

*Methods 5 and 29*

Run 3

| | | Charging Time |
|---|---|---|
| B27 | 2107 | 11 |
| C27 | 2120 | 11 |
| B29 | 2133 | 11 |
| B2 | 2145 | 11 |
| C2 | 2207 | 11 |
| B4 | 2217 | 11 |
| C4 | 2229 | 11 |
| B6 | 2240 | 11 |
| C6 | 2251 | 11 |
| B8 | 2302 | 11 |
| C8 | 2334 | 11 |
| B10 | 2346 | 11 |
| C10 | 21 | 11 |
| B12 | 33 | 11 |
| C12 | 48 | 11 |
| B14 | 102 | 11 |
| C14 | 116 | 11 |
| B16 | 131 | 11 |
| C16 | 147 | 11 |
| B18 | 202 | 11 |
| C18 | 225 | 11 |
| B20 | 303 | 11 |
| C20 | 315 | 11 |
| B22 | 328 | 11 |
| C22 | 340 | 11 |
| B24 | 354 | 11 |
| C24 | 407 | 11 |
| B26 | 420 | 11 |
| C26 | 433 | 11 |
| B28 | 446 | 11 |
| B1 | 524 | 11 |
| C1 | 536 | 11 |
| B3 | 548 | 11 |
| C3 | 602 | 11 |
| B5 | 617 | 11 |
| C5 | 631 | 11 |
| B7 | 646 | 11 |
| C7 | 700 | 11 |
| B9 | 741 | 11 |
| C9 | 755 | 11 |
| B11 | 850 | 11 |
| C11 | 908 | 11 |
| B13 | 929 | 11 |
| B15 | 943 | 11 |
| C13 | 1001 | 11 |
| C15 | 1019 | 11 |
| B17 | 1034 | 11 |
| C17 | 1045 | 11 |
| B19 | 1101 | 11 |
| C19 | 1113 | 11 |
| B21 | 1157 | 11 |
| C21 | 1211 | 11 |
| B23 | 1225 | 11 |
| C23 | 1237 | 11 |
| B25 | 1251 | 11 |
| C25 | 1304 | 11 |
| B27 | 1316 | 11 |
| C27 | 1329 | 11 |

672.8
16.2
510
1020

*Methods 0031 and 316*

Run 1

11/1-11/2, 2016
2:13 PM
4:40 AM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2426 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| 50 | 16.19 | 2431.9 | 12.0 |

*Methods 0031 and 316*
*Run 1 H2S*

Run 2

11/02/16
5:13 AM
7:10 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2435 | 12 |
| B17 | 16.19 | 2435 | 12 |
| 48 | 16.19 | 2432.4 | 12.0 |

*Methods 0031 and 316*
*Run 2 and 3 H2S*

Run 3

11/2-11/3, 2016
7:49 PM
10:56 AM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B9 | 16.19 | 2435 | 12 |
| 51 | 16.19 | 2432.0 | 12.0 |

*Methods 0031 and 316*

Run 1

| | | Charging Time |
|---|---|---|
| B2 | 1417 | 11 |
| C2 | 1428 | 11 |
| B4 | 1443 | 11 |
| C4 | 1453 | 11 |
| B6 | 1507 | 11 |
| C6 | 1520 | 11 |
| B8 | 1538 | 11 |
| C8 | 1551 | 11 |
| B10 | 1605 | 11 |
| C10 | 1649 | 11 |
| B12 | 1702 | 11 |
| C12 | 1715 | 11 |
| B14 | 1728 | 11 |
| C14 | 1740 | 11 |
| B16 | 1753 | 11 |
| C16 | 1806 | 11 |
| B18 | 1818 | 11 |
| C18 | 1831 | 11 |
| B20 | 1915 | 11 |
| C20 | 1927 | 11 |
| B22 | 1940 | 11 |
| C22 | 1955 | 11 |
| B24 | 2007 | 11 |
| C24 | 2019 | 11 |
| B26 | 2033 | 11 |
| C26 | 2053 | 11 |
| B28 | 2106 | 11 |
| B1 | 2144 | 11 |
| C1 | 2156 | 11 |
| B3 | 2207 | 11 |
| C3 | 2218 | 11 |
| B5 | 2231 | 11 |
| C5 | 2244 | 11 |
| B7 | 2254 | 11 |
| C7 | 2342 | 11 |
| B9 | 2352 | 11 |
| C9 | 4 | 11 |
| B11 | 42 | 11 |
| C11 | 53 | 11 |
| B13 | 115 | 11 |
| C13 | 232 | 11 |
| B15 | 245 | 11 |
| C15 | 259 | 11 |
| B17 | 311 | 11 |
| C17 | 322 | 11 |
| B19 | 333 | 11 |
| C19 | 343 | 11 |
| B21 | 418 | 11 |
| C21 | 429 | 11 |
| B23 | 440 | 11 |

*Methods 0031 and 316*
*Run 1 H2S*

Run 2

| | | Charging Time |
|---|---|---|
| C25 | 517 | 11 |
| B27 | 529 | 11 |
| C27 | 545 | 11 |
| B29 | 556 | 11 |
| B2 | 611 | 11 |
| C2 | 626 | 11 |
| B4 | 639 | 11 |
| C4 | 650 | 11 |
| B6 | 701 | 11 |
| C6 | 742 | 11 |
| B8 | 756 | 11 |
| C8 | 810 | 11 |
| B10 | 825 | 11 |
| C10 | 907 | 11 |
| B12 | 924 | 11 |
| C12 | 937 | 11 |
| B14 | 953 | 11 |
| C14 | 1005 | 11 |
| B16 | 1018 | 11 |
| C16 | 1029 | 11 |
| B18 | 1043 | 11 |
| C18 | 1053 | 11 |
| B20 | 1055 | 11 |
| C20 | 1206 | 11 |
| B22 | 1219 | 11 |
| C22 | 1234 | 11 |
| B24 | 1246 | 11 |
| C24 | 1258 | 11 |
| B26 | 1314 | 11 |
| C26 | 1327 | 11 |
| B28 | 1342 | 11 |
| B1 | 1358 | 11 |
| C1 | 1412 | 11 |
| B3 | 1426 | 11 |
| C3 | 1439 | 11 |
| B5 | 1449 | 11 |
| C5 | 1500 | 11 |
| B7 | 1541 | 11 |
| C7 | 1553 | 11 |
| B9 | 1824 | 11 |
| C9 | 1633 | 11 |
| B11 | 1644 | 11 |
| C11 | 1710 | 11 |
| B13 | 1730 | 11 |
| C13 | 1834 | 11 |
| B15 | 1851 | 11 |
| C15 | 1903 | 11 |
| B17 | 1915 | 11 |

*Methods 0031 and 316*
*Run 2 and 3 H2S*

Run 3

| | | Charging Time |
|---|---|---|
| C19 | 1953 | 11 |
| B21 | 2042 | 11 |
| C21 | 2054 | 11 |
| B23 | 2104 | 11 |
| C23 | 2116 | 11 |
| B25 | 2126 | 11 |
| C25 | 2137 | 11 |
| B27 | 2147 | 11 |
| C27 | 2157 | 11 |
| B29 | 2210 | 11 |
| B2 | 2220 | 11 |
| C2 | 2230 | 11 |
| B4 | 2239 | 11 |
| C4 | 2249 | 11 |
| B6 | 2258 | 11 |
| C6 | 2357 | 11 |
| B8 | 2352 | 11 |
| C8 | 6 | 11 |
| B10 | 19 | 11 |
| C10 | 111 | 11 |
| B12 | 122 | 11 |
| C12 | 134 | 11 |
| B14 | 147 | 11 |
| C14 | 202 | 11 |
| B16 | 220 | 11 |
| C16 | 238 | 11 |
| B18 | 256 | 11 |
| C18 | 309 | 11 |
| B20 | 353 | 11 |
| C20 | 404 | 11 |
| B22 | 417 | 11 |
| C22 | 429 | 11 |
| B24 | 442 | 11 |
| C24 | 457 | 11 |
| B26 | 511 | 11 |
| C26 | 526 | 11 |
| B28 | 538 | 11 |
| B1 | 617 | 11 |
| C1 | 704 | 11 |
| B3 | 715 | 11 |
| C3 | 739 | 11 |
| B5 | 752 | 11 |
| C5 | 807 | 11 |
| B7 | 826 | 11 |
| C7 | 839 | 11 |
| C9 | 853 | 11 |
| B11 | 943 | 11 |
| C11 | 956 | 11 |
| B13 | 1015 | 11 |
| C13 | 1026 | 11 |
| B9 | 1048 | 11 |

| | | |
|---|---|---|
| 580 | 556.8 | 591.6 |
| 16.2 | 16.2 | 16.2 |
| 510 | 510 | 510 |
| 1020 | 1020 | 1020 |

*Methods 5 and 29*

Run 1

10/28/16
3:28 AM
5:01 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2435 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| 47 | 16.19 | 2432.5 | 12.0 |

*Methods 5 and 29*

Run 2

10/31/16
8:23 AM
10:04 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| 48 | 16.19 | 2431.6 | 12.0 |

*Methods 5 and 29*

Run 3

10/31-11/1, 2016
8:58 PM
1:27 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| 58 | 16.19 | 2431.9 | 12.0 |

*Methods 5 and 29*

Run 1

| [redacted] | | Charging Time |
|---|---|---|
| B28 | 333 | 11 |
| B1 | 423 | 11 |
| C1 | 435 | 11 |
| B3 | 446 | 11 |
| C3 | 500 | 11 |
| B5 | 511 | 11 |
| C5 | 525 | 11 |
| B7 | 535 | 11 |
| C7 | 550 | 11 |
| B9 | 641 | 11 |
| C9 | 653 | 11 |
| B11 | 706 | 11 |
| C11 | 719 | 11 |
| B13 | 742 | 11 |
| C13 | 806 | 11 |
| B15 | 817 | 11 |
| C15 | 831 | 11 |
| B17 | 845 | 11 |
| C17 | 900 | 11 |
| B19 | 913 | 11 |
| C19 | 925 | 11 |
| B21 | 1018 | 11 |
| C21 | 1033 | 11 |
| B23 | 1047 | 11 |
| C23 | 1059 | 11 |
| B25 | 1113 | 11 |
| C25 | 1126 | 11 |
| B27 | 1139 | 11 |
| C27 | 1151 | 11 |
| B29 | 1205 | 11 |
| B2 | 1248 | 11 |
| C2 | 1302 | 11 |
| B4 | 1314 | 11 |
| C4 | 1326 | 11 |
| B6 | 1339 | 11 |
| C6 | 1353 | 11 |
| B8 | 1405 | 11 |
| C8 | 1417 | 11 |
| B10 | 1435 | 11 |
| C10 | 1505 | 11 |
| B12 | 1539 | 11 |
| C12 | 1552 | 11 |
| B14 | 1605 | 11 |
| C14 | 1618 | 11 |
| B16 | 1630 | 11 |
| C16 | 1647 | 11 |
| B18 | 1702 | 11 |

[redacted]

545.2
16.2
510
1020

*Methods 5 and 29*

Run 2

| [redacted] | | Charging Time |
|---|---|---|
| B12 | 827 | 11 |
| C12 | 843 | 11 |
| B14 | 858 | 11 |
| C14 | 913 | 11 |
| B16 | 927 | 11 |
| C16 | 938 | 11 |
| B18 | 950 | 11 |
| C18 | 1001 | 11 |
| B20 | 1051 | 11 |
| C20 | 1103 | 11 |
| B22 | 1116 | 11 |
| C22 | 1130 | 11 |
| B24 | 1142 | 11 |
| C24 | 1157 | 11 |
| B26 | 1210 | 11 |
| C26 | 1225 | 11 |
| B28 | 1240 | 11 |
| B1 | 1332 | 11 |
| C1 | 1345 | 11 |
| B3 | 1358 | 11 |
| C3 | 1410 | 11 |
| B5 | 1422 | 11 |
| C5 | 1435 | 11 |
| B7 | 1449 | 11 |
| C7 | 1500 | 11 |
| B9 | 1545 | 11 |
| C9 | 1601 | 11 |
| B11 | 1640 | 11 |
| C11 | 1655 | 11 |
| B13 | 1713 | 11 |
| C13 | 1739 | 11 |
| B15 | 1759 | 11 |
| C15 | 1812 | 11 |
| B17 | 1825 | 11 |
| C17 | 1838 | 11 |
| B19 | 1851 | 11 |
| C19 | 1903 | 11 |
| B21 | 1950 | 11 |
| C21 | 2004 | 11 |
| B23 | 2017 | 11 |
| C23 | 2031 | 11 |
| B25 | 2044 | 11 |
| C25 | 2056 | 11 |
| B27 | 2107 | 11 |
| C27 | 2120 | 11 |
| B29 | 2133 | 11 |
| B2 | 2145 | 11 |
| C2 | 2207 | 11 |

556.8
16.2
510
1020

*Methods 5 and 29*

Run 3

| [redacted] | | Charging Time |
|---|---|---|
| B27 | 2107 | 11 |
| C27 | 2120 | 11 |
| B29 | 2133 | 11 |
| B2 | 2145 | 11 |
| C2 | 2207 | 11 |
| B4 | 2217 | 11 |
| C4 | 2229 | 11 |
| B6 | 2240 | 11 |
| C6 | 2251 | 11 |
| B8 | 2302 | 11 |
| C8 | 2334 | 11 |
| B10 | 2346 | 11 |
| C10 | 21 | 11 |
| B12 | 33 | 11 |
| C12 | 48 | 11 |
| B14 | 102 | 11 |
| C14 | 116 | 11 |
| B16 | 131 | 11 |
| C16 | 147 | 11 |
| B18 | 202 | 11 |
| C18 | 225 | 11 |
| B20 | 303 | 11 |
| C20 | 315 | 11 |
| B22 | 328 | 11 |
| C22 | 340 | 11 |
| B24 | 354 | 11 |
| C24 | 407 | 11 |
| B26 | 420 | 11 |
| C26 | 433 | 11 |
| B28 | 446 | 11 |
| B1 | 524 | 11 |
| C1 | 536 | 11 |
| B3 | 548 | 11 |
| C3 | 602 | 11 |
| B5 | 617 | 11 |
| C5 | 631 | 11 |
| B7 | 646 | 11 |
| C7 | 700 | 11 |
| B9 | 741 | 11 |
| C9 | 755 | 11 |
| B11 | 850 | 11 |
| C11 | 908 | 11 |
| B13 | 929 | 11 |
| B15 | 943 | 11 |
| C13 | 1001 | 11 |
| C15 | 1019 | 11 |
| B17 | 1034 | 11 |
| C17 | 1045 | 11 |
| B19 | 1101 | 11 |
| C19 | 1113 | 11 |
| B21 | 1157 | 11 |
| C21 | 1211 | 11 |
| B23 | 1225 | 11 |
| C23 | 1237 | 11 |
| B25 | 1251 | 11 |
| C25 | 1304 | 11 |
| B27 | 1316 | 11 |
| C27 | 1329 | 11 |

[redacted]

672.8
16.2
510
1020

*Methods 0031 and 316*

Run 1

11/1-11/2, 2016
2:13 PM
4:40 AM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2426 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2426 | 12 |
| B17 | 16.19 | 2435 | 12 |
| C17 | 16.19 | 2426 | 12 |
| B19 | 16.19 | 2435 | 12 |
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| 50 | 16.19 | 2431.9 | 12.0 |

*Methods 0031 and 316*
*Run 1 H2S*

Run 2

11/02/16
5:13 AM
7:10 PM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| B9 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B15 | 16.19 | 2435 | 12 |
| C15 | 16.19 | 2435 | 12 |
| B17 | 16.19 | 2435 | 12 |
| 48 | 16.19 | 2432.4 | 12.0 |

*Methods 0031 and 316*
*Run 2 and 3 H2S*

Run 3

11/2-11/3, 2016
7:49 PM
10:56 AM

| Oven ID | Coking Time (hrs) | Avg. Temp (°F) | Pushing Period (minutes) |
|---|---|---|---|
| C19 | 16.19 | 2426 | 12 |
| B21 | 16.19 | 2435 | 12 |
| C21 | 16.19 | 2426 | 12 |
| B23 | 16.19 | 2435 | 12 |
| C23 | 16.19 | 2426 | 12 |
| B25 | 16.19 | 2435 | 12 |
| C25 | 16.19 | 2426 | 12 |
| B27 | 16.19 | 2435 | 12 |
| C27 | 16.19 | 2426 | 12 |
| B29 | 16.19 | 2435 | 12 |
| B2 | 16.19 | 2435 | 12 |
| C2 | 16.19 | 2435 | 12 |
| B4 | 16.19 | 2435 | 12 |
| C4 | 16.19 | 2435 | 12 |
| B6 | 16.19 | 2435 | 12 |
| C6 | 16.19 | 2435 | 12 |
| B8 | 16.19 | 2435 | 12 |
| C8 | 16.19 | 2435 | 12 |
| B10 | 16.19 | 2435 | 12 |
| C10 | 16.19 | 2426 | 12 |
| B12 | 16.19 | 2435 | 12 |
| C12 | 16.19 | 2426 | 12 |
| B14 | 16.19 | 2435 | 12 |
| C14 | 16.19 | 2426 | 12 |
| B16 | 16.19 | 2435 | 12 |
| C16 | 16.19 | 2426 | 12 |
| B18 | 16.19 | 2435 | 12 |
| C18 | 16.19 | 2426 | 12 |
| B20 | 16.19 | 2435 | 12 |
| C20 | 16.19 | 2426 | 12 |
| B22 | 16.19 | 2435 | 12 |
| C22 | 16.19 | 2426 | 12 |
| B24 | 16.19 | 2435 | 12 |
| C24 | 16.19 | 2426 | 12 |
| B26 | 16.19 | 2435 | 12 |
| C26 | 16.19 | 2426 | 12 |
| B28 | 16.19 | 2435 | 12 |
| B1 | 16.19 | 2435 | 12 |
| C1 | 16.19 | 2435 | 12 |
| B3 | 16.19 | 2435 | 12 |
| C3 | 16.19 | 2435 | 12 |
| B5 | 16.19 | 2435 | 12 |
| C5 | 16.19 | 2435 | 12 |
| B7 | 16.19 | 2435 | 12 |
| C7 | 16.19 | 2435 | 12 |
| C9 | 16.19 | 2426 | 12 |
| B11 | 16.19 | 2435 | 12 |
| C11 | 16.19 | 2426 | 12 |
| B13 | 16.19 | 2435 | 12 |
| C13 | 16.19 | 2426 | 12 |
| B9 | 16.19 | 2435 | 12 |
| 51 | 16.19 | 2432.0 | 12.0 |

*Methods 0031 and 316*

Run 1

| | | Charging Time |
|---|---|---|
| B2 | 1417 | 11 |
| C2 | 1428 | 11 |
| B4 | 1443 | 11 |
| C4 | 1453 | 11 |
| B6 | 1507 | 11 |
| C6 | 1520 | 11 |
| B8 | 1538 | 11 |
| C8 | 1551 | 11 |
| B10 | 1605 | 11 |
| C10 | 1649 | 11 |
| B12 | 1702 | 11 |
| C12 | 1715 | 11 |
| B14 | 1728 | 11 |
| C14 | 1740 | 11 |
| B16 | 1753 | 11 |
| C16 | 1806 | 11 |
| B18 | 1818 | 11 |
| C18 | 1831 | 11 |
| B20 | 1915 | 11 |
| C20 | 1927 | 11 |
| B22 | 1940 | 11 |
| C22 | 1955 | 11 |
| B24 | 2007 | 11 |
| C24 | 2019 | 11 |
| B26 | 2033 | 11 |
| C26 | 2053 | 11 |
| B28 | 2106 | 11 |
| B1 | 2144 | 11 |
| C1 | 2156 | 11 |
| B3 | 2207 | 11 |
| C3 | 2218 | 11 |
| B5 | 2231 | 11 |
| C5 | 2244 | 11 |
| B7 | 2254 | 11 |
| C7 | 2342 | 11 |
| B9 | 2352 | 11 |
| C9 | 4 | 11 |
| B11 | 42 | 11 |
| C11 | 55 | 11 |
| B13 | 115 | 11 |
| C13 | 232 | 11 |
| B15 | 245 | 11 |
| C15 | 259 | 11 |
| B17 | 311 | 11 |
| C17 | 322 | 11 |
| B19 | 333 | 11 |
| C19 | 343 | 11 |
| B21 | 418 | 11 |
| C21 | 429 | 11 |
| B23 | 440 | 11 |

[redacted]

580
16.2
510
1020

*Methods 0031 and 316*
*Run 1 H2S*

Run 2

| | | Charging Time |
|---|---|---|
| C25 | 517 | 11 |
| B27 | 529 | 11 |
| C27 | 545 | 11 |
| B29 | 556 | 11 |
| B2 | 611 | 11 |
| C2 | 626 | 11 |
| B4 | 639 | 11 |
| C4 | 650 | 11 |
| B6 | 701 | 11 |
| C6 | 742 | 11 |
| B8 | 756 | 11 |
| C8 | 810 | 11 |
| B10 | 825 | 11 |
| C10 | 907 | 11 |
| B12 | 924 | 11 |
| C12 | 937 | 11 |
| B14 | 953 | 11 |
| C14 | 1005 | 11 |
| B16 | 1018 | 11 |
| C16 | 1029 | 11 |
| B18 | 1043 | 11 |
| C18 | 1053 | 11 |
| B20 | 1055 | 11 |
| C20 | 1206 | 11 |
| B22 | 1219 | 11 |
| C22 | 1234 | 11 |
| B24 | 1246 | 11 |
| C24 | 1258 | 11 |
| B26 | 1314 | 11 |
| C26 | 1327 | 11 |
| B28 | 1342 | 11 |
| B1 | 1358 | 11 |
| C1 | 1412 | 11 |
| B3 | 1426 | 11 |
| C3 | 1439 | 11 |
| B5 | 1449 | 11 |
| C5 | 1500 | 11 |
| B7 | 1541 | 11 |
| C7 | 1553 | 11 |
| B9 | 1824 | 11 |
| C9 | 1633 | 11 |
| B11 | 1644 | 11 |
| C11 | 1710 | 11 |
| B13 | 1730 | 11 |
| C13 | 1834 | 11 |
| B15 | 1851 | 11 |
| C15 | 1903 | 11 |
| B17 | 1915 | 11 |

[redacted]

556.8
16.2
510
1020

*Methods 0031 and 316*
*Run 2 and 3 H2S*

Run 3

| | | Charging Time |
|---|---|---|
| C19 | 1953 | 11 |
| B21 | 2042 | 11 |
| C21 | 2054 | 11 |
| B23 | 2104 | 11 |
| C23 | 2116 | 11 |
| B25 | 2126 | 11 |
| C25 | 2137 | 11 |
| B27 | 2147 | 11 |
| C27 | 2157 | 11 |
| B29 | 2210 | 11 |
| B2 | 2220 | 11 |
| C2 | 2230 | 11 |
| B4 | 2239 | 11 |
| C4 | 2249 | 11 |
| B6 | 2258 | 11 |
| C6 | 2357 | 11 |
| B8 | 2352 | 11 |
| C8 | 6 | 11 |
| B10 | 19 | 11 |
| C10 | 111 | 11 |
| B12 | 122 | 11 |
| C12 | 134 | 11 |
| B14 | 147 | 11 |
| C14 | 202 | 11 |
| B16 | 220 | 11 |
| C16 | 238 | 11 |
| B18 | 256 | 11 |
| C18 | 309 | 11 |
| B20 | 353 | 11 |
| C20 | 404 | 11 |
| B22 | 417 | 11 |
| C22 | 429 | 11 |
| B24 | 442 | 11 |
| C24 | 457 | 11 |
| B26 | 511 | 11 |
| C26 | 526 | 11 |
| B28 | 538 | 11 |
| B1 | 617 | 11 |
| C1 | 704 | 11 |
| B3 | 715 | 11 |
| C3 | 739 | 11 |
| B5 | 752 | 11 |
| C5 | 807 | 11 |
| B7 | 826 | 11 |
| C7 | 839 | 11 |
| C9 | 853 | 11 |
| B11 | 943 | 11 |
| C11 | 956 | 11 |
| B13 | 1015 | 11 |
| C13 | 1026 | 11 |
| B9 | 1048 | 11 |

[redacted]

591.6
16.2
510
1020

# REPORT - APPENDIX B

# Montrose Field Data Sheets

# Method 5/29

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 1** | | | | |
| 1 | 2016/10/28 | 03:29:01 | 20.15 | 0.59 |
| 2 | 2016/10/28 | 03:30:01 | 19.71 | 0.99 |
| 3 | 2016/10/28 | 04:19:01 | 19.45 | 0.98 |
| 4 | 2016/10/28 | 04:20:01 | 19.19 | 1.23 |
| 5 | 2016/10/28 | 04:32:01 | 19.51 | 1.08 |
| 6 | 2016/10/28 | 04:33:01 | 19.91 | 0.76 |
| 7 | 2016/10/28 | 04:44:01 | 19.40 | 1.16 |
| 8 | 2016/10/28 | 04:45:01 | 20.42 | 0.42 |
| 9 | 2016/10/28 | 04:55:01 | 19.72 | 0.90 |
| 10 | 2016/10/28 | 04:56:01 | 19.75 | 0.88 |
| 11 | 2016/10/28 | 05:08:01 | 20.36 | 0.42 |
| 12 | 2016/10/28 | 05:09:01 | 19.88 | 0.90 |
| 13 | 2016/10/28 | 05:21:01 | 19.68 | 0.94 |
| 14 | 2016/10/28 | 05:22:01 | 19.88 | 0.79 |
| 15 | 2016/10/28 | 05:33:01 | 19.54 | 1.05 |
| 16 | 2016/10/28 | 05:34:01 | 20.33 | 0.48 |
| 17 | 2016/10/28 | 05:46:01 | 19.87 | 0.77 |
| 18 | 2016/10/28 | 05:47:01 | 19.68 | 0.94 |
| 19 | 2016/10/28 | 06:31:01 | 19.90 | 0.85 |
| 20 | 2016/10/28 | 06:32:01 | 20.08 | 0.75 |
| 21 | 2016/10/28 | 06:49:01 | 19.23 | 1.29 |
| 22 | 2016/10/28 | 06:50:01 | 19.84 | 0.78 |
| 23 | 2016/10/28 | 07:01:01 | 20.02 | 0.72 |
| 24 | 2016/10/28 | 07:02:01 | 20.11 | 0.71 |
| 25 | 2016/10/28 | 07:16:01 | 19.46 | 1.17 |
| 26 | 2016/10/28 | 07:17:01 | 19.94 | 0.78 |
| 27 | 2016/10/28 | 07:38:01 | 18.92 | 1.50 |
| 28 | 2016/10/28 | 07:39:01 | 20.36 | 0.47 |
| 29 | 2016/10/28 | 07:58:01 | 19.50 | 1.06 |
| 30 | 2016/10/28 | 07:59:01 | 19.49 | 1.15 |
| 31 | 2016/10/28 | 08:12:01 | 19.40 | 1.20 |
| 32 | 2016/10/28 | 08:13:01 | 19.89 | 0.87 |
| 33 | 2016/10/28 | 08:28:01 | 19.43 | 1.25 |
| 34 | 2016/10/28 | 08:29:01 | 19.91 | 0.79 |
| 35 | 2016/10/28 | 08:41:01 | 19.52 | 1.18 |
| 36 | 2016/10/28 | 08:42:01 | 20.04 | 0.80 |
| 37 | 2016/10/28 | 08:56:01 | 19.13 | 1.35 |
| 38 | 2016/10/28 | 08:57:01 | 19.59 | 1.05 |
| 39 | 2016/10/28 | 09:09:01 | 20.14 | 0.61 |
| 40 | 2016/10/28 | 09:10:01 | 19.47 | 1.23 |
| 41 | 2016/10/28 | 09:21:01 | 19.62 | 1.03 |
| 42 | 2016/10/28 | 09:22:01 | 19.74 | 0.97 |
| 43 | 2016/10/28 | 09:55:01 | 20.78 | 0.15 |
| 44 | 2016/10/28 | 09:56:01 | 20.78 | 0.15 |
| 45 | 2016/10/28 | 10:05:01 | 20.07 | 0.65 |
| 46 | 2016/10/28 | 10:06:01 | 19.49 | 1.18 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 47 | 2016/10/28 | 10:29:01 | 19.79 | 0.95 |
| 48 | 2016/10/28 | 10:30:01 | 19.80 | 0.97 |
| 49 | 2016/10/28 | 10:43:01 | 19.74 | 0.99 |
| 50 | 2016/10/28 | 10:44:01 | 19.86 | 0.95 |
| 51 | 2016/10/28 | 10:55:01 | 19.40 | 1.17 |
| 52 | 2016/10/28 | 10:56:01 | 19.70 | 0.94 |
| 53 | 2016/10/28 | 11:07:01 | 19.35 | 1.21 |
| 54 | 2016/10/28 | 11:08:01 | 19.87 | 0.84 |
| 55 | 2016/10/28 | 11:21:01 | 18.83 | 1.52 |
| 56 | 2016/10/28 | 11:22:01 | 19.66 | 0.88 |
| 57 | 2016/10/28 | 11:35:01 | 19.72 | 1.03 |
| 58 | 2016/10/28 | 11:36:01 | 19.89 | 0.94 |
| 59 | 2016/10/28 | 11:47:01 | 19.08 | 1.32 |
| 60 | 2016/10/28 | 11:48:01 | 19.54 | 0.96 |
| 61 | 2016/10/28 | 12:02:01 | 19.44 | 1.30 |
| 62 | 2016/10/28 | 12:03:01 | 20.36 | 0.53 |
| 63 | 2016/10/28 | 12:44:01 | 20.46 | 0.36 |
| 64 | 2016/10/28 | 12:45:01 | 19.52 | 1.19 |
| 65 | 2016/10/28 | 12:58:01 | 19.54 | 1.19 |
| 66 | 2016/10/28 | 12:59:01 | 20.38 | 0.49 |
| 67 | 2016/10/28 | 13:10:01 | 20.01 | 0.78 |
| 68 | 2016/10/28 | 13:11:01 | 19.80 | 1.01 |
| 69 | 2016/10/28 | 13:22:01 | 20.12 | 0.57 |
| 70 | 2016/10/28 | 13:23:01 | 19.39 | 1.24 |
| 71 | 2016/10/28 | 13:35:01 | 19.64 | 1.07 |
| 72 | 2016/10/28 | 13:36:01 | 20.17 | 0.66 |
| 73 | 2016/10/28 | 13:49:01 | 19.75 | 0.86 |
| 74 | 2016/10/28 | 13:50:01 | 19.55 | 1.08 |
| 75 | 2016/10/28 | 14:01:01 | 19.87 | 0.86 |
| 76 | 2016/10/28 | 14:02:01 | 19.78 | 1.02 |
| 77 | 2016/10/28 | 14:14:01 | 19.64 | 1.06 |
| 78 | 2016/10/28 | 14:15:01 | 19.87 | 0.88 |
| 79 | 2016/10/28 | 14:27:01 | 19.57 | 1.10 |
| 80 | 2016/10/28 | 14:28:01 | 20.04 | 0.77 |
| 81 | 2016/10/28 | 15:01:01 | 19.54 | 1.05 |
| 82 | 2016/10/28 | 15:02:01 | 19.68 | 0.98 |
| | **Run 1 Average** | | **19.76** | **0.92** |
| **RUN 2** | | | | |
| 1 | 2016/10/31 | 08:24:01 | 19.94 | 0.85 |
| 2 | 2016/10/31 | 08:25:01 | 20.54 | 0.42 |
| 3 | 2016/10/31 | 08:39:01 | 20.10 | 0.72 |
| 4 | 2016/10/31 | 08:40:01 | 19.95 | 0.84 |
| 5 | 2016/10/31 | 08:54:01 | 20.79 | 0.20 |
| 6 | 2016/10/31 | 08:55:01 | 19.59 | 1.13 |
| 7 | 2016/10/31 | 09:10:01 | 19.73 | 0.95 |
| 8 | 2016/10/31 | 09:11:01 | 19.91 | 0.82 |
| 9 | 2016/10/31 | 09:23:01 | 20.02 | 0.80 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 10 | 2016/10/31 | 09:24:01 | 20.61 | 0.39 |
| 11 | 2016/10/31 | 09:35:01 | 19.65 | 1.07 |
| 12 | 2016/10/31 | 09:36:01 | 20.18 | 0.68 |
| 13 | 2016/10/31 | 09:46:01 | 20.49 | 0.46 |
| 14 | 2016/10/31 | 09:47:01 | 20.32 | 0.66 |
| 15 | 2016/10/31 | 09:58:01 | 19.60 | 1.11 |
| 16 | 2016/10/31 | 09:59:01 | 20.19 | 0.68 |
| 17 | 2016/10/31 | 10:47:01 | 20.47 | 0.46 |
| 18 | 2016/10/31 | 10:48:01 | 20.43 | 0.55 |
| 19 | 2016/10/31 | 11:00:01 | 19.92 | 0.91 |
| 20 | 2016/10/31 | 11:01:01 | 20.17 | 0.72 |
| 21 | 2016/10/31 | 11:13:01 | 20.02 | 0.85 |
| 22 | 2016/10/31 | 11:14:01 | 20.87 | 0.16 |
| 23 | 2016/10/31 | 11:26:01 | 19.70 | 1.05 |
| 24 | 2016/10/31 | 11:27:01 | 20.07 | 0.76 |
| 25 | 2016/10/31 | 11:39:01 | 19.86 | 0.93 |
| 26 | 2016/10/31 | 11:40:01 | 20.76 | 0.26 |
| 27 | 2016/10/31 | 11:52:01 | 19.59 | 1.09 |
| 28 | 2016/10/31 | 11:53:01 | 20.05 | 0.74 |
| 29 | 2016/10/31 | 12:06:01 | 20.11 | 0.75 |
| 30 | 2016/10/31 | 12:07:01 | 20.31 | 0.62 |
| 31 | 2016/10/31 | 12:22:01 | 19.76 | 0.90 |
| 32 | 2016/10/31 | 12:23:01 | 20.17 | 0.62 |
| 33 | 2016/10/31 | 12:36:01 | 19.75 | 1.05 |
| 34 | 2016/10/31 | 12:37:01 | 20.58 | 0.40 |
| 35 | 2016/10/31 | 13:30:01 | 19.36 | 1.22 |
| 36 | 2016/10/31 | 13:31:01 | 20.45 | 0.44 |
| 37 | 2016/10/31 | 13:41:01 | 20.55 | 0.37 |
| 38 | 2016/10/31 | 13:42:01 | 19.89 | 0.94 |
| 39 | 2016/10/31 | 13:54:01 | 20.28 | 0.60 |
| 40 | 2016/10/31 | 13:55:01 | 20.49 | 0.47 |
| 41 | 2016/10/31 | 14:07:01 | 19.87 | 0.94 |
| 42 | 2016/10/31 | 14:08:01 | 20.68 | 0.29 |
| 43 | 2016/10/31 | 14:18:01 | 20.25 | 0.63 |
| 44 | 2016/10/31 | 14:19:01 | 20.42 | 0.53 |
| 45 | 2016/10/31 | 14:32:01 | 19.99 | 0.78 |
| 46 | 2016/10/31 | 14:33:01 | 20.44 | 0.46 |
| 47 | 2016/10/31 | 14:44:01 | 20.70 | 0.23 |
| 48 | 2016/10/31 | 14:45:01 | 20.00 | 0.88 |
| 49 | 2016/10/31 | 14:56:01 | 20.40 | 0.46 |
| 50 | 2016/10/31 | 14:57:01 | 19.91 | 0.89 |
| 51 | 2016/10/31 | 15:35:01 | 20.62 | 0.33 |
| 52 | 2016/10/31 | 15:36:01 | 19.80 | 1.07 |
| 53 | 2016/10/31 | 15:56:01 | 20.01 | 0.75 |
| 54 | 2016/10/31 | 15:57:01 | 19.86 | 0.88 |
| 55 | 2016/10/31 | 16:36:01 | 20.11 | 0.72 |
| 56 | 2016/10/31 | 16:50:01 | 19.67 | 1.02 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 57 | 2016/10/31 | 16:51:01 | 20.29 | 0.57 |
| 58 | 2016/10/31 | 17:07:01 | 20.38 | 0.43 |
| 59 | 2016/10/31 | 17:08:01 | 19.48 | 1.18 |
| 60 | 2016/10/31 | 17:23:01 | 19.50 | 1.10 |
| 61 | 2016/10/31 | 17:24:01 | 19.95 | 0.80 |
| 62 | 2016/10/31 | 17:34:01 | 19.68 | 1.08 |
| 63 | 2016/10/31 | 17:35:01 | 20.35 | 0.56 |
| 64 | 2016/10/31 | 18:07:01 | 20.38 | 0.46 |
| 65 | 2016/10/31 | 18:08:01 | 19.74 | 1.08 |
| 66 | 2016/10/31 | 18:21:01 | 19.65 | 1.12 |
| 67 | 2016/10/31 | 18:22:01 | 20.36 | 0.55 |
| 68 | 2016/10/31 | 18:34:01 | 19.71 | 1.04 |
| 69 | 2016/10/31 | 18:35:01 | 20.06 | 0.75 |
| 70 | 2016/10/31 | 18:46:01 | 20.44 | 0.43 |
| 71 | 2016/10/31 | 18:47:01 | 19.86 | 1.00 |
| 72 | 2016/10/31 | 18:59:01 | 19.93 | 0.85 |
| 73 | 2016/10/31 | 19:00:01 | 19.94 | 0.87 |
| 74 | 2016/10/31 | 19:45:01 | 19.93 | 0.87 |
| 75 | 2016/10/31 | 19:46:01 | 20.27 | 0.63 |
| 76 | 2016/10/31 | 19:59:01 | 20.46 | 0.42 |
| 77 | 2016/10/31 | 20:00:01 | 19.23 | 1.64 |
| 78 | 2016/10/31 | 20:12:01 | 20.15 | 0.69 |
| 79 | 2016/10/31 | 20:13:01 | 20.09 | 0.80 |
| 80 | 2016/10/31 | 20:25:01 | 19.71 | 1.01 |
| 81 | 2016/10/31 | 20:26:01 | 19.96 | 0.83 |
| 82 | 2016/10/31 | 20:38:01 | 20.51 | 0.36 |
| 83 | 2016/10/31 | 20:39:01 | 19.74 | 1.02 |
| 84 | 2016/10/31 | 20:51:01 | 19.83 | 0.92 |
| 85 | 2016/10/31 | 20:52:01 | 20.08 | 0.74 |
| 86 | 2016/10/31 | 21:02:01 | 20.48 | 0.40 |
| 87 | 2016/10/31 | 21:03:01 | 19.87 | 1.00 |
| 88 | 2016/10/31 | 21:14:01 | 20.10 | 0.68 |
| 89 | 2016/10/31 | 21:15:01 | 19.95 | 0.83 |
| 90 | 2016/10/31 | 21:28:01 | 19.68 | 1.12 |
| 91 | 2016/10/31 | 21:29:01 | 20.63 | 0.32 |
| 92 | 2016/10/31 | 21:40:01 | 19.60 | 1.10 |
| 93 | 2016/10/31 | 21:41:01 | 20.52 | 0.39 |
| 94 | 2016/10/31 | 22:02:01 | 20.05 | 0.76 |
| 95 | 2016/10/31 | 22:03:01 | 20.07 | 0.79 |
| 96 | | | | |
| | **Run 2 Averages** | | **20.09** | **0.74** |
| **RUN 3** | | | | |
| 1 | 2016/10/31 | 22:58:01 | 20.29 | 0.57 |
| 2 | 2016/10/31 | 22:59:01 | 20.21 | 0.71 |
| 3 | 2016/10/31 | 23:32:01 | 20.23 | 0.65 |
| 4 | 2016/10/31 | 23:33:01 | 20.14 | 0.75 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 5 | 2016/10/31 | 23:43:01 | 20.34 | 0.50 |
| 6 | 2016/10/31 | 23:44:01 | 20.35 | 0.57 |
| 7 | 2016/11/01 | 00:19:01 | 19.84 | 0.87 |
| 8 | 2016/11/01 | 00:20:01 | 19.99 | 0.79 |
| 9 | 2016/11/01 | 00:31:01 | 19.71 | 0.99 |
| 10 | 2016/11/01 | 00:32:01 | 20.76 | 0.19 |
| 11 | 2016/11/01 | 00:43:01 | 20.21 | 0.58 |
| 12 | 2016/11/01 | 00:44:01 | 19.99 | 0.78 |
| 13 | 2016/11/01 | 00:58:01 | 20.07 | 0.69 |
| 14 | 2016/11/01 | 00:59:01 | 20.50 | 0.41 |
| 15 | 2016/11/01 | 01:13:01 | 19.83 | 0.81 |
| 16 | 2016/11/01 | 01:14:01 | 19.85 | 0.79 |
| 17 | 2016/11/01 | 01:28:01 | 20.06 | 0.71 |
| 18 | 2016/11/01 | 01:29:01 | 20.50 | 0.41 |
| 19 | 2016/11/01 | 01:43:01 | 19.93 | 0.80 |
| 20 | 2016/11/01 | 01:44:01 | 19.95 | 0.80 |
| 21 | 2016/11/01 | 01:58:01 | 20.05 | 0.77 |
| 22 | 2016/11/01 | 01:59:01 | 20.04 | 0.81 |
| 23 | 2016/11/01 | 02:22:01 | 19.71 | 1.00 |
| 24 | 2016/11/01 | 02:23:01 | 20.29 | 0.56 |
| 25 | 2016/11/01 | 03:00:01 | 19.92 | 0.89 |
| 26 | 2016/11/01 | 03:01:01 | 20.36 | 0.55 |
| 27 | 2016/11/01 | 03:13:01 | 19.69 | 1.07 |
| 28 | 2016/11/01 | 03:14:01 | 20.03 | 0.78 |
| 29 | 2016/11/01 | 03:25:01 | 19.75 | 0.98 |
| 30 | 2016/11/01 | 03:26:01 | 20.39 | 0.51 |
| 31 | 2016/11/01 | 03:37:01 | 20.40 | 0.44 |
| 32 | 2016/11/01 | 03:38:01 | 19.77 | 1.01 |
| 33 | 2016/11/01 | 03:50:01 | 20.56 | 0.31 |
| 34 | 2016/11/01 | 03:51:01 | 19.72 | 0.99 |
| 35 | 2016/11/01 | 04:04:01 | 19.68 | 1.04 |
| 36 | 2016/11/01 | 04:05:01 | 20.01 | 0.75 |
| 37 | 2016/11/01 | 04:17:01 | 20.04 | 0.74 |
| 38 | 2016/11/01 | 04:18:01 | 20.07 | 0.74 |
| 39 | 2016/11/01 | 04:31:01 | 19.47 | 1.12 |
| 40 | 2016/11/01 | 04:32:01 | 20.03 | 0.68 |
| 41 | 2016/11/01 | 04:43:01 | 20.59 | 0.30 |
| 42 | 2016/11/01 | 04:44:01 | 19.73 | 1.07 |
| 43 | 2016/11/01 | 05:20:01 | 20.37 | 0.41 |
| 44 | 2016/11/01 | 05:21:01 | 19.29 | 1.26 |
| 45 | 2016/11/01 | 05:33:01 | 19.90 | 0.88 |
| 46 | 2016/11/01 | 05:34:01 | 19.95 | 0.86 |
| 47 | 2016/11/01 | 05:45:01 | 20.57 | 0.31 |
| 48 | 2016/11/01 | 05:46:01 | 19.80 | 0.96 |
| 49 | 2016/11/01 | 06:00:01 | 19.81 | 0.93 |
| 50 | 2016/11/01 | 06:01:01 | 20.06 | 0.75 |
| 51 | 2016/11/01 | 06:14:01 | 19.58 | 1.14 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 52 | 2016/11/01 | 06:15:01 | 20.52 | 0.41 |
| 53 | 2016/11/01 | 06:29:01 | 19.75 | 0.94 |
| 54 | 2016/11/01 | 06:30:01 | 20.40 | 0.46 |
| 55 | 2016/11/01 | 06:57:01 | 19.79 | 0.97 |
| 56 | 2016/11/01 | 06:58:01 | 20.00 | 0.82 |
| 57 | 2016/11/01 | 07:37:01 | 20.12 | 0.73 |
| 58 | 2016/11/01 | 07:38:01 | 20.05 | 0.84 |
| 59 | 2016/11/01 | 07:52:01 | 19.07 | 1.42 |
| 60 | 2016/11/01 | 07:53:01 | 19.87 | 0.81 |
| 61 | 2016/11/01 | 08:47:01 | 20.44 | 0.43 |
| 62 | 2016/11/01 | 08:48:01 | 19.72 | 1.07 |
| 63 | 2016/11/01 | 09:07:01 | 19.59 | 1.07 |
| 64 | 2016/11/01 | 09:08:01 | 19.82 | 0.91 |
| 65 | 2016/11/01 | 09:25:01 | 19.81 | 0.90 |
| 66 | 2016/11/01 | 09:26:01 | 19.82 | 0.96 |
| 67 | 2016/11/01 | 09:38:01 | 20.55 | 0.34 |
| 68 | 2016/11/01 | 09:39:01 | 19.58 | 1.19 |
| 69 | 2016/11/01 | 10:00:01 | 19.75 | 0.91 |
| 70 | 2016/11/01 | 10:01:01 | 20.11 | 0.64 |
| 71 | 2016/11/01 | 10:16:01 | 19.71 | 0.96 |
| 72 | 2016/11/01 | 10:17:01 | 19.77 | 0.99 |
| 73 | 2016/11/01 | 10:30:01 | 19.84 | 0.95 |
| 74 | 2016/11/01 | 10:31:01 | 20.03 | 0.87 |
| 75 | 2016/11/01 | 10:42:01 | 20.03 | 0.72 |
| 76 | 2016/11/01 | 10:43:01 | 19.72 | 1.01 |
| 77 | 2016/11/01 | 10:57:01 | 20.30 | 0.53 |
| 78 | 2016/11/01 | 10:58:01 | 19.70 | 1.08 |
| 79 | 2016/11/01 | 11:10:01 | 19.53 | 1.13 |
| 80 | 2016/11/01 | 11:11:01 | 19.96 | 0.78 |
| 81 | 2016/11/01 | 11:54:01 | 19.43 | 1.24 |
| 82 | 2016/11/01 | 11:55:01 | 20.40 | 0.49 |
| 83 | 2016/11/01 | 12:07:01 | 19.78 | 0.98 |
| 84 | 2016/11/01 | 12:08:01 | 19.88 | 0.92 |
| 85 | 2016/11/01 | 12:21:01 | 19.34 | 1.28 |
| 86 | 2016/11/01 | 12:22:01 | 20.45 | 0.44 |
| 87 | 2016/11/01 | 12:34:01 | 19.44 | 1.22 |
| 88 | 2016/11/01 | 12:35:01 | 19.97 | 0.78 |
| 89 | 2016/11/01 | 12:48:01 | 19.29 | 1.27 |
| 90 | 2016/11/01 | 12:49:01 | 20.04 | 0.71 |
| 91 | 2016/11/01 | 13:00:01 | 19.12 | 1.30 |
| 92 | 2016/11/01 | 13:01:01 | 19.60 | 0.97 |
| 93 | 2016/11/01 | 13:13:01 | 19.42 | 1.26 |
| 94 | 2016/11/01 | 13:14:01 | 20.04 | 0.79 |
| 95 | 2016/11/01 | 13:25:01 | 19.59 | 1.00 |
| 96 | 2016/11/01 | 13:26:01 | 19.77 | 0.88 |
| **Run 3 Average** | | | 19.95 | 0.82 |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | October 28, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 1 |
| **Unit** | Pushing Baghouse | **Start Time** | 3:28 |
| **Operation** | Normal | **End Time** | 17:01 |
| **Tester(s)** | BC, JW, TM, TL | | |

| Cal. | LOW | | MID | | HIGH | | | Conc. | Tank ID | | | Response Time (sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Units | LOW | MID | HIGH | Up | Down |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | 45 | 45 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B | 50 | 50 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |

| | | | | Initial Values | | Final Values | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
| O2 | Zero | | 0.01 | 0.11 | 0.50 | 0.16 | 0.75 | 0.25 | 20.03 | 0.135 | | | |
| | Mid | 10.01 | 10.07 | 9.88 | -0.95 | 10.01 | -0.30 | 0.65 | 20.03 | 9.945 | 19.76 | 20.03 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.00 | -0.30 | 0.08 | 0.10 | 0.40 | 19.79 | 0.040 | | | |
| | Mid | 10.15 | 10.04 | 9.92 | -0.61 | 10.04 | 0.00 | 0.61 | 19.79 | 9.98 | 0.92 | 0.90 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | October 31, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 2 |
| **Unit** | Pushing Baghouse | **Start Time** | 8:23 |
| **Operation** | Normal | **End Time** | 22:04 |
| **Tester(s)** | BC, JW, TM, TL | | |

| Cal. Gas | LOW | | MID | | HIGH | | Span | Conc. Units | Tank ID | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | | | LOW | MID | HIGH |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values | | Final Values | | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | | | | | | |
| O2 | Zero | | 0.01 | 0.16 | 0.75 | 0.14 | 0.65 | -0.10 | 20.03 | 0.15 | | | |
| | Mid | 10.01 | 10.07 | 10.01 | -0.30 | 10.10 | 0.15 | 0.45 | 20.03 | 10.055 | 20.09 | 20.15 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.08 | 0.10 | 0.11 | 0.25 | 0.15 | 19.79 | 0.095 | | | |
| | Mid | 10.15 | 10.04 | 10.04 | 0.00 | 10.02 | -0.10 | -0.10 | 19.79 | 10.03 | 0.74 | 0.66 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Oct. 31-Nov. 1, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 3 |
| **Unit** | Pushing Baghouse | **Start Time** | 22:58 |
| **Operation** | Normal | **End Time** | 13:27 |
| **Tester(s)** | BC, JW, TM, TL | | |

| Cal. | LOW | | MID | | HIGH | | | Conc. | Tank ID | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Units | LOW | MID | HIGH |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values System Cal. Response | Initial Values System Cal. Bias (% of Span) | Final Values System Cal. Response | Final Values System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | Zero | | 0.01 | 0.14 | 0.65 | 0.11 | 0.50 | -0.15 | 20.03 | 0.125 | | | |
| | Mid | 10.01 | 10.07 | 10.10 | 0.15 | 10.04 | -0.15 | -0.30 | 20.03 | 10.07 | 19.95 | 19.96 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.11 | 0.25 | 0.15 | 0.45 | 0.20 | 19.79 | 0.13 | | | |
| | Mid | 10.15 | 10.04 | 10.02 | -0.10 | 10.01 | -0.15 | -0.05 | 19.79 | 10.015 | 0.82 | 0.70 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | October 28, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 1 |
| Unit: | Pushing Baghouse | Test Start Time: | 3:28 AM |
| Unit Operation: | Normal | Test Finish Time: | 5:01 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH@_d$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.34 | in. Hg |
| Stack Static Pressure (Pg) | 0.10 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 20.03 | % dv |
| CO2 | 0.90 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Metals Testing Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 61.9 | F |
| Stack Temperature (Tsavg) | 126.8 | F |
| Orifice Pressure Drop (dHavg) | 3.235 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8641 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04707 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 13.55 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.54 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.07 | % dv |
| Water Collected ($V_f$- $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$- $W_i$) | 36.5 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 1.721 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.721 | scf |
| Volume Dry Gas Metered (Vm) | 118.341 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 118.652 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 3.351 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 3.360 | dscm |
| Stack Absolute Pressure (Ps) | 29.35 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 586.5 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.16 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1418 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0143 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0143 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.95 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.79 | lb/lb-mole |
| Gas Velocity (Vs) | 51.72 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 87,735 | scfm |
| Standard Gas Flowrate | 77,429 | scfm |
| Dry Standard Gas Flowrate | 76,321.53 | dscfm |
| Actual Gas Flowrate | 2,484 | acm/min |
| Standard Gas Flowrate | 2,193 | scm/min |
| Dry Standard Gas Flowrate | 2,161 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 103.3 | % |

**Metals**

| Mercury | | | |
|---|---|---|---|
| Emission mass (1B Fraction) | < | 0.165 | (ug) |
| Emission mass (2B Fraction) | | 0.190 | (ug) |
| Emission mass (3B Fraction) | < | 0.0230 | (ug) |
| Emission mass (3C Fraction) | | 1.780 | (ug) |
| Emission concentration (1B Fraction) | < | 4.91E-05 | (mg/dscm) |
| Emission concentration (2B Fraction) | | 5.65E-05 | (mg/dscm) |
| Emission concentration (3A Fraction) | < | 6.85E-06 | (mg/dscm) |
| Emission concentration (3B Fraction) | | 5.30E-04 | (mg/dscm) |
| Emission concentration (3C Fraction) | | 0.00E+00 | (mg/dscm) |
| Emission rate (1B Fraction) | < | 2.07E-06 | (lb/hr) |
| Emission rate (2B Fraction) | | 2.39E-06 | (lb/hr) |
| Emission rate (3B Fraction) | < | 2.89E-07 | (lb/hr) |
| Emission rate (3C Fraction) | | 2.24E-05 | (lb/hr) |

| Antimony | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.800 | (ug) |
| Back Half Mass Gained | < | 0.400 | (ug) |
| Emission Concentration Front-Half | < | 2.38E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 1.19E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 1.00E-05 | (lb/hr) |
| Emission Rate Back-Half | < | 5.02E-06 | (lb/hr) |

| Arsenic | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.800 | (ug) |
| Back Half Mass Gained | < | 0.400 | (ug) |
| Emission Concentration Front-Half | < | 2.38E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 1.19E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 1.00E-05 | (lb/hr) |
| Emission Rate Back-Half | < | 5.02E-06 | (lb/hr) |

| Beryllium | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.200 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) |
| Emission Concentration Front-Half | < | 5.95E-05 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.98E-05 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.51E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 1.26E-06 | (lb/hr) |

| Cadmium | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.200 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) |
| Emission Concentration Front-Half | < | 5.95E-05 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.98E-05 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.51E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 1.26E-06 | (lb/hr) |

| Chromium | | | |
|---|---|---|---|
| Front Half Mass Gained | | 35.200 | (ug) |
| Back Half Mass Gained | | 4.650 | (ug) |
| Emission Concentration Front-Half | | 1.05E-02 | (mg/dscm) |
| Emission Concentration Back-Half | | 1.38E-03 | (mg/dscm) |
| Emission Rate Front-Half | | 4.42E-04 | (lb/hr) |
| Emission Rate Back-Half | | 5.84E-05 | (lb/hr) |

| Cobalt | | | |
|---|---|---|---|
| Front Half Mass Gained | | 0.930 | (ug) |
| Back Half Mass Gained | | 0.310 | (ug) |
| Emission Concentration Front-Half | | 2.77E-04 | (mg/dscm) |
| Emission Concentration Back-Half | | 9.23E-05 | (mg/dscm) |
| Emission Rate Front-Half | | 1.17E-05 | (lb/hr) |
| Emission Rate Back-Half | | 3.89E-06 | (lb/hr) |

| Lead | | | |
|---|---|---|---|
| Front Half Mass Gained | | 0.860 | (ug) |
| Back Half Mass Gained | | 0.640 | (ug) |
| Emission Concentration Front-Half | | 2.56E-04 | (mg/dscm) |
| Emission Concentration Back-Half | | 1.90E-04 | (mg/dscm) |
| Emission Rate Front-Half | | 1.08E-05 | (lb/hr) |
| Emission Rate Back-Half | | 8.04E-06 | (lb/hr) |

| Manganese | | | |
|---|---|---|---|
| Front Half Mass Gained | | 16.100 | (ug) |
| Back Half Mass Gained | | 17.900 | (ug) |
| Emission Concentration Front-Half | | 4.79E-03 | (mg/dscm) |
| Emission Concentration Back-Half | | 5.33E-03 | (mg/dscm) |
| Emission Rate Front-Half | | 2.02E-04 | (lb/hr) |
| Emission Rate Back-Half | | 2.25E-04 | (lb/hr) |

| Nickel | | | |
|---|---|---|---|
| Front Half Mass Gained | | 21.400 | (ug) |
| Back Half Mass Gained | | 8.760 | (ug) |
| Emission Concentration Front-Half | | 6.37E-03 | (mg/dscm) |
| Emission Concentration Back-Half | | 2.61E-03 | (mg/dscm) |
| Emission Rate Front-Half | | 2.69E-04 | (lb/hr) |
| Emission Rate Back-Half | | 1.10E-04 | (lb/hr) |

| Selenium | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 2.000 | (ug) |
| Back Half Mass Gained | | 1.300 | (ug) |
| Emission Concentration Front-Half | < | 5.95E-04 | (mg/dscm) |
| Emission Concentration Back-Half | | 3.87E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.51E-05 | (lb/hr) |
| Emission Rate Back-Half | | 1.63E-05 | (lb/hr) |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In (F or C) | Meter Temp Out (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.70 | 0.837 | 2.8 | 117 | 61 | 62 |
| A-1 | 0.78 | 0.883 | 3.1 | 116 | 60 | 61 |
| A-2 | 0.71 | 0.843 | 2.8 | 120 | 60 | 61 |
| A-2 | 0.70 | 0.837 | 2.8 | 116 | 60 | 61 |
| A-3 | 0.70 | 0.837 | 2.8 | 121 | 61 | 61 |
| A-3 | 0.71 | 0.843 | 3.1 | 109 | 61 | 61 |
| A-4 | 0.72 | 0.849 | 3.2 | 115 | 61 | 61 |
| A-4 | 0.72 | 0.849 | 3.2 | 115 | 61 | 61 |
| A-5 | 0.64 | 0.800 | 2.8 | 117 | 61 | 61 |
| A-5 | 0.63 | 0.794 | 2.8 | 106 | 60 | 61 |
| A-6 | 0.64 | 0.800 | 2.8 | 122 | 60 | 61 |
| A-6 | 0.64 | 0.800 | 2.8 | 110 | 60 | 61 |
| A-7 | 0.63 | 0.794 | 2.8 | 127 | 60 | 60 |
| A-7 | 0.63 | 0.794 | 2.8 | 122 | 60 | 60 |
| A-8 | 0.70 | 0.837 | 2.8 | 128 | 60 | 60 |
| A-8 | 0.65 | 0.806 | 2.8 | 137 | 60 | 60 |
| A-9 | 0.65 | 0.806 | 2.8 | 144 | 60 | 60 |
| A-9 | 0.71 | 0.843 | 2.8 | 137 | 60 | 60 |
| A-10 | 0.74 | 0.860 | 3.2 | 144 | 60 | 60 |
| A-10 | 0.74 | 0.860 | 3.2 | 137 | 60 | 60 |
| A-11 | 0.73 | 0.854 | 3.1 | 145 | 60 | 60 |
| A-11 | 0.74 | 0.860 | 3.2 | 109 | 60 | 60 |
| A-12 | 0.82 | 0.906 | 3.6 | 112 | 60 | 60 |
| A-12 | 0.77 | 0.877 | 3.1 | 115 | 60 | 60 |
| B-1 | 0.95 | 0.975 | 4.1 | 125 | 61 | 61 |
| B-1 | 0.95 | 0.975 | 4.1 | 149 | 61 | 61 |
| B-2 | 0.96 | 0.980 | 4.1 | 137 | 61 | 61 |
| B-2 | 0.97 | 0.985 | 4.1 | 162 | 61 | 61 |
| B-3 | 0.95 | 0.975 | 4.1 | 135 | 61 | 61 |
| B-3 | 0.95 | 0.975 | 4.1 | 138 | 61 | 61 |
| B-4 | 0.97 | 0.985 | 4.1 | 136 | 62 | 61 |
| B-4 | 0.93 | 0.964 | 4.0 | 108 | 62 | 62 |
| B-5 | 0.99 | 0.995 | 4.3 | 118 | 62 | 62 |
| B-5 | 0.90 | 0.949 | 3.9 | 121 | 62 | 62 |
| B-6 | 0.95 | 0.975 | 4.1 | 131 | 63 | 63 |
| B-6 | 0.86 | 0.927 | 3.8 | 125 | 63 | 63 |
| B-7 | 0.86 | 0.927 | 3.8 | 139 | 64 | 63 |
| B-7 | 0.85 | 0.922 | 3.7 | 131 | 64 | 63 |
| B-8 | 0.94 | 0.970 | 4.1 | 133 | 64 | 64 |
| B-8 | 0.94 | 0.970 | 4.1 | 131 | 64 | 64 |
| B-9 | 0.60 | 0.775 | 2.6 | 135 | 65 | 65 |
| B-9 | 0.60 | 0.775 | 2.6 | 114 | 65 | 65 |
| B-10 | 0.55 | 0.742 | 2.5 | 130 | 66 | 66 |
| B-10 | 0.52 | 0.721 | 2.3 | 127 | 66 | 66 |
| B-11 | 0.54 | 0.735 | 2.4 | 136 | 67 | 66 |
| B-11 | 0.53 | 0.728 | 2.3 | 120 | 67 | 67 |
| B-12 | 0.56 | 0.748 | 2.5 | 139 | 67 | 67 |
| B-12 | 0.55 | 0.742 | 2.4 | 127 | 67 | 67 |
| Average | 0.75 | 0.864 | 3.24 | 126.8 | | 61.9 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 688.200 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 806.541 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 118.341 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 722.7 | 726.0 | -3.3 | | | 0.0 |
| 2 | 744.4 | 730.7 | 13.7 | | | 0.0 |
| 3 | 617.9 | 616.8 | 1.1 | | | 0.0 |
| 4 | 726.3 | 727.8 | -1.5 | | | 0.0 |
| 5 | 714.0 | 714.3 | -0.3 | | | 0.0 |
| 6 | 794.1 | 767.3 | 26.8 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 4319.4 | 4282.9 | 36.5 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$- $W_i$) | $V_f$ | $V_i$ | ($V_f$- Vi) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | October 28, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 1 |
| Unit: | Pushing Baghouse | Test Start Time: | 3:28 AM |
| Unit Operation: | Normal | Test Finish Time: | 5:01 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.34 | in. Hg |
| Stack Static Pressure (Pg) | 0.1 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72 | inches |
| Stack Width (enter 0 if circular stack) | 0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 20.03 | % dv |
| CO2 | 0.90 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Particulate Matter Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 61.9 | F |
| Stack Temperature (Tsavg) | 126.8 | F |
| Orifice Pressure Drop (dHavg) | 3.235 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8641 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04707 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 13.55 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.54 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Particulate Matter**

| | | |
|---|---|---|
| Acetone Wash Container No. | NA | |
| Front Half Filter No. | NA | |
| Acetone Wash Volume (Vaw) | 100 | ml |
| Acetone Wash Weight Gain | 5.3 | mg |
| Front Half Filter Particulate | 2.6 | mg |
| Total Particulate Mass ($m_n$) | 7.90 | mg |
| Particulate Concentration | 0.00103 | gr/dscf |
| Particulate Concentration | 2.35 | mg/dscm |
| Particulate Emission Rate | 0.028 | lb/push |
| Particulate Emission Rate | 0.099 | lb/hr |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.07 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 36.5 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 1.721 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.721 | scf |
| Volume Dry Gas Metered (Vm) | 118.341 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 118.652 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 3.351 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 3.360 | dscm |
| Stack Absolute Pressure (Ps) | 29.35 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 586.5 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.16 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1418 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0143 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0143 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.95 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.79 | lb/lb-mole |
| Gas Velocity (Vs) | 51.72 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 87,735 | acfm |
| Standard Gas Flowrate | 77,429 | scfm |
| Dry Standard Gas Flowrate | 76,322 | dscfm |
| Actual Gas Flowrate | 2,484 | acm/min |
| Standard Gas Flowrate | 2,193 | scm/min |
| Dry Standard Gas Flowrate | 2,161 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 103.3 | % |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP $(in. H2O)^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In (F or C) | Meter Temp Out (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.70 | 0.837 | 2.8 | 117 | 61 | 62 |
| A-1 | 0.78 | 0.883 | 3.1 | 116 | 60 | 61 |
| A-2 | 0.71 | 0.843 | 2.8 | 120 | 60 | 61 |
| A-2 | 0.70 | 0.837 | 2.8 | 116 | 60 | 61 |
| A-3 | 0.70 | 0.837 | 2.8 | 121 | 61 | 61 |
| A-3 | 0.71 | 0.843 | 3.1 | 109 | 61 | 61 |
| A-4 | 0.72 | 0.849 | 3.2 | 115 | 61 | 61 |
| A-4 | 0.72 | 0.849 | 3.2 | 115 | 61 | 61 |
| A-5 | 0.64 | 0.800 | 2.8 | 117 | 61 | 61 |
| A-5 | 0.63 | 0.794 | 2.8 | 106 | 60 | 61 |
| A-6 | 0.64 | 0.800 | 2.8 | 122 | 60 | 61 |
| A-6 | 0.64 | 0.800 | 2.8 | 110 | 60 | 61 |
| A-7 | 0.63 | 0.794 | 2.8 | 127 | 60 | 60 |
| A-7 | 0.63 | 0.794 | 2.8 | 122 | 60 | 60 |
| A-8 | 0.70 | 0.837 | 2.8 | 128 | 60 | 60 |
| A-8 | 0.65 | 0.806 | 2.8 | 137 | 60 | 60 |
| A-9 | 0.65 | 0.806 | 2.8 | 144 | 60 | 60 |
| A-9 | 0.71 | 0.843 | 2.8 | 137 | 60 | 60 |
| A-10 | 0.74 | 0.860 | 3.2 | 144 | 60 | 60 |
| A-10 | 0.74 | 0.860 | 3.2 | 137 | 60 | 60 |
| A-11 | 0.73 | 0.854 | 3.1 | 145 | 60 | 60 |
| A-11 | 0.74 | 0.860 | 3.2 | 109 | 60 | 60 |
| A-12 | 0.82 | 0.906 | 3.6 | 112 | 60 | 60 |
| A-12 | 0.77 | 0.877 | 3.1 | 115 | 60 | 60 |
| B-1 | 0.95 | 0.975 | 4.1 | 125 | 61 | 61 |
| B-1 | 0.95 | 0.975 | 4.1 | 149 | 61 | 61 |
| B-2 | 0.96 | 0.980 | 4.1 | 137 | 61 | 61 |
| B-2 | 0.97 | 0.985 | 4.1 | 162 | 61 | 61 |
| B-3 | 0.95 | 0.975 | 4.1 | 135 | 61 | 61 |
| B-3 | 0.95 | 0.975 | 4.1 | 138 | 61 | 61 |
| B-4 | 0.97 | 0.985 | 4.1 | 136 | 62 | 61 |
| B-4 | 0.93 | 0.964 | 4.0 | 108 | 62 | 62 |
| B-5 | 0.99 | 0.995 | 4.3 | 118 | 62 | 62 |
| B-5 | 0.90 | 0.949 | 3.9 | 121 | 62 | 62 |
| B-6 | 0.95 | 0.975 | 4.1 | 131 | 63 | 63 |
| B-6 | 0.86 | 0.927 | 3.8 | 125 | 63 | 63 |
| B-7 | 0.86 | 0.927 | 3.8 | 139 | 64 | 63 |
| B-7 | 0.85 | 0.922 | 3.7 | 131 | 64 | 63 |
| B-8 | 0.94 | 0.970 | 4.1 | 133 | 64 | 64 |
| B-8 | 0.94 | 0.970 | 4.1 | 131 | 64 | 64 |
| B-9 | 0.60 | 0.775 | 2.6 | 135 | 65 | 65 |
| B-9 | 0.60 | 0.775 | 2.6 | 114 | 65 | 65 |
| B-10 | 0.55 | 0.742 | 2.5 | 130 | 66 | 66 |
| B-10 | 0.52 | 0.721 | 2.3 | 127 | 66 | 66 |
| B-11 | 0.54 | 0.735 | 2.4 | 136 | 67 | 66 |
| B-11 | 0.53 | 0.728 | 2.3 | 120 | 67 | 67 |
| B-12 | 0.56 | 0.748 | 2.5 | 139 | 67 | 67 |
| B-12 | 0.55 | 0.742 | 2.4 | 127 | 67 | 67 |
| Average | 0.75 | 0.864 | 3.24 | 126.8 | | 61.9 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 688.200 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 806.541 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 118.341 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 722.7 | 726.0 | -3.3 | 0.0 | 0.0 | 0.0 |
| 2 | 744.4 | 730.7 | 13.7 | 0.0 | 0.0 | 0.0 |
| 3 | 617.9 | 616.8 | 1.1 | 0.0 | 0.0 | 0.0 |
| 4 | 726.3 | 727.8 | -1.5 | 0.0 | 0.0 | 0.0 |
| 5 | 714.0 | 714.3 | -0.3 | 0.0 | 0.0 | 0.0 |
| 6 | 794.1 | 767.3 | 26.8 | 0.0 | 0.0 | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 4319.4 | 4282.9 | 36.5 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | $(W_f - W_i)$ | $V_f$ | $V_i$ | $(V_f - Vi)$ |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | October 31, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 2 |
| Unit: | Pushing Baghouse | Test Start Time: | 8:23 AM |
| Unit Operation: | Normal | Test Finish Time: | 10:04 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.42 | in. Hg |
| Stack Static Pressure (Pg) | 0.10 | in. $H_2O$ |
| Stack Diameter (Dx) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 20.15 | % dv |
| CO2 | 0.66 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Metals Testing Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 63.5 | F |
| Stack Temperature (Tsavg) | 119.9 | F |
| Orifice Pressure Drop (dHavg) | 3.342 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8716 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04707 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 13.68 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.51 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.19 | % dv |
| Water Collected ($V_f$- $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$- $W_i$) | 43.5 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.051 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.051 | scf |
| Volume Dry Gas Metered (Vm) | 121.319 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 121.630 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 3.435 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 3.444 | dscm |
| Stack Absolute Pressure (Ps) | 29.43 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 579.5 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.44 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1168 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0166 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0166 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.73 | lb/lb-mole |
| Gas Velocity (Vs) | 51.84 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 87,939 | acfm |
| Standard Gas Flowrate | 78,754 | scfm |
| Dry Standard Gas Flowrate | 77,448 | dscfm |
| Actual Gas Flowrate | 2,490 | acm/min |
| Standard Gas Flowrate | 2,230 | scm/min |
| Dry Standard Gas Flowrate | 2,193 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 104.40 | % |

**Metals**

| Mercury | | | |
|---|---|---|---|
| Emission mass (1B Fraction) | < | 0.030 | (ug) |
| Emission mass (2B Fraction) | | 0.190 | (ug) |
| Emission mass (3B Fraction) | | 0.0690 | (ug) |
| Emission mass (3C Fraction) | | 1.010 | (ug) |
| Emission concentration (1B Fraction) | < | 8.71E-06 | (mg/dscm) |
| Emission concentration (2B Fraction) | | 5.52E-05 | (mg/dscm) |
| Emission concentration (3A Fraction) | | 2.00E-05 | (mg/dscm) |
| Emission concentration (3B Fraction) | | 2.93E-04 | (mg/dscm) |
| Emission concentration (3C Fraction) | | 0.00E+00 | (mg/dscm) |
| Emission rate (1B Fraction) | < | 3.69E-07 | (lb/hr) |
| Emission rate (2B Fraction) | | 2.34E-06 | (lb/hr) |
| Emission rate (3B Fraction) | | 8.49E-07 | (lb/hr) |
| Emission rate (3C Fraction) | | 1.24E-05 | (lb/hr) |

| Chromium | | | |
|---|---|---|---|
| Front Half Mass Gained | | 43.000 | (ug) |
| Back Half Mass Gained | | 3.700 | (ug) |
| Emission Concentration Front-Half | | 1.25E-02 | (mg/dscm) |
| Emission Concentration Back-Half | | 1.07E-03 | (mg/dscm) |
| Emission Rate Front-Half | | 5.29E-04 | (lb/hr) |
| Emission Rate Back-Half | | 4.56E-05 | (lb/hr) |

| Cobalt | | | |
|---|---|---|---|
| Front Half Mass Gained | | 0.550 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) |
| Emission Concentration Front-Half | | 1.60E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.90E-05 | (mg/dscm) |
| Emission Rate Front-Half | | 6.77E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 1.23E-06 | (lb/hr) |

| Antimony | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.800 | (ug) |
| Back Half Mass Gained | < | 0.400 | (ug) |
| Emission Concentration Front-Half | < | 2.32E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 1.16E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 9.85E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 4.92E-06 | (lb/hr) |

| Lead | | | |
|---|---|---|---|
| Front Half Mass Gained | | 0.700 | (ug) |
| Back Half Mass Gained | | 0.560 | (ug) |
| Emission Concentration Front-Half | | 2.03E-04 | (mg/dscm) |
| Emission Concentration Back-Half | | 1.63E-04 | (mg/dscm) |
| Emission Rate Front-Half | | 8.62E-06 | (lb/hr) |
| Emission Rate Back-Half | | 6.89E-06 | (lb/hr) |

| Arsenic | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.800 | (ug) |
| Back Half Mass Gained | < | 0.400 | (ug) |
| Emission Concentration Front-Half | < | 2.32E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 1.16E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 9.85E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 4.92E-06 | (lb/hr) |

| Manganese | | | |
|---|---|---|---|
| Front Half Mass Gained | | 20.600 | (ug) |
| Back Half Mass Gained | | 11.200 | (ug) |
| Emission Concentration Front-Half | | 5.98E-03 | (mg/dscm) |
| Emission Concentration Back-Half | | 3.25E-03 | (mg/dscm) |
| Emission Rate Front-Half | | 2.54E-04 | (lb/hr) |
| Emission Rate Back-Half | | 1.38E-04 | (lb/hr) |

| Beryllium | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.200 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) |
| Emission Concentration Front-Half | < | 5.81E-05 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.90E-05 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.46E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 1.23E-06 | (lb/hr) |

| Nickel | | | |
|---|---|---|---|
| Front Half Mass Gained | | 19.600 | (ug) |
| Back Half Mass Gained | | 2.840 | (ug) |
| Emission Concentration Front-Half | | 5.69E-03 | (mg/dscm) |
| Emission Concentration Back-Half | | 8.25E-04 | (mg/dscm) |
| Emission Rate Front-Half | | 2.41E-04 | (lb/hr) |
| Emission Rate Back-Half | | 3.50E-05 | (lb/hr) |

| Cadmium | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 0.200 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) |
| Emission Concentration Front-Half | < | 5.81E-05 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.90E-05 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.46E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 1.23E-06 | (lb/hr) |

| Selenium | | | |
|---|---|---|---|
| Front Half Mass Gained | < | 2.000 | (ug) |
| Back Half Mass Gained | | 2.900 | (ug) |
| Emission Concentration Front-Half | < | 5.81E-04 | (mg/dscm) |
| Emission Concentration Back-Half | | 8.42E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.46E-05 | (lb/hr) |
| Emission Rate Back-Half | | 3.57E-05 | (lb/hr) |

**ArcelorMittal Pushing Baghouse** — **Run 2** — F or C? F=1,C=0: 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.81 | 0.900 | 3.6 | 106 | 59 | 61 |
| A-1 | 0.81 | 0.900 | 3.6 | 120 | 60 | 61 |
| A-2 | 0.81 | 0.900 | 3.6 | 117 | 61 | 61 |
| A-2 | 0.95 | 0.975 | 4.1 | 131 | 61 | 61 |
| A-3 | 0.95 | 0.975 | 4.1 | 116 | 61 | 61 |
| A-3 | 0.83 | 0.911 | 3.7 | 133 | 61 | 61 |
| A-4 | 0.79 | 0.889 | 3.5 | 116 | 62 | 61 |
| A-4 | 0.79 | 0.889 | 3.5 | 134 | 62 | 61 |
| A-5 | 0.90 | 0.949 | 3.9 | 90 | 62 | 62 |
| A-5 | 0.98 | 0.990 | 4.3 | 116 | 62 | 62 |
| A-6 | 0.87 | 0.933 | 3.8 | 111 | 63 | 62 |
| A-6 | 0.98 | 0.990 | 4.3 | 133 | 63 | 62 |
| A-7 | 0.87 | 0.933 | 3.8 | 119 | 63 | 62 |
| A-7 | 0.92 | 0.959 | 4.0 | 136 | 63 | 62 |
| A-8 | 0.88 | 0.938 | 3.8 | 121 | 63 | 63 |
| A-8 | 0.68 | 0.825 | 2.9 | 142 | 63 | 63 |
| A-9 | 0.64 | 0.800 | 2.8 | 124 | 63 | 63 |
| A-9 | 0.74 | 0.860 | 3.2 | 112 | 64 | 64 |
| A-10 | 0.66 | 0.812 | 2.9 | 119 | 64 | 64 |
| A-10 | 0.64 | 0.800 | 2.8 | 111 | 64 | 64 |
| A-11 | 0.65 | 0.806 | 2.8 | 117 | 64 | 64 |
| A-11 | 0.63 | 0.794 | 2.7 | 115 | 64 | 64 |
| A-12 | 0.64 | 0.800 | 2.8 | 116 | 64 | 64 |
| A-12 | 0.55 | 0.742 | 2.4 | 112 | 64 | 64 |
| B-1 | 0.73 | 0.854 | 3.2 | 117 | 65 | 64 |
| B-1 | 0.65 | 0.806 | 2.9 | 105 | 65 | 65 |
| B-2 | 0.70 | 0.837 | 3.1 | 134 | 66 | 65 |
| B-2 | 0.63 | 0.794 | 2.7 | 106 | 66 | 66 |
| B-3 | 0.72 | 0.849 | 3.1 | 123 | 66 | 66 |
| B-3 | 0.66 | 0.812 | 2.9 | 138 | 66 | 66 |
| B-4 | 0.72 | 0.849 | 3.1 | 142 | 66 | 66 |
| B-4 | 0.72 | 0.849 | 3.1 | 122 | 66 | 66 |
| B-5 | 0.66 | 0.812 | 2.9 | 117 | 66 | 66 |
| B-5 | 0.65 | 0.806 | 2.9 | 120 | 66 | 66 |
| B-6 | 0.80 | 0.894 | 3.5 | 128 | 66 | 66 |
| B-6 | 0.83 | 0.911 | 3.6 | 117 | 65 | 66 |
| B-7 | 0.84 | 0.917 | 3.7 | 130 | 65 | 66 |
| B-7 | 0.88 | 0.938 | 3.9 | 118 | 64 | 63 |
| B-8 | 0.73 | 0.854 | 3.2 | 111 | 64 | 64 |
| B-8 | 0.76 | 0.872 | 3.3 | 116 | 64 | 64 |
| B-9 | 0.77 | 0.877 | 3.4 | 125 | 64 | 64 |
| B-9 | 0.74 | 0.860 | 3.3 | 112 | 63 | 64 |
| B-10 | 0.75 | 0.866 | 3.3 | 121 | 63 | 64 |
| B-10 | 0.72 | 0.849 | 3.2 | 115 | 63 | 64 |
| B-11 | 0.76 | 0.872 | 3.3 | 129 | 63 | 63 |
| B-11 | 0.74 | 0.860 | 3.3 | 107 | 63 | 63 |
| B-12 | 0.72 | 0.849 | 3.2 | 116 | 63 | 63 |
| B-12 | 0.78 | 0.883 | 3.4 | 118 | 62 | 62 |
| Average | 0.76 | 0.872 | 3.34 | 119.9 | | 63.5 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 806.920 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 928.239 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 121.319 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 727.6 | 726.2 | 1.4 | | | 0.0 |
| 2 | 618.6 | 603.5 | 15.1 | | | 0.0 |
| 3 | 620.7 | 619.1 | 1.6 | | | 0.0 |
| 4 | 731.9 | 730.4 | 1.5 | | | 0.0 |
| 5 | 712.1 | 712.1 | 0.0 | | | 0.0 |
| 6 | 792.5 | 768.6 | 23.9 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 4203.4 | 4159.9 | 43.5 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$- $W_i$) | $V_f$ | $V_i$ | ($V_f$- $V_i$) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | October 31, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 2 |
| Unit: | Pushing Baghouse | Test Start Time: | 8:23 AM |
| Unit Operation: | Normal | Test Finish Time: | 10:04 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_{@}$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.42 | in. Hg |
| Stack Static Pressure (Pg) | 0.10 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 20.15 | % dv |
| CO2 | 0.66 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Particulate Matter Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 63.5 | F |
| Stack Temperature (Tsavg) | 119.9 | F |
| Orifice Pressure Drop (dHavg) | 3.342 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8716 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04707 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 13.68 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.51 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Particulate Matter**

| | | |
|---|---|---|
| Acetone Wash Container No. | NA | |
| Front Half Filter No. | NA | |
| Acetone Wash Volume (Vaw) | 93 | ml |
| Acetone Wash Weight Gain | 2.7 | mg |
| Front Half Filter Particulate | 2.7 | mg |
| Total Particulate Mass ($m_n$) | 5.40 | mg |
| Particulate Concentration | 0.00069 | gr/dscf |
| Particulate Concentration | 1.57 | mg/dscm |
| Particulate Emission Rate | 0.019 | lb/push |
| Particulate Emission Rate | 0.066 | lb/hr |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.19 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 43.5 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.051 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.051 | scf |
| Volume Dry Gas Metered (Vm) | 121.319 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 121.630 | dscf |
| Volume Dry Gas Metered ($Vm(m^3)$) | 3.435 | dacm |
| Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 3.444 | dscm |
| Stack Absolute Pressure (Ps) | 29.43 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 579.5 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.44 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1168 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0166 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0166 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.73 | lb/lb-mole |
| Gas Velocity (Vs) | 51.84 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 87,939 | acfm |
| Standard Gas Flowrate | 78,754 | scfm |
| Dry Standard Gas Flowrate | 77,448 | dscfm |
| Actual Gas Flowrate | 2,490 | acm/min |
| Standard Gas Flowrate | 2,230 | scm/min |
| Dry Standard Gas Flowrate | 2,193 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 104.4 | % |

**ArcelorMittal** **Run 2** **F or C?**
**Baghouse Exhaust** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP $(in. H2O)^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.81 | 0.900 | 3.6 | 106 | 59 | 61 |
| A-1 | 0.81 | 0.900 | 3.6 | 120 | 60 | 61 |
| A-2 | 0.81 | 0.900 | 3.6 | 117 | 61 | 61 |
| A-2 | 0.95 | 0.975 | 4.1 | 131 | 61 | 61 |
| A-3 | 0.95 | 0.975 | 4.1 | 116 | 61 | 61 |
| A-3 | 0.83 | 0.911 | 3.7 | 133 | 61 | 61 |
| A-4 | 0.79 | 0.889 | 3.5 | 116 | 62 | 61 |
| A-4 | 0.79 | 0.889 | 3.5 | 134 | 62 | 61 |
| A-5 | 0.90 | 0.949 | 3.9 | 90 | 62 | 62 |
| A-5 | 0.98 | 0.990 | 4.3 | 116 | 62 | 62 |
| A-6 | 0.87 | 0.933 | 3.8 | 111 | 63 | 62 |
| A-6 | 0.98 | 0.990 | 4.3 | 133 | 63 | 62 |
| A-7 | 0.87 | 0.933 | 3.8 | 119 | 63 | 62 |
| A-7 | 0.92 | 0.959 | 4.0 | 136 | 63 | 62 |
| A-8 | 0.88 | 0.938 | 3.8 | 121 | 63 | 63 |
| A-8 | 0.68 | 0.825 | 2.9 | 142 | 63 | 63 |
| A-9 | 0.64 | 0.800 | 2.8 | 124 | 63 | 63 |
| A-9 | 0.74 | 0.860 | 3.2 | 112 | 64 | 64 |
| A-10 | 0.66 | 0.812 | 2.9 | 119 | 64 | 64 |
| A-10 | 0.64 | 0.800 | 2.8 | 111 | 64 | 64 |
| A-11 | 0.65 | 0.806 | 2.8 | 117 | 64 | 64 |
| A-11 | 0.63 | 0.794 | 2.7 | 115 | 64 | 64 |
| A-12 | 0.64 | 0.800 | 2.8 | 116 | 64 | 64 |
| A-12 | 0.55 | 0.742 | 2.4 | 112 | 64 | 64 |
| B-1 | 0.73 | 0.854 | 3.2 | 117 | 65 | 64 |
| B-1 | 0.65 | 0.806 | 2.9 | 105 | 65 | 65 |
| B-2 | 0.70 | 0.837 | 3.1 | 134 | 66 | 65 |
| B-2 | 0.63 | 0.794 | 2.7 | 106 | 66 | 66 |
| B-3 | 0.72 | 0.849 | 3.1 | 123 | 66 | 66 |
| B-3 | 0.66 | 0.812 | 2.9 | 138 | 66 | 66 |
| B-4 | 0.72 | 0.849 | 3.1 | 142 | 66 | 66 |
| B-4 | 0.72 | 0.849 | 3.1 | 122 | 66 | 66 |
| B-5 | 0.66 | 0.812 | 2.9 | 117 | 66 | 66 |
| B-5 | 0.65 | 0.806 | 2.9 | 120 | 66 | 66 |
| B-6 | 0.80 | 0.894 | 3.5 | 128 | 66 | 66 |
| B-6 | 0.83 | 0.911 | 3.6 | 117 | 65 | 66 |
| B-7 | 0.84 | 0.917 | 3.7 | 130 | 65 | 66 |
| B-7 | 0.88 | 0.938 | 3.9 | 118 | 64 | 63 |
| B-8 | 0.73 | 0.854 | 3.2 | 111 | 64 | 64 |
| B-8 | 0.76 | 0.872 | 3.3 | 116 | 64 | 64 |
| B-9 | 0.77 | 0.877 | 3.4 | 125 | 64 | 64 |
| B-9 | 0.74 | 0.860 | 3.3 | 112 | 63 | 64 |
| B-10 | 0.75 | 0.866 | 3.3 | 121 | 63 | 64 |
| B-10 | 0.72 | 0.849 | 3.2 | 115 | 63 | 64 |
| B-11 | 0.76 | 0.872 | 3.3 | 129 | 63 | 63 |
| B-11 | 0.74 | 0.860 | 3.3 | 107 | 63 | 63 |
| B-12 | 0.72 | 0.849 | 3.2 | 116 | 63 | 63 |
| B-12 | 0.78 | 0.883 | 3.4 | 118 | 62 | 62 |
| Average | 0.76 | 0.872 | 3.34 | 119.9 | | 63.5 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 806.920 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 928.239 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 121.319 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 727.6 | 726.2 | 1.4 | 0.0 | 0.0 | 0.0 |
| 2 | 618.6 | 603.5 | 15.1 | 0.0 | 0.0 | 0.0 |
| 3 | 620.7 | 619.1 | 1.6 | 0.0 | 0.0 | 0.0 |
| 4 | 731.9 | 730.4 | 1.5 | 0.0 | 0.0 | 0.0 |
| 5 | 712.1 | 712.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 792.5 | 768.6 | 23.9 | 0.0 | 0.0 | 0.0 |
| 7 | 0.0 | 0.0 | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 4203.4 | 4159.9 | 43.5 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | $(W_f - W_i)$ | $V_f$ | $V_i$ | $(V_f - Vi)$ |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 31-Nov. 1, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 3 |
| Unit: | Pushing Baghouse | Test Start Time: | 10:58 PM |
| Unit Operation: | Normal | Test Finish Time: | 1:27 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.33 | in. Hg |
| Stack Static Pressure (Pg) | 0.12 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 19.96 | % dv |
| CO2 | 0.70 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Metals Testing Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 60.4 | F |
| Stack Temperature (Tsavg) | 123.7 | F |
| Orifice Pressure Drop (dHavg) | 3.308 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8670 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04707 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |

| | | |
|---|---|---|
| Total Test Time | 14.48 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.31 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.34 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 43.5 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.051 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.051 | scf |
| Volume Dry Gas Metered (Vm) | 121.030 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 121.693 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 3.427 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 3.446 | dscm |
| Stack Absolute Pressure (Ps) | 29.34 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 583.4 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.82 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1303 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0166 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0166 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.73 | lb/lb-mole |
| Gas Velocity (Vs) | 51.81 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 87,895 | acfm |
| Standard Gas Flowrate | 77,960 | scfm |
| Dry Standard Gas Flowrate | 76,667 | dscfm |
| Actual Gas Flowrate | 2,489 | acm/min |
| Standard Gas Flowrate | 2,208 | scm/min |
| Dry Standard Gas Flowrate | 2,171 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 105.52 | % |

**Metals**

| Mercury | | | | Chromium | | |
|---|---|---|---|---|---|---|
| Emission mass (1B Fraction) | < | 0.030 | (ug) | Front Half Mass Gained | 37.600 | (ug) |
| Emission mass (2B Fraction) | | 0.160 | (ug) | Back Half Mass Gained | 3.970 | (ug) |
| Emission mass (3B Fraction) | < | 0.0250 | (ug) | Emission Concentration Front-Half | 1.09E-02 | (mg/dscm) |
| Emission mass (3C Fraction) | | 1.250 | (ug) | Emission Concentration Back-Half | 1.15E-03 | (mg/dscm) |
| | | | | Emission Rate Front-Half | 4.33E-04 | (lb/hr) |
| Emission concentration (1B Fraction) | < | 8.71E-06 | (mg/dscm) | Emission Rate Back-Half | 4.57E-05 | (lb/hr) |
| Emission concentration (2B Fraction) | | 4.64E-05 | (mg/dscm) | | | |
| Emission concentration (3A Fraction) | < | 7.25E-06 | (mg/dscm) | **Cobalt** | | |
| Emission concentration (3B Fraction) | | 3.63E-04 | (mg/dscm) | Front Half Mass Gained | 0.520 | (ug) |
| Emission concentration (3C Fraction) | | 0.00E+00 | (mg/dscm) | Back Half Mass Gained | 0.100 | (ug) |
| Emission rate (1B Fraction) | < | 3.45E-07 | (lb/hr) | Emission Concentration Front-Half | 1.51E-04 | (mg/dscm) |
| Emission rate (2B Fraction) | | 1.84E-06 | (lb/hr) | Emission Concentration Back-Half | 2.90E-05 | (mg/dscm) |
| Emission rate (3B Fraction) | < | 2.88E-07 | (lb/hr) | Emission Rate Front-Half | 5.98E-06 | (lb/hr) |
| Emission rate (3C Fraction) | | 1.44E-05 | (lb/hr) | Emission Rate Back-Half | 1.15E-06 | (lb/hr) |
| **Antimony** | | | | **Lead** | | |
| Front Half Mass Gained | < | 0.800 | (ug) | Front Half Mass Gained | 0.740 | (ug) |
| Back Half Mass Gained | < | 0.400 | (ug) | Back Half Mass Gained | 0.690 | (ug) |
| Emission Concentration Front-Half | < | 2.32E-04 | (mg/dscm) | Emission Concentration Front-Half | 2.15E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 1.16E-04 | (mg/dscm) | Emission Concentration Back-Half | 2.00E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 9.21E-06 | (lb/hr) | Emission Rate Front-Half | 8.52E-06 | (lb/hr) |
| Emission Rate Back-Half | < | 4.60E-06 | (lb/hr) | Emission Rate Back-Half | 7.94E-06 | (lb/hr) |
| **Arsenic** | | | | **Manganese** | | |
| Front Half Mass Gained | < | 0.800 | (ug) | Front Half Mass Gained | 27.400 | (ug) |
| Back Half Mass Gained | < | 0.400 | (ug) | Back Half Mass Gained | 37.800 | (ug) |
| Emission Concentration Front-Half | < | 2.32E-04 | (mg/dscm) | Emission Concentration Front-Half | 7.95E-03 | (mg/dscm) |
| Emission Concentration Back-Half | < | 1.16E-04 | (mg/dscm) | Emission Concentration Back-Half | 1.10E-02 | (mg/dscm) |
| Emission Rate Front-Half | < | 9.21E-06 | (lb/hr) | Emission Rate Front-Half | 3.15E-04 | (lb/hr) |
| Emission Rate Back-Half | < | 4.60E-06 | (lb/hr) | Emission Rate Back-Half | 4.35E-04 | (lb/hr) |
| **Beryllium** | | | | **Nickel** | | |
| Front Half Mass Gained | | 0.780 | (ug) | Front Half Mass Gained | 19.500 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) | Back Half Mass Gained | 2.290 | (ug) |
| Emission Concentration Front-Half | | 2.26E-04 | (mg/dscm) | Emission Concentration Front-Half | 5.66E-03 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.90E-05 | (mg/dscm) | Emission Concentration Back-Half | 6.65E-04 | (mg/dscm) |
| Emission Rate Front-Half | | 8.98E-06 | (lb/hr) | Emission Rate Front-Half | 2.24E-04 | (lb/hr) |
| Emission Rate Back-Half | < | 1.15E-06 | (lb/hr) | Emission Rate Back-Half | 2.64E-05 | (lb/hr) |
| **Cadmium** | | | | **Selenium** | | |
| Front Half Mass Gained | < | 0.200 | (ug) | Front Half Mass Gained | < 2.000 | (ug) |
| Back Half Mass Gained | < | 0.100 | (ug) | Back Half Mass Gained | 2.000 | (ug) |
| Emission Concentration Front-Half | < | 5.80E-05 | (mg/dscm) | Emission Concentration Front-Half | < 5.80E-04 | (mg/dscm) |
| Emission Concentration Back-Half | < | 2.90E-05 | (mg/dscm) | Emission Concentration Back-Half | 5.80E-04 | (mg/dscm) |
| Emission Rate Front-Half | < | 2.30E-06 | (lb/hr) | Emission Rate Front-Half | < 2.30E-05 | (lb/hr) |
| Emission Rate Back-Half | < | 1.15E-06 | (lb/hr) | Emission Rate Back-Half | 2.30E-05 | (lb/hr) |

**ArcelorMittal** **Run 3** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In (F or C) | Meter Temp Out (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.70 | 0.837 | 3.0 | 117 | 61 | 61 |
| A-1 | 0.67 | 0.819 | 2.9 | 106 | 60 | 61 |
| A-2 | 0.61 | 0.781 | 2.7 | 100 | 60 | 61 |
| A-2 | 0.68 | 0.825 | 3.0 | 111 | 60 | 61 |
| A-3 | 0.63 | 0.794 | 2.8 | 107 | 60 | 61 |
| A-3 | 0.64 | 0.800 | 2.8 | 109 | 60 | 61 |
| A-4 | 0.70 | 0.837 | 3.0 | 106 | 60 | 60 |
| A-4 | 0.71 | 0.843 | 3.1 | 127 | 60 | 60 |
| A-5 | 0.66 | 0.812 | 2.9 | 112 | 60 | 60 |
| A-5 | 0.70 | 0.837 | 3.0 | 123 | 60 | 60 |
| A-6 | 0.85 | 0.922 | 3.7 | 108 | 60 | 60 |
| A-6 | 0.91 | 0.954 | 4.0 | 109 | 59 | 60 |
| A-7 | 0.75 | 0.866 | 3.3 | 113 | 59 | 59 |
| A-7 | 0.85 | 0.922 | 3.7 | 115 | 59 | 59 |
| A-8 | 0.75 | 0.866 | 3.3 | 113 | 59 | 59 |
| A-8 | 0.77 | 0.877 | 3.4 | 121 | 59 | 59 |
| A-9 | 0.75 | 0.866 | 3.3 | 116 | 59 | 59 |
| A-9 | 0.79 | 0.889 | 3.5 | 122 | 59 | 59 |
| A-10 | 0.75 | 0.866 | 3.3 | 119 | 59 | 59 |
| A-10 | 0.72 | 0.849 | 3.2 | 120 | 59 | 59 |
| A-11 | 0.72 | 0.849 | 3.2 | 119 | 58 | 59 |
| A-11 | 0.79 | 0.889 | 3.5 | 113 | 58 | 59 |
| A-12 | 0.74 | 0.860 | 3.3 | 114 | 58 | 59 |
| A-12 | 0.71 | 0.843 | 3.1 | 111 | 59 | 59 |
| B-1 | 0.70 | 0.837 | 3.0 | 112 | 59 | 59 |
| B-1 | 0.73 | 0.854 | 3.2 | 113 | 59 | 59 |
| B-2 | 0.70 | 0.837 | 3.0 | 113 | 58 | 59 |
| B-2 | 0.73 | 0.854 | 3.2 | 117 | 58 | 59 |
| B-3 | 0.74 | 0.860 | 3.5 | 100 | 58 | 58 |
| B-3 | 0.82 | 0.906 | 3.6 | 131 | 58 | 58 |
| B-4 | 0.72 | 0.849 | 3.2 | 101 | 58 | 58 |
| B-4 | 0.76 | 0.872 | 3.3 | 123 | 59 | 59 |
| B-5 | 0.91 | 0.954 | 4.0 | 119 | 59 | 59 |
| B-5 | 0.88 | 0.938 | 3.9 | 124 | 59 | 59 |
| B-6 | 0.80 | 0.894 | 3.5 | 133 | 59 | 59 |
| B-6 | 0.86 | 0.927 | 3.8 | 132 | 60 | 59 |
| B-7 | 0.74 | 0.860 | 3.3 | 126 | 60 | 60 |
| B-7 | 0.75 | 0.866 | 3.3 | 141 | 61 | 60 |
| B-8 | 0.80 | 0.894 | 3.5 | 133 | 61 | 60 |
| B-8 | 0.75 | 0.866 | 3.3 | 146 | 62 | 61 |
| B-9 | 0.83 | 0.911 | 3.7 | 129 | 63 | 62 |
| B-9 | 0.83 | 0.911 | 3.7 | 149 | 64 | 63 |
| B-10 | 0.78 | 0.883 | 3.4 | 146 | 65 | 64 |
| B-10 | 0.78 | 0.883 | 3.4 | 166 | 66 | 64 |
| B-11 | 0.76 | 0.872 | 3.3 | 149 | 66 | 65 |
| B-11 | 0.76 | 0.872 | 3.3 | 177 | 67 | 66 |
| B-12 | 0.73 | 0.854 | 3.2 | 150 | 68 | 66 |
| B-12 | 0.74 | 0.860 | 3.2 | 178 | 69 | 66 |
| Average | 0.75 | 0.867 | 3.31 | 123.7 | | 60.4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Initial volume | 928.700 | $ft^3$ | Initial volume | 0.000 | liters | |
| Final volume | 1049.730 | $ft^3$ | Final volume | 0.000 | liters | |
| Total metered | 121.030 | dscf | Total metered | 0.000 | dry actual liters | |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 698.8 | 711.3 | -12.5 | | | 0.0 |
| 2 | 733.2 | 715.4 | 17.8 | | | 0.0 |
| 3 | 605.7 | 602.7 | 3.0 | | | 0.0 |
| 4 | 736.7 | 733.7 | 3.0 | | | 0.0 |
| 5 | 719.1 | 719.0 | 0.1 | | | 0.0 |
| 6 | 782.1 | 750.0 | 32.1 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 4275.6 | 4232.1 | 43.5 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - $V_i$) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 31-Nov. 1, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 3 |
| Unit: | Pushing Baghouse | Test Start Time: | 10:58 PM |
| Unit Operation: | Normal | Test Finish Time: | 1:27 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_{@}$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.33 | in. Hg |
| Stack Static Pressure (Pg) | 0.12 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 19.96 | % dv |
| CO2 | 0.70 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Particulate Matter Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 60.4 | F |
| Stack Temperature (Tsavg) | 123.7 | F |
| Orifice Pressure Drop (dHavg) | 3.308 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8670 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04707 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 14.48 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.31 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Particulate Matter**

| | | |
|---|---|---|
| Acetone Wash Container No. | NA | |
| Front Half Filter No. | NA | |
| Acetone Wash Volume (Vaw) | 120 | ml |
| Acetone Wash Weight Gain | 2.8 | mg |
| Front Half Filter Particulate | 1.6 | mg |
| Total Particulate Mass ($m_n$) | 4.40 | mg |
| Particulate Concentration | 0.0006 | gr/dscf |
| Particulate Concentration | 1.28 | mg/dscm |
| Particulate Emission Rate | 0.015 | lb/push |
| Particulate Emission Rate | 0.051 | lb/hr |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.34 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 43.5 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.051 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.051 | scf |
| Volume Dry Gas Metered (Vm) | 121.030 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 121.693 | dscf |
| Volume Dry Gas Metered ($Vm(m^3)$) | 3.427 | dacm |
| Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 3.446 | dscm |
| Stack Absolute Pressure (Ps) | 29.34 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 583.4 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.82 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1303 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0166 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0166 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.73 | lb/lb-mole |
| Gas Velocity (Vs) | 51.81 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 87.895 | acfm |
| Standard Gas Flowrate | 77.960 | scfm |
| Dry Standard Gas Flowrate | 76.667 | dscfm |
| Actual Gas Flowrate | 2.489 | acm/min |
| Standard Gas Flowrate | 2.208 | scm/min |
| Dry Standard Gas Flowrate | 2.171 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 105.5 | % |

**ArcelorMittal** **Run 3** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP $(in. H2O)^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.70 | 0.837 | 3.0 | 117 | 61 | 61 |
| A-1 | 0.67 | 0.819 | 2.9 | 106 | 60 | 61 |
| A-2 | 0.61 | 0.781 | 2.7 | 100 | 60 | 61 |
| A-2 | 0.68 | 0.825 | 3.0 | 111 | 60 | 61 |
| A-3 | 0.63 | 0.794 | 2.8 | 107 | 60 | 61 |
| A-3 | 0.64 | 0.800 | 2.8 | 109 | 60 | 61 |
| A-4 | 0.70 | 0.837 | 3.0 | 106 | 60 | 60 |
| A-4 | 0.71 | 0.843 | 3.1 | 127 | 60 | 60 |
| A-5 | 0.66 | 0.812 | 2.9 | 112 | 60 | 60 |
| A-5 | 0.70 | 0.837 | 3.0 | 123 | 60 | 60 |
| A-6 | 0.85 | 0.922 | 3.7 | 108 | 60 | 60 |
| A-6 | 0.91 | 0.954 | 4.0 | 109 | 59 | 60 |
| A-7 | 0.75 | 0.866 | 3.3 | 113 | 59 | 59 |
| A-7 | 0.85 | 0.922 | 3.7 | 115 | 59 | 59 |
| A-8 | 0.75 | 0.866 | 3.3 | 113 | 59 | 59 |
| A-8 | 0.77 | 0.877 | 3.4 | 121 | 59 | 59 |
| A-9 | 0.75 | 0.866 | 3.3 | 116 | 59 | 59 |
| A-9 | 0.79 | 0.889 | 3.5 | 122 | 59 | 59 |
| A-10 | 0.75 | 0.866 | 3.3 | 119 | 59 | 59 |
| A-10 | 0.72 | 0.849 | 3.2 | 120 | 59 | 59 |
| A-11 | 0.72 | 0.849 | 3.2 | 119 | 58 | 59 |
| A-11 | 0.79 | 0.889 | 3.5 | 113 | 58 | 59 |
| A-12 | 0.74 | 0.860 | 3.3 | 114 | 58 | 59 |
| A-12 | 0.71 | 0.843 | 3.1 | 111 | 59 | 59 |
| B-1 | 0.70 | 0.837 | 3.0 | 112 | 59 | 59 |
| B-1 | 0.73 | 0.854 | 3.2 | 113 | 59 | 59 |
| B-2 | 0.70 | 0.837 | 3.0 | 113 | 58 | 59 |
| B-2 | 0.73 | 0.854 | 3.2 | 117 | 58 | 59 |
| B-3 | 0.74 | 0.860 | 3.5 | 100 | 58 | 58 |
| B-3 | 0.82 | 0.906 | 3.6 | 131 | 58 | 58 |
| B-4 | 0.72 | 0.849 | 3.2 | 101 | 58 | 58 |
| B-4 | 0.76 | 0.872 | 3.3 | 123 | 59 | 59 |
| B-5 | 0.91 | 0.954 | 4.0 | 119 | 59 | 59 |
| B-5 | 0.88 | 0.938 | 3.9 | 124 | 59 | 59 |
| B-6 | 0.80 | 0.894 | 3.5 | 133 | 59 | 59 |
| B-6 | 0.86 | 0.927 | 3.8 | 132 | 60 | 59 |
| B-7 | 0.74 | 0.860 | 3.3 | 126 | 60 | 60 |
| B-7 | 0.75 | 0.866 | 3.3 | 141 | 61 | 60 |
| B-8 | 0.80 | 0.894 | 3.5 | 133 | 61 | 60 |
| B-8 | 0.75 | 0.866 | 3.3 | 146 | 62 | 61 |
| B-9 | 0.83 | 0.911 | 3.7 | 129 | 63 | 62 |
| B-9 | 0.83 | 0.911 | 3.7 | 149 | 64 | 63 |
| B-10 | 0.78 | 0.883 | 3.4 | 146 | 65 | 64 |
| B-10 | 0.78 | 0.883 | 3.4 | 166 | 66 | 64 |
| B-11 | 0.76 | 0.872 | 3.3 | 149 | 66 | 65 |
| B-11 | 0.76 | 0.872 | 3.3 | 177 | 67 | 66 |
| B-12 | 0.73 | 0.854 | 3.2 | 150 | 68 | 66 |
| B-12 | 0.74 | 0.860 | 3.2 | 178 | 69 | 66 |
| Average | 0.75 | 0.867 | 3.31 | 123.7 | | 60.4 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 928.700 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 1049.730 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 121.030 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 698.8 | 711.3 | -12.5 | | | 0.0 |
| 2 | 733.2 | 715.4 | 17.8 | | | 0.0 |
| 3 | 605.7 | 602.7 | 3.0 | | | 0.0 |
| 4 | 736.7 | 733.7 | 3.0 | | | 0.0 |
| 5 | 719.1 | 719.0 | 0.1 | | | 0.0 |
| 6 | 782.1 | 750.0 | 32.1 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 4275.6 | 4232.1 | 43.5 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | $(W_f - W_i)$ | $V_f$ | $V_i$ | $(V_f - Vi)$ |

# This page intentionally left blank

# MONTROSE METHOD 5/29 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | ArcelorMittal | **Test Type:** | Method 5/29 | **Meter ΔH :** | 1.971 | **Start Time:** | 0328 |
| **Date:** | 10/28/16 - 10/28/16 | **Run Number:** | 1 | **Meter Correction (γ):** | 1.003 | **Stop Time:** | ~~0830~~ 1701 |
| **Plant:** | Monessen, PA | **Nozzle Diameter (inches):** | 0.255 | **Pitot Correction:** | 0.84 | **T/C ID:** | 7-9 |
| **Sampling Location:** | PEC Stack Outlet | **Static Press (in. $H_2O$):** | +0.10 | **Control Box ID:** | 1618 | **Probe ID:** | 7-9 |
| | | **Baro. Pres. (in. Hg):** | 29.34 | **Assumed Moisture (%):** | 2% | **Pitot ID:** | 7-9 |
| **Project Number:** | Proj106377 (16-167) | **Ambient Temp (°F):** | 50°F | **Umbilical Length (Feet):** | 200' | **Filter ID:** | Q6993 |
| **Test Crew:** | JV JW TL TM CB | **Initial K-factor** | ~~4.0~~ 4.4 | | | **Stack Diameter (inches):** | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time 0:00:00 | Metered Volume (ft³) 688.200 | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Oven Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-1 | 0:02:30 | ~~692.90~~ 691.33 | 0.70 | 2.8 | 4.0 | 117 | 248 | 247 | 49 | 61 | 62 | Start 328 |
| A-1 | 0:05:00 | 692.90 | 0.78 | 3.1 | 5.0 | 116 | 249 | 248 | 48 | 60 | 61 | Push @ 417 |
| A-2 | 0:07:30 | 695.26 | 0.71 | 2.8 | 4.0 | 120 | 246 | 251 | 49 | 60 | 61 | Push @ 430 |
| A-2 | 0:10:00 | 698.27 | 0.70 | 2.8 | 4.0 | 116 | 244 | 250 | 50 | 60 | 61 | Push @ 442 |
| A-3 | 0:12:30 | 699.89 | 0.70 | 2.8 | 4.0 | 121 | 248 | 241 | 50 | 61 | 61 | Push @ 453 Chg K- 4.4 |
| A-3 | 0:15:00 | 702.31 | 0.71 | 3.1 | 5.0 | 109 | 242 | 256 | 51 | 61 | 61 | Push @ 507 |
| A-4 | 0:17:30 | 704.77 | 0.72 | 3.2 | 5.0 | 115 | 255 | 260 | 51 | 61 | 61 | Push @ 519 |
| A-4 | 0:20:00 | 707.26 | 0.72 | 3.2 | 5.0 | 115 | 253 | 258 | 50 | 61 | 61 | Push @ 531 |
| A-5 | 0:22:30 | 709.26 | 0.64 | 2.8 | 5.0 | 117 | 247 | 257 | 53 | 61 | 61 | Push @ 544 |
| A-5 | 0:25:00 | 711.99 | 0.63 | 2.8 | 5.0 | 106 | 254 | 256 | 49 | 60 | 61 | Push @ 629 |
| A-6 | 0:27:30 | 714.29 | 0.64 | 2.8 | 5.0 | 122 | 254 | 259 | 48 | 60 | 61 | Push @ 647 |
| A-6 | 0:30:00 | 716.60 | 0.64 | 2.8 | 5.0 | 110 | 255 | 260 | 49 | 60 | 61 | Push @ 0700 |
| A-7 | 0:32:30 | 718.91 | 0.63 | 2.8 | 5.0 | 127 | 254 | 265 | 52 | 60 | 61 | Push @ 0713 |
| A-7 | 0:35:00 | 721.24 | 0.63 | 2.8 | 5.0 | 122 | 255 | 264 | 49 | 60 | 60 | Push @ 0736 |
| A-8 | 0:37:30 | 723.54 | 0.70 | 2.8 | 5.0 | 128 | 252 | 258 | 50 | 60 | 60 | Push @ 0750 - 0756 |
| A-8 | 0:40:00 | 725.88 | 0.65 | 2.8 | 5.0 | 137 | 253 | 259 | 51 | 60 | 60 | Push @ 0810 |
| A-9 | 0:42:30 | 728.18 | 0.65 | 2.8 | 5 | 144 | 252 | 257 | 52 | 60 | 60 | Push @ 0825 |
| A-9 | 0:45:00 | 730.48 | 0.71 | 2.8 | 5 | 137 | 254 | 260 | 54 | 60 | 60 | Push @ 0839 |
| A-10 | 0:47:30 | 732.88 | 0.74 | 3.2 | 5 | 144 | 255 | 256 | 48 | 60 | 60 | Push @ 0854 |
| A-10 | 0:50:00 | 735.26 | 0.74 | 3.2 | 5 | 137 | 254 | 254 | 46 | 60 | 60 | Push @ 0907 |
| A-11 | 0:52:30 | 737.66 | 0.73 | 3.1 | 5 | 145 | 255 | 258 | 46 | 60 | 60 | Push @ 0919 |
| A-11 | 0:55:00 | 740.19 | 0.74 | 3.2 | 5 | 109 | 252 | 258 | 45 | 60 | 60 | Push @ 0954 |
| A-12 | 0:57:30 | 742.60 | 0.82 | 3.6 | 5 | 118 | 251 | 257 | 45 | 60 | 60 | Push @ 1004 |
| A-12 | 1:00:00 | 745.05 | 0.77 | 3.1 | 5 | 115 | 255 | 258 | 47 | 60 | 60 | Push @ 1027 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15.00 | 0.000 |
| Check | Final | 15.00 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |
| Fyrite Kit ID: | NA | Fyrite $O_2$ Check | | NA % |

Balance ID: BAL 017

| | | |
|---|---|---|
| Reference Weight (200g): | NA | Tolerance = +/- 0.5 g |
| Reference Weight (500g): | 500.0 | Tolerance = +/- 0.5 g |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | 5%$HNO_3$/10%$H_2O_2$ (g) | 722.7 | 726.0 | |
| 2 | 5%$HNO_3$/10%$H_2O_2$ (g) | 744.4 | 730.7 | |
| 3 | Empty (g) | 617.9 | 616.8 | |
| 4 | 10%$H_2SO_4$/$KMnO_4$ (g) | 726.8 | 727.8 | |
| 5 | 10%$H_2SO_4$/$KMnO_4$ (g) | 714.0 | 714.3 | |
| 6 | Silica (g) | 794.1 | 767.3 | |

**MONTROSE METHOD 5/29 DATA SHEET**

**Client:** ArcelorMittal **Test Type:** Method 5/29 **Project Number:** Proj106377 (16-167)

**Date:** 10/28/16 - 10/28/16 **Run Number:** 1 **Sampling Location:** PEC Stack Outlet

**Test Crew:** JV JW TL TM CB

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed JV JW TL T (mins) | Proj106377 (16-167) Volume ( ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Oven Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 1:02:30 | 747.64 | .95 | 4.1 | 6 | 255 | 250 | 261 | 48 | 61 | 61 | 1041 |
| B-1 | 1:05:00 | 750.37 | .95 | 4.1 | 6 | 149 | 257 | 260 | 48 | 61 | 61 | 1053 |
| B-2 | 1:07:30 | 753.13 | .96 | 4.1 | 6 | 137 | 255 | 254 | 48 | 61 | 61 | 1105 |
| B-2 | 1:10:00 | 755.90 | .97 | 4.1 | 6 | 162 | 256 | 262 | 49 | 61 | 61 | 1119 |
| B-3 | 1:12:30 | 758.66 | .95 | 4.1 | 6 | 135 | 252 | 257 | 52 | 61 | 61 | 1134 |
| B-3 | 1:15:00 | 761.43 | .95 | 4.1 | 6 | 138 | 252 | 252 | 50 | 61 | 61 | 1145 |
| B-4 | 1:17:30 | 764.21 | .97 | 4.1 | 6 | 136 | 254 | 260 | 50 | 62 | 61 | 1201 |
| B-4 | 1:20:00 | 766.97 | .93 | 4.0 | 6 | 108 | 251 | 244 | 51 | 62 | 62 | 1243 |
| B-5 | 1:22:30 | 769.79 | .99 | 4.3 | 7 | 118 | 252 | 243 | 53 | 62 | 62 | 1255 |
| B-5 | 1:25:00 | 772.52 | .90 | 3.9 | 6 | 121 | 243 | 258 | 56 | 62 | 62 | 1309 |
| B-6 | 1:27:30 | 775.26 | .95 | 4.1 | 7 | 131 | 251 | 245 | 58 | 63 | 63 | 1321 |
| B-6 | 1:30:00 | 777.90 | .86 | 3.8 | 6 | 125 | 248 | 255 | 61 | 63 | 63 | 1334 |
| B-7 | 1:32:30 | 780.62 | .86 | 3.8 | 6 | 139 | 243 | 263 | 62 | 64 | 63 | 1349 |
| B-7 | 1:35:00 | 783.22 | .85 | 3.7 | 6 | 131 | 249 | 250 | 59 | 64 | 63 | 1400 |
| B-8 | 1:37:30 | 785.92 | .94 | 4.1 | 7 | 133 | 250 | 244 | 59 | 64 | 64 | 1413 |
| B-8 | 1:40:00 | 788.64 | .94 | 4.1 | 6 | 131 | 251 | 240 | 60 | 64 | 64 | 1435 |
| B-9 | 1:42:30 | 791.18 | .60 | 2.6 | 5 | 135 | 253 | 246 | 50 | 65 | 65 | 1500 |
| B-9 | 1:45:00 | 793.37 | .60 | 2.6 | 5 | 114 | 258 | 261 | 53 | 65 | 65 | 1535 |
| B-10 | 1:47:30 | 795.61 | .55 | 2.5 | 4 | 130 | 254 | 252 | 54 | 66 | 66 | 1548 |
| B-10 | 1:50:00 | 797.78 | .52 | 2.3 | 4 | 127 | 254 | 253 | 56 | 66 | 66 | 1559 |
| B-11 | 1:52:30 | 799.99 | .54 | 2.4 | 4 | 136 | 252 | 255 | 54 | 67 | 66 | 1613 |
| B-11 | 1:55:00 | 802.14 | .53 | 2.3 | 4 | 120 | 246 | 245 | 55 | 67 | 67 | 1625 |
| B-12 | 1:57:30 | 804.34 | .56 | 2.5 | 4 | 139 | 247 | 255 | 57 | 67 | 67 | 1643 |
| B-12 | 2:00:00 | 806.541 | .55 | 2.4 | 4 | 127 | 244 | 241 | 58 | 67 | 67 | 1659 |

-125



ArcelorMittal Monessen Pushing Baghouse ICR Report 16-167 Page 75 of 465

# MONTROSE METHOD 5/29 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | ArcelorMittal | **Test Type:** | Method 5/29 | **Meter ΔH :** | 1.971 | **Start Time:** | 0823 |
| **Date:** | 10/31/16 | **Run Number:** | 2 | **Meter Correction (γ):** | 1.003 | **Stop Time:** | 2204 |
| **Plant:** | Monessen, PA | **Nozzle Diameter (inches):** | 0.255 | **Pitot Correction:** | 0.84 | **T/C ID:** | 7-9 |
| **Sampling Location:** | PEC Stack Outlet | **Static Press (in. $H_2O$):** | +0.10 | **Control Box ID:** | 16PB | **Probe ID:** | 7-9 |
| | | **Baro. Pres. (in. Hg):** | 29.42 | **Assumed Moisture (%):** | 2 | **Pitot ID:** | 7-9 |
| **Project Number:** | Proj106377 (16-167) | **Ambient Temp (°F):** | 42 | **Umbilical Length (Feet):** | 200' | **Filter ID:** | Q |
| **Test Crew:** | JV JW TL TM CB | **Initial K-factor** | 4.4 | | | **Stack Diameter (inches):** | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time | Metered Volume (ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Oven Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0:00:00 | 800.92 | | | | | | | | | | |
| A-1 | 0:02:30 | 809.28 | 0.81 | 3.6 | 5 | 106 | 243 | 250 | 44 | 59 | 61 | Push @ 0823 |
| A-1 | 0:05:00 | 811.860 | 0.81 | 3.6 | 5 | 120 | 250 | 259 | 44 | 60 | 61 | Push @ 0838 |
| A-2 | 0:07:30 | 814.46 | 0.81 | 3.6 | 5 | 117 | 248 | 260 | 46 | 61 | 61 | Push @ 0854 |
| A-2 | 0:10:00 | 817.19 | 0.95 | 4.1 | 6 | 131 | 252 | 254 | 46 | 61 | 61 | Push @ 0908 |
| A-3 | 0:12:30 | 820.99 | 0.95 | 4.1 | 6 | 116 | 254 | 258 | 48 | 61 | 61 | Push @ 0922 |
| A-3 | 0:15:00 | 822.88 | 0.83 | 3.7 | 5 | 133 | 247 | 259 | 47 | 61 | 61 | Push @ 0933 |
| A-4 | 0:17:30 | 825.26 | 0.79 | 3.5 | 5 | 116 | 251 | 256 | 48 | 62 | 61 | Push @ 0945 |
| A-4 | 0:20:00 | 827.85 | 0.79 | 3.5 | 5 | 134 | 243 | 255 | 48 | 62 | 61 | Push @ 0956 |
| A-5 | 0:22:30 | 830.610 | 0.90 | 3.9 | 5.0 | 90 | 251 | 255 | 47 | 62 | 62 | Push @ 1047 |
| A-5 | 0:25:00 | 833.435 | 0.98 | 4.3 | 5.0 | 116 | 247 | 255 | 49 | 62 | 62 | Push @ 1059 |
| A-6 | 0:27:30 | 836.135 | 0.87 | 3.8 | 5.0 | 111 | 248 | 254 | 49 | 63 | 62 | Push @ 1112 |
| A-6 | 0:30:00 | 838.975 | 0.98 | 4.3 | 5.0 | 133 | 249 | 254 | 51 | 63 | 62 | Push @ 1125 |
| A-7 | 0:32:30 | 841.65 | 0.87 | 3.8 | 5.0 | 119 | 248 | 255 | 52 | 63 | 62 | Push @ 1137 |
| A-7 | 0:35:00 | 844.400 | 0.92 | 4.0 | 5.0 | 126 | 248 | 255 | 53 | 63 | 62 | Push @ 1151 |
| A-8 | 0:37:30 | 847.100 | 0.88 | 3.8 | 5.0 | 121 | 250 | 256 | 52 | 63 | 63 | Push @ 1205 |
| A-8 | 0:40:00 | 849.470 | 0.68 | 2.9 | 3.5 | 142 | 250 | 256 | 52 | 63 | 63 | Push @ 1220 |
| A-9 | 0:42:30 | 851.780 | 0.64 | 2.8 | 3.5 | 124 | 247 | 250 | 50 | 63 | 63 | Push @ 1234 |
| A-9 | 0:45:00 | 854.270 | 0.74 | 3.2 | 4.0 | 112 | 249 | 254 | 54 | 64 | 64 | Push @ ~~1321~~ 1329 |
| A-10 | 0:47:30 | 856.630 | 0.66 | 2.9 | 3.5 | 119 | 250 | 256 | 54 | 64 | 64 | Push @ 1340 |
| A-10 | 0:50:00 | 858.950 | 0.64 | 2.8 | 3.5 | 111 | 246 | 257 | 56 | 64 | 64 | Push @ 1353 |
| A-11 | 0:52:30 | 861.250 | 0.65 | 2.8 | 3.5 | 117 | 246 | 256 | 56 | 64 | 64 | Push @ 1405 |
| A-11 | 0:55:00 | 863.530 | 0.63 | 2.7 | 3.5 | 115 | 246 | 256 | 55 | 64 | 64 | Push @ 1417 |
| A-12 | 0:57:30 | 865.895 | 0.64 | 2.8 | 3.5 | 116 | 247 | 255 | 55 | 64 | 64 | Push @ 1431 |
| A-12 | 1:00:00 | 868.045 | 0.55 | 2.4 | 3.0 | 112 | 248 | 255 | 55 | 64 | 64 | Push @ 1443 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.000 |
| Check | Final | 8 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |

Fyrite Kit ID: NA — Fyrite $O_2$ Check — %

Balance ID: BAL-017

| | | |
|---|---|---|
| Reference Weight (200g): | NA | Tolerance = +/- 0.5 g |
| Reference Weight (500g): | 500.0 | Tolerance = +/- 0.5 g |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | 5%$HNO_3$/10%$H_2O_2$ (g) | 727.6 | 726.2 | |
| 2 | 5%$HNO_3$/10%$H_2O_2$ (g) | 618.6 | 603.5 | |
| 3 | Empty (g) | 620.7 | 619.1 | |
| 4 | 10%$H_2SO_4$/$KMnO_4$ (g) | 731.9 | 730.4 | |
| 5 | 10%$H_2SO_4$/$KMnO_4$ (g) | 712.1 | 712.1 | |
| 6 | Silica (g) | 792.5 | 768.6 | |

## MONTROSE METHOD 5/29 DATA SHEET

**Client:** ArcelorMittal **Test Type:** Method 5/29 **Project Number:** Proj106377 (16-167)

**Date:** 10/31/16 **Run Number:** 2 **Sampling Location:** PEC Stack Outlet

**Test Crew:** JV JW TL TM CB

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed JV JW TL T (mins) | Proj106377 (16-167) Volume ( ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Oven Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 1:02:30 | 870.483 | 0.73 | 3.2 | 4 | 117 | 253 | 256 | 51 | 65 | 64 | Push @ 1455 |
| B-1 | 1:05:00 | 872.863 | 0.65 | 2.9 | 3 | 105 | 251 | 255 | 51 | 65 | 65 | Push @ 1534 |
| B-2 | 1:07:30 | 875.255 | 0.70 | 3.1 | 4 | 134 | 253 | 258 | 50 | 66 | 65 | Push @ 1555 |
| B-2 | 1:10:00 | 877.530 | 0.63 | 2.7 | 3.5 | 106 | 253 | 257 | 59 | 66 | 66 | Push @ 1635 |
| B-3 | 1:12:30 | 879.960 | 0.72 | 3.1 | 4.0 | 123 | 253 | 256 | 59 | 66 | 66 | Push @ 1644 |
| B-3 | 1:15:00 | 882.513 | 0.66 | 2.9 | 4.0 | 138 | 255 | 257 | 50 | 66 | 66 | Push @ 1705 |
| B-4 | 1:17:30 | 885.034 | 0.72 | 3.1 | 4.0 | 142 | 248 | 255 | 51 | 66 | 66 | Push @ 1722 |
| B-4 | 1:20:00 | 887.882 | 0.72 | 3.1 | 4.0 | 122 | 243 | 257 | 53 | 66 | 66 | Push @ 1733 |
| B-5 | 1:22:30 | 889.965 | 0.66 | 2.9 | 3.5 | 117 | 243 | 256 | 49 | 66 | 66 | Push @ 1806 |
| B-5 | 1:25:00 | 892.146 | 0.65 | 2.9 | 3.5 | 120 | 246 | 256 | 51 | 66 | 66 | Push @ 1819 |
| B-6 | 1:27:30 | 894.721 | 0.80 | 3.5 | 4.0 | 128 | 249 | 255 | 49 | 66 | 66 | Push @ 1832 |
| B-6 | 1:30:00 | 897.362 | 0.83 | 3.6 | 4.5 | 117 | 250 | 255 | 48 | 65 | 66 | Push @ 1841 |
| B-7 | 1:32:30 | 900.002 | 0.84 | 3.7 | 4.5 | 130 | 257 | 256 | 47 | 65 | 66 | Push @ 1858 |
| B-7 | 1:35:00 | 902.758 | 0.88 | 3.9 | 5.0 | 118 | 256 | 257 | 45 | 64 | 63 | Push @ 1945 |
| B-8 | 1:37:30 | 905.353 | 0.73 | 3.2 | 4.0 | 111 | 250 | 255 | 44 | 64 | 64 | Push @ 1958 |
| B-8 | 1:40:00 | 907.877 | 0.76 | 3.3 | 4.0 | 116 | 249 | 255 | 45 | 64 | 64 | Push @ 2011 |
| B-9 | 1:42:30 | ~~88~~ 910.446 | 0.77 | 3.4 | 4.0 | 125 | 254 | 267 | 45 | 64 | 64 | Push @ 2025 |
| B-9 | 1:45:00 | 913.009 | 0.74 | 3.3 | 4.0 | 112 | 251 | 260 | 45 | 63 | 64 | Push @ 2038 |
| B-10 | 1:47:30 | 915.524 | 0.75 | 3.3 | 4.0 | 121 | 247 | 254 | 45 | 63 | 64 | Push @ 2051 |
| B-10 | 1:50:00 | 918.035 | 0.72 | 3.2 | 4.0 | 115 | 249 | 255 | 45 | 63 | 64 | Push @ 2102 |
| B-11 | 1:52:30 | 920.600 | 0.76 | 3.3 | 4.0 | 129 | 252 | 255 | 45 | 63 | 63 | Push @ 2114 |
| B-11 | 1:55:00 | ~~73~~ 923.142 | 0.74 | 3.3 | 4.0 | 107 | 253 | 255 | 45 | 63 | 63 | Push @ 2128 |
| B-12 | 1:57:30 | 925.658 | 0.72 | 3.2 | 4.0 | 116 | 254 | 255 | 45 | 63 | 63 | Push @ 2138 |
| B-12 | 2:00:00 | 928.239 | 0.78 | 3.4 | 4.0 | 118 | 258 | 256 | 44 | 62 | 62 | Push @ 2201 |

Stop 2204

# MONTROSE METHOD 5/29 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | ArcelorMittal | **Test Type:** | Method 5/29 | **Meter ΔH :** | 1.971 | **Start Time:** | ~~1058~~ ~~2058~~ 22:50 |
| **Date:** | 10/31/16 | **Run Number:** | 3 | **Meter Correction (γ):** | 1.003 | **Stop Time:** | 1327 11/1/16 |
| **Plant:** | Monessen, PA | **Nozzle Diameter (inches):** | 0.255 | **Pitot Correction:** | 0.84 | **T/C ID:** | 7-9 |
| **Sampling Location:** | PEC Stack Outlet | **Static Press (in. $H_2O$):** | 0.12 | **Control Box ID:** | 1618 | **Probe ID:** | 7-9 |
| | | **Baro. Pres. (in. Hg):** | 29.33 | **Assumed Moisture (%):** | 2% | **Pitot ID:** | 7-9 |
| **Project Number:** | Proj106377 (16-167) | **Ambient Temp (°F):** | 50 °F | **Umbilical Length (Feet):** | 200' | **Filter ID:** | Q7066 |
| **Test Crew:** | JV JW TL TM CB | **Initial K-factor** | 4.4 | | | **Stack Diameter (inches):** | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time | Metered Volume (ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Oven Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0:00:00 | 928.700 | | | | | | | | | | |
| A-1 | 0:02:30 | 931.6 | 0.70 | 3.0 | 5 | 117 | 248 | 256 | 48 | 61 | 61 | Start ~~1058~~ 22:50 |
| A-1 | 0:05:00 | 934.022 | 0.67 | 2.9 | 5 | 106 | 249 | 254 | 48 | 60 | 61 | ~~2132~~ 23:32 |
| A-2 | 0:07:30 | 936.366 | 0.61 | 2.7 | ~~4~~ 5 | 100 | 254 | 254 | 48 | 60 | 61 | ~~2143~~ 23:43 |
| A-2 | 0:10:00 | 938.769 | 0.68 | 3.0 | 6 | 111 | 250 | ~~2~~ 254 | 47 | 60 | 61 | 0019 |
| A-3 | 0:12:30 | 941.148 | 0.63 | 2.8 | 5 | 107 | 248 | 254 | 47 | 60 | 61 | 0031 |
| A-3 | 0:15:00 | 943.512 | 0.64 | 2.8 | 5 | 109 | 250 | 254 | 48 | 60 | 61 | 0043 |
| A-4 | 0:17:30 | 945.889 | 0.70 | 3.0 | 6 | 106 | 247 | 255 | 48 | 60 | 60 | 0057 |
| A-4 | 0:20:00 | 948.351 | 0.71 | 3.1 | 6 | 127 | 253 | 255 | 50 | 60 | 60 | 0113 |
| A-5 | 0:22:30 | 950.746 | 0.66 | 2.9 | 6 | 112 | 251 | 255 | 52 | 60 | 60 | 0127 |
| A-5 | 0:25:00 | 953.144 | 0.70 | 3.0 | 6 | 123 | 249 | 254 | 50 | 60 | 60 | 0143 |
| A-6 | 0:27:30 | 955.785 | 0.85 | 3.7 | 7 | 108 | 246 | 255 | 51 | 60 | 60 | 0158 |
| A-6 | 0:30:00 | 958.547 | 0.91 | 4.0 | 8 | 109 | 248 | 255 | 50 | 59 | 60 | 0221 |
| A-7 | 0:32:30 | 961.152 | 0.75 | 3.3 | 7 | 113 | 252 | 255 | 49 | 59 | 59 | 0259 |
| A-7 | 0:35:00 | 963.820 | 0.85 | 3.7 | 7 | 115 | 247 | 256 | 50 | 59 | 59 | 0313 |
| A-8 | 0:37:30 | 966.377 | 0.75 | 3.3 | 7 | 113 | 251 | 255 | 53 | 59 | 59 | 0325 |
| A-8 | 0:40:00 | 968.919 | 0.77 | 3.4 | 7 | 121 | 252 | 255 | 53 | 59 | 59 | 0337 |
| A-9 | 0:42:30 | 971.453 | 0.73 ~~0.75~~ | 3.3 | 7 | 116 | 247 | 254 | 53 | 59 | 59 | 0350 |
| A-9 | 0:45:00 | 974.049 | 0.79 | 3.5 | 7 | 122 | 246 | 255 | 54 | 59 | 59 | 0403 |
| A-10 | 0:47:30 | 976.610 | 0.75 | 3.3 | 7 | 119 | 248 | 255 | 54 | 59 | 59 | 0417 |
| A-10 | 0:50:00 | 979.116 | 0.72 | 3.2 | 6 | 120 | 249 | 255 | 53 | 59 | 59 | 0430 |
| A-11 | 0:52:30 | 981.619 | 0.72 | 3.2 | 6 | 119 | 252 | 255 | 54 | 58 | 59 | 0444 |
| A-11 | 0:55:00 | 984.225 | 0.79 | 3.5 | 7 | 113 | 258 | 255 | 50 | 58 | 59 | 0520 |
| A-12 | 0:57:30 | 986.775 | 0.74 | 3.3 | 7 | 114 | 254 | 255 | 53 | 58 | 59 | 0533 |
| A-12 | 1:00:00 | 989.271 | 0.71 | 3.1 | 6 | 111 | 256 | 255 | 53 | 59 | 59 | 0545 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.000 |
| Check | Final | 11 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | C | M | S |
| $O_2$ (%) | | | | |

Fyrite Kit ID: NA  Fyrite $O_2$ Check: MA %

Balance ID: 3Al-017

| | | |
|---|---|---|
| Reference Weight (200g): | NA | Tolerance = +/- 0.5 g |
| Reference Weight (500g): | 500.0 | Tolerance = +/- 0.5 g |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | 5%$HNO_3$/10%$H_2O_2$ (g) | 698.8 | 711.3 | |
| 2 | 5%$HNO_3$/10%$H_2O_2$ (g) | 733.2 | 715.4 | |
| 3 | Empty (g) | 605.7 | 602.7 | |
| 4 | 10%$H_2SO_4$/$KMnO_4$ (g) | 736.7 | 733.7 | |
| 5 | 10%$H_2SO_4$/$KMnO_4$ (g) | 719.1 | 719.0 | |
| 6 | Silica (g) | 782.1 | 750.0 | |

**MONTROSE METHOD 5/29 DATA SHEET**

**Client:** ArcelorMittal **Test Type:** Method 5/29 **Project Number:** Proj106377 (16-167)

**Date:** 10/31/16 **Run Number:** ~~2~~ 3 **Sampling Location:** PEC Stack Outlet

**Test Crew:** JV JW TL TM CB

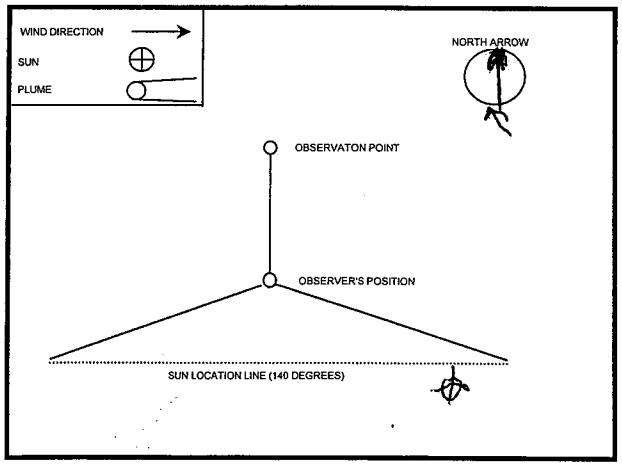
*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed JV JW TL T (mins) | Proj106377 (16-167) Volume ( ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Oven Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 1:02:30 | 991.714 | 0.70 | 3.0 | 6 | 112 | 257 | 255 | 52 | 59 | 59 | 0600 |
| B-1 | 1:05:00 | 994.190 | 0.73 | 3.2 | 6 | 113 | 252 | 256 | 53 | 59 | 59 | 0614 |
| B-2 | 1:07:30 | 996.646 | 0.70 | 3.0 | 6 | 113 | 253 | 257 | 52 | 58 | 59 | 0628 |
| B-2 | 1:10:00 | 999.135 | 0.73 | 3.2 | 6 | 117 | 258 | 255 | 50 | 58 | 59 | 0657 |
| B-3 | 1:12:30 | 001.663 | 0.79 | 3.5 | 6 | 100 | 251 | 257 | 48 | 58 | 58 | 0735 |
| B-3 | 1:15:00 | 004.249 | 0.82 | 3.6 | 7 | 131 | 247 | 256 | 51 | 58 | 58 | 0750 |
| B-4 | 1:17:30 | 006.983 | 0.72 | 3.2 | 6 | 101 | 243 | 257 | 51 | 58 | 58 | 0845 |
| B-4 | 1:20:00 | 008.937 | 0.76 | ~~3.4~~ | 6 | 123 | 245 | 259 | 56 | 59 | 59 | 0900 3.3 |
| B-5 | 1:22:30 | 011.601 | 0.91 | 4.0 | 7 | 119 | 248 | 254 | 58 | 59 | 59 | 0924 |
| B-5 | 1:25:00 | 014.268 | 0.88 | 3.9 | 7 | 124 | 250 | 253 | 60 | 59 | 59 | 0937 |
| B-6 | 1:27:30 | 016.608 | 0.80 | 3.5 | 7 | 133 | 246 | 254 | 61 | 59 | 59 | 0958 |
| B-6 | 1:30:00 | 019.521 | 0.86 | 3.8 | 7 | 132 | 244 | 255 | 66 | 60 | 59 | 1014 |
| B-7 | 1:32:30 | 022.115 | 0.74 | 3.3 | 6 | 126 | 251 | 255 | 59 | 60 | 60 | 1029 |
| B-7 | 1:35:00 | 024.369 | 0.75 | 3.3 | 6 | 141 | 251 | 256 | 57 | 61 | 60 | 1041 |
| B-8 | 1:37:30 | 026.875 | 0.80 | 3.5 | 7 | 133 | 250 | 256 | 56 | 61 | 60 | 1057 |
| B-8 | 1:40:00 | 029.360 | 0.75 | 3.3 | 6 | 146 | 249 | 254 | 57 | 62 | 61 | 1108 |
| B-9 | 1:42:30 | 032.990 | 0.83 | 3.7 | 7 | 129 | 243 | 255 | 55 | 63 | 62 | 1152 |
| B-9 | 1:45:00 | 034.645 | 0.83 | 3.7 | 7 | 149 | 243 | 256 | 57 | 64 | 63 | 1206 |
| B-10 | 1:47:30 | 037.255 | 0.78 | 3.4 | 6 | 146 | 248 | 254 | 60 | 65 | 64 | 1219 |
| B-10 | 1:50:00 | 039.893 | 0.78 | 3.4 | 6 | 166 | 252 | 255 | 59 | 66 | 64 | 1232 |
| B-11 | 1:52:30 | 042.385 | 0.76 | 3.3 | 6 | 149 | 250 | 255 | 60 | 66 | 65 | 1246 |
| B-11 | 1:55:00 | 044.750 | 0.76 | 3.3 | 6 | 177 | 252 | 253 | 62 | 67 | 66 | 1258 |
| B-12 | 1:57:30 | 047.227 | 0.73 | 3.2 | 6 | 150 | 252 | 256 | 64 | 68 | 66 | 1311 |
| B-12 | 2:00:00 | 049.730 | 0.74 | 3.2 | 6.0 | 178 | 251 | 255 | 64 | 69 | 66 | 1324 |

Page__of__

# VISIBLE EMISSIONS OBSERVATION FORM

| | |
|---|---|
| PROJECT NUMBER | 16-167 |
| COMPANY NAME | Arcelormittal Monessen |
| SOURCE | PEC Baghouse Stack |
| LOCATION | in plant by Rail stop |
| CITY / STATE / ZIP | Monessen / PA / 15062 |
| PROCESS EQUIPMENT / OPERATING MODE | Coke Oven Battery / Normal |
| CONTROL EQUIPMENT / OPERATING MODE | PEC Baghouse / Normal |
| HEIGHT ABOVE GROUND LEVEL | START 75 END 75 |
| HEIGHT RELATIVE TO OBSERVER | START 75 END 75 |
| DISTANCE FROM OBSERVER | START 400' END 400' |
| DIRECTION FROM OBSERVER | START N END N |
| VERTICAL ANGLE TO OBSERVATION POINT | START <30° END <30° |
| DIRECTION TO OBSERVATION PT. | START S END S |
| DISTANCE OF OBSERVATION POINT FROM EMISSION OUTLET | START ≈400' END ≈400' |
| DESCRIBE EMISSIONS | START NONE |
| DECRIBE EMISSIONS | END NONE |
| EMISSION COLOR | START N/A END N/A |
| IF WATER DROPLET PLUME | ATTACHED_ ~~NOT ATTACHED~~_ N/A_ |
| DESCRIBE PLUME BACKGROUND | START SKY END SKY |
| SKY CONDITIONS | START Partly Cloudy END Partly Cloudy |
| WIND SPEED | START 0-5 END 0-5 |
| WIND DIRECTION | START ENE END NE |
| AMBIENT TEMP | START 44 END 45 |
| WET BULB TEMP | START 39° END 38 |
| PERCENT HUMIDITY | START 80 END 76 |




START TIME 8:45 STOP TIME 9:45

| | 0 | 15 | 30 | 45 | | 0 | 15 | 30 | 45 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 | 34 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 | 36 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 41 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 0 | 44 | 0 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 | 46 | 0 | 0 | 0 | 0 |
| 17 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 | 0 | 48 | 0 | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 | 0 | 51 | 0 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 | 52 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 53 | 0 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 | 54 | 0 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 | 0 | 55 | 0 | 0 | 0 | 0 |
| 26 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 |
| 27 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 28 | 0 | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 | 0 | 59 | 0 | 0 | 0 | 0 |

8:44 Q
8:57 Q
8:13 Q
9:25 Q
9:37 Q

MONTROSE ENVIRONMENTAL

| | |
|---|---|
| OBSERVER'S NAME | Christopher Burkovich |
| OBSERVER'S SIGNATURE | DATE 10-31-16 |
| ORGANIZATION | Montrose RCS |
| CERTIFIED BY | OpacitAir DATE 8/22/2016 |

# Method 0010/23

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 1** | | | | |
| 1 | 2016/10/25 | 08:27:01 | 20.49 | 0.38 |
| 2 | 2016/10/25 | 08:28:01 | 19.68 | 1.07 |
| 3 | 2016/10/25 | 09:07:01 | 19.62 | 1.17 |
| 4 | 2016/10/25 | 09:08:01 | 20.09 | 0.76 |
| 5 | 2016/10/25 | 09:18:01 | 20.45 | 0.43 |
| 6 | 2016/10/25 | 09:19:01 | 19.68 | 1.17 |
| 7 | 2016/10/25 | 09:32:01 | 19.60 | 1.05 |
| 8 | 2016/10/25 | 09:33:01 | 20.10 | 0.67 |
| 9 | 2016/10/25 | 09:45:01 | 20.43 | 0.43 |
| 10 | 2016/10/25 | 09:46:01 | 19.68 | 1.17 |
| 11 | 2016/10/25 | 10:39:01 | 19.42 | 1.20 |
| 12 | 2016/10/25 | 10:40:01 | 20.47 | 0.43 |
| 13 | 2016/10/25 | 10:51:01 | 20.20 | 0.65 |
| 14 | 2016/10/25 | 10:52:01 | 19.81 | 1.03 |
| 15 | 2016/10/25 | 11:03:01 | 20.53 | 0.36 |
| 16 | 2016/10/25 | 11:04:01 | 19.76 | 1.07 |
| 17 | 2016/10/25 | 11:16:01 | 20.20 | 0.62 |
| 18 | 2016/10/25 | 11:17:01 | 19.79 | 1.04 |
| 19 | 2016/10/25 | 11:30:01 | 20.17 | 0.68 |
| 20 | 2016/10/25 | 11:31:01 | 19.95 | 0.95 |
| 21 | 2016/10/25 | 11:44:01 | 20.61 | 0.30 |
| 22 | 2016/10/25 | 11:45:01 | 19.69 | 1.15 |
| 23 | 2016/10/25 | 12:12:01 | 19.99 | 0.89 |
| 24 | 2016/10/25 | 12:13:01 | 20.27 | 0.68 |
| 25 | 2016/10/25 | 12:26:01 | 20.22 | 0.61 |
| 26 | 2016/10/25 | 12:27:01 | 19.91 | 0.93 |
| 27 | 2016/10/25 | 12:40:01 | 20.52 | 0.37 |
| 28 | 2016/10/25 | 12:41:01 | 19.67 | 1.19 |
| 29 | 2016/10/25 | 12:55:01 | 19.50 | 1.22 |
| 30 | 2016/10/25 | 12:56:01 | 20.01 | 0.78 |
| 31 | 2016/10/25 | 13:30:01 | 19.89 | 0.95 |
| 32 | 2016/10/25 | 13:31:01 | 20.33 | 0.60 |
| 33 | 2016/10/25 | 13:42:01 | 19.71 | 1.12 |
| 34 | 2016/10/25 | 13:53:01 | 20.04 | 0.73 |
| 35 | 2016/10/25 | 13:54:01 | 20.02 | 0.82 |
| 36 | 2016/10/25 | 14:05:01 | 19.80 | 0.93 |
| 37 | 2016/10/25 | 14:06:01 | 19.88 | 0.93 |
| 38 | 2016/10/25 | 14:17:01 | 19.52 | 1.18 |
| 39 | 2016/10/25 | 14:18:01 | 20.61 | 0.32 |
| 40 | 2016/10/25 | 14:29:01 | 20.08 | 0.66 |
| 41 | 2016/10/25 | 14:30:01 | 19.68 | 1.04 |
| 42 | 2016/10/25 | 14:50:01 | 20.42 | 0.42 |
| 43 | 2016/10/25 | 14:51:01 | 19.85 | 1.00 |
| 44 | 2016/10/25 | 15:04:01 | 20.25 | 0.53 |
| 45 | 2016/10/25 | 15:05:01 | 19.71 | 1.06 |
| 46 | 2016/10/25 | 15:35:01 | 20.13 | 0.69 |
| 47 | 2016/10/25 | 15:36:01 | 19.80 | 1.01 |
| 48 | 2016/10/25 | 15:50:01 | 20.09 | 0.70 |
| 49 | 2016/10/25 | 15:51:01 | 19.92 | 0.87 |
| 50 | 2016/10/25 | 16:15:01 | 19.47 | 1.25 |
| 51 | 2016/10/25 | 16:16:01 | 20.36 | 0.53 |
| 52 | 2016/10/25 | 16:29:01 | 19.62 | 1.19 |
| 53 | 2016/10/25 | 16:30:01 | 19.96 | 0.85 |
| 54 | 2016/10/25 | 16:44:01 | 19.38 | 1.32 |
| 55 | 2016/10/25 | 16:45:01 | 19.97 | 0.84 |
| 56 | 2016/10/25 | 16:57:01 | 19.79 | 0.91 |
| 57 | 2016/10/25 | 16:58:01 | 19.77 | 1.00 |
| 58 | 2016/10/25 | 17:11:01 | 20.01 | 0.72 |
| 59 | 2016/10/25 | 17:12:01 | 19.65 | 1.08 |
| 60 | 2016/10/25 | 17:25:01 | 19.30 | 1.29 |
| 61 | 2016/10/25 | 17:26:01 | 19.91 | 0.77 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 62 | 2016/10/25 | 18:04:01 | 19.95 | 0.86 |
| 63 | 2016/10/25 | 18:05:01 | 19.93 | 0.95 |
| 64 | 2016/10/25 | 18:17:01 | 19.68 | 1.05 |
| 65 | 2016/10/25 | 18:18:01 | 20.02 | 0.73 |
| 66 | 2016/10/25 | 18:30:01 | 19.62 | 1.19 |
| 67 | 2016/10/25 | 18:31:01 | 20.11 | 0.77 |
| 68 | 2016/10/25 | 18:49:01 | 20.78 | 0.16 |
| 69 | 2016/10/25 | 18:50:01 | 20.79 | 0.16 |
| 70 | 2016/10/25 | 19:17:01 | 19.60 | 1.22 |
| 71 | 2016/10/25 | 19:18:01 | 20.32 | 0.56 |
| 72 | 2016/10/25 | 19:30:01 | 20.24 | 0.62 |
| 73 | 2016/10/25 | 19:31:01 | 19.79 | 1.09 |
| 74 | 2016/10/25 | 19:49:01 | 20.29 | 0.56 |
| 75 | 2016/10/25 | 19:50:01 | 19.71 | 1.14 |
| 76 | 2016/10/25 | 20:02:01 | 20.17 | 0.70 |
| 77 | 2016/10/25 | 20:03:01 | 19.73 | 1.20 |
| 78 | 2016/10/25 | 20:15:01 | 20.08 | 0.75 |
| 79 | 2016/10/25 | 20:16:01 | 19.71 | 1.15 |
| 80 | 2016/10/25 | 20:29:01 | 19.87 | 1.00 |
| 81 | 2016/10/25 | 20:30:01 | 20.22 | 0.71 |
| 82 | 2016/10/25 | 20:51:01 | 19.65 | 1.21 |
| 83 | 2016/10/25 | 20:52:01 | 20.11 | 0.78 |
| 84 | 2016/10/25 | 20:53:01 | 20.79 | 0.18 |
| 85 | 2016/10/25 | 21:06:01 | 20.44 | 0.45 |
| 86 | 2016/10/25 | 21:07:01 | 19.68 | 1.22 |
| 87 | 2016/10/25 | 21:55:01 | 19.62 | 1.22 |
| 88 | 2016/10/25 | 22:08:01 | 20.11 | 0.77 |
| 89 | 2016/10/25 | 22:09:01 | 20.15 | 0.81 |
| 90 | 2016/10/25 | 22:22:01 | 19.65 | 1.24 |
| 91 | 2016/10/25 | 22:23:01 | 20.06 | 0.81 |
| 92 | 2016/10/25 | 22:35:01 | 19.54 | 1.21 |
| 93 | 2016/10/25 | 22:36:01 | 20.41 | 0.53 |
| 94 | 2016/10/25 | 22:48:01 | 19.77 | 1.07 |
| 95 | 2016/10/25 | 22:49:01 | 20.04 | 0.81 |
| 96 | 2016/10/25 | 23:01:01 | 20.35 | 0.50 |
| 97 | 2016/10/25 | 23:02:01 | 19.64 | 1.18 |
| 98 | 2016/10/25 | 23:34:01 | 20.06 | 0.77 |
| 99 | 2016/10/25 | 23:35:01 | 19.82 | 1.03 |
| 100 | 2016/10/25 | 23:47:01 | 20.23 | 0.67 |
| 101 | 2016/10/25 | 23:48:01 | 19.80 | 1.13 |
| 102 | 2016/10/26 | 00:04:01 | 19.70 | 1.10 |
| 103 | 2016/10/26 | 00:05:01 | 19.94 | 0.92 |
| 104 | 2016/10/26 | 00:35:01 | 20.51 | 0.41 |
| 105 | 2016/10/26 | 00:36:01 | 19.79 | 1.11 |
| 106 | 2016/10/26 | 00:50:01 | 20.19 | 0.70 |
| 107 | 2016/10/26 | 00:51:01 | 19.82 | 1.08 |
| 108 | 2016/10/26 | 01:05:01 | 20.16 | 0.73 |
| 109 | 2016/10/26 | 01:06:01 | 19.87 | 1.03 |
| 110 | 2016/10/26 | 01:23:01 | 19.66 | 1.25 |
| 111 | 2016/10/26 | 01:24:01 | 20.10 | 0.80 |
| 112 | 2016/10/26 | 01:36:01 | 19.79 | 1.05 |
| 113 | 2016/10/26 | 01:37:01 | 20.41 | 0.54 |
| 114 | 2016/10/26 | 01:49:01 | 19.40 | 1.34 |
| 115 | 2016/10/26 | 01:50:01 | 19.95 | 0.89 |
| 116 | 2016/10/26 | 02:06:01 | 19.93 | 0.96 |
| 117 | 2016/10/26 | 02:07:01 | 19.92 | 0.97 |
| 118 | 2016/10/26 | 02:23:01 | 19.60 | 1.10 |
| 119 | 2016/10/26 | 02:24:01 | 19.79 | 0.97 |
| 120 | 2016/10/26 | 02:41:01 | 19.74 | 1.17 |
| 121 | 2016/10/26 | 02:42:01 | 20.23 | 0.70 |
| 122 | 2016/10/26 | 03:17:01 | 19.25 | 1.42 |
| 123 | 2016/10/26 | 03:18:01 | 20.37 | 0.52 |
| 124 | 2016/10/26 | 03:34:01 | 19.59 | 1.29 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 125 | 2016/10/26 | 03:35:01 | 20.05 | 0.84 |
| 126 | 2016/10/26 | 03:53:01 | 19.63 | 1.22 |
| 127 | 2016/10/26 | 03:54:01 | 20.43 | 0.53 |
| 128 | 2016/10/26 | 04:12:01 | 19.71 | 1.19 |
| 129 | 2016/10/26 | 04:13:01 | 20.11 | 0.78 |
| 130 | 2016/10/26 | 04:32:01 | 19.66 | 1.23 |
| 131 | 2016/10/26 | 04:33:01 | 20.33 | 0.64 |
| 132 | 2016/10/26 | 04:52:01 | 19.73 | 1.16 |
| 133 | 2016/10/26 | 04:53:01 | 19.95 | 0.95 |
| 134 | 2016/10/26 | 05:19:01 | 19.81 | 1.10 |
| 135 | 2016/10/26 | 05:20:01 | 20.24 | 0.74 |
| 136 | 2016/10/26 | 05:43:01 | 19.73 | 1.17 |
| 137 | 2016/10/26 | 05:44:01 | 20.03 | 0.87 |
| 138 | 2016/10/26 | 05:56:01 | 19.87 | 1.05 |
| 139 | 2016/10/26 | 05:57:01 | 19.98 | 0.95 |
| 140 | 2016/10/26 | 06:11:01 | 19.59 | 1.24 |
| 141 | 2016/10/26 | 06:12:01 | 19.83 | 1.03 |
| **RUN 1 AVERAGES** | | | **19.96** | **0.88** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **Run 2** | | | | |
| 1 | 2016/10/26 | 07:34:01 | 20.25 | 0.62 |
| 2 | 2016/10/26 | 07:35:01 | 19.81 | 1.06 |
| 3 | 2016/10/26 | 07:49:01 | 20.25 | 0.62 |
| 4 | 2016/10/26 | 07:50:01 | 19.76 | 1.13 |
| 5 | 2016/10/26 | 08:06:01 | 19.75 | 1.10 |
| 6 | 2016/10/26 | 08:07:01 | 19.97 | 0.92 |
| 7 | 2016/10/26 | 08:21:01 | 19.73 | 1.12 |
| 8 | 2016/10/26 | 08:22:01 | 20.29 | 0.68 |
| 9 | 2016/10/26 | 08:37:01 | 19.68 | 1.17 |
| 10 | 2016/10/26 | 08:38:01 | 20.15 | 0.75 |
| 11 | 2016/10/26 | 09:19:01 | 20.62 | 0.34 |
| 12 | 2016/10/26 | 09:20:01 | 19.72 | 1.16 |
| 13 | 2016/10/26 | 09:32:01 | 19.70 | 1.18 |
| 14 | 2016/10/26 | 09:33:01 | 19.95 | 0.97 |
| 15 | 2016/10/26 | 09:49:01 | 20.45 | 0.49 |
| 16 | 2016/10/26 | 09:50:01 | 19.84 | 1.09 |
| 17 | 2016/10/26 | 10:04:01 | 19.88 | 0.96 |
| 18 | 2016/10/26 | 10:05:01 | 19.96 | 0.92 |
| 19 | 2016/10/26 | 10:17:01 | 19.71 | 1.12 |
| 20 | 2016/10/26 | 10:18:01 | 20.11 | 0.82 |
| 21 | 2016/10/26 | 10:29:01 | 19.60 | 1.12 |
| 22 | 2016/10/26 | 10:30:01 | 19.88 | 0.92 |
| 23 | 2016/10/26 | 10:42:01 | 19.75 | 1.11 |
| 24 | 2016/10/26 | 10:43:01 | 20.09 | 0.86 |
| 25 | 2016/10/26 | 10:54:01 | 19.55 | 1.15 |
| 26 | 2016/10/26 | 10:55:01 | 19.96 | 0.81 |
| 27 | 2016/10/26 | 11:06:01 | 19.92 | 0.94 |
| 28 | 2016/10/26 | 11:07:01 | 19.96 | 0.97 |
| 29 | 2016/10/26 | 12:01:01 | 19.81 | 1.06 |
| 30 | 2016/10/26 | 12:02:01 | 20.38 | 0.58 |
| 31 | 2016/10/26 | 12:20:01 | 19.89 | 0.94 |
| 32 | 2016/10/26 | 12:21:01 | 20.11 | 0.81 |
| 33 | 2016/10/26 | 12:43:01 | 19.99 | 0.89 |
| 34 | 2016/10/26 | 12:44:01 | 19.94 | 0.98 |
| 35 | 2016/10/26 | 12:55:01 | 19.67 | 1.20 |
| 36 | 2016/10/26 | 12:56:01 | 20.26 | 0.65 |
| 37 | 2016/10/26 | 13:07:01 | 20.41 | 0.48 |
| 38 | 2016/10/26 | 13:08:01 | 19.65 | 1.26 |
| 39 | 2016/10/26 | 13:19:01 | 20.10 | 0.72 |
| 40 | 2016/10/26 | 13:20:01 | 19.65 | 1.20 |
| 41 | 2016/10/26 | 13:33:01 | 20.04 | 0.83 |
| 42 | 2016/10/26 | 13:34:01 | 19.87 | 1.05 |
| 43 | 2016/10/26 | 13:45:01 | 19.71 | 1.13 |
| 44 | 2016/10/26 | 13:46:01 | 20.16 | 0.73 |
| 45 | 2016/10/26 | 13:56:01 | 19.82 | 1.00 |
| 46 | 2016/10/26 | 13:57:01 | 20.02 | 0.88 |
| 47 | 2016/10/26 | 14:15:01 | 19.67 | 1.13 |
| 48 | 2016/10/26 | 14:16:01 | 20.00 | 0.81 |
| 49 | 2016/10/26 | 14:26:01 | 20.47 | 0.38 |
| 50 | 2016/10/26 | 14:27:01 | 19.62 | 1.23 |
| 51 | 2016/10/26 | 14:38:01 | 19.89 | 0.90 |
| 52 | 2016/10/26 | 14:39:01 | 19.84 | 0.96 |
| 53 | 2016/10/26 | 14:51:01 | 19.60 | 1.08 |
| 54 | 2016/10/26 | 14:52:01 | 20.00 | 0.80 |
| 55 | 2016/10/26 | 15:03:01 | 19.49 | 1.17 |
| 56 | 2016/10/26 | 15:04:01 | 19.89 | 0.85 |
| 57 | 2016/10/26 | 15:32:01 | 19.51 | 1.16 |
| 58 | 2016/10/26 | 15:33:01 | 20.44 | 0.44 |
| 59 | 2016/10/26 | 15:46:01 | 19.86 | 0.82 |
| 60 | 2016/10/26 | 15:47:01 | 19.73 | 0.95 |
| 61 | 2016/10/26 | 16:00:01 | 20.03 | 0.75 |
| 62 | 2016/10/26 | 16:01:01 | 20.28 | 0.58 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 63 | 2016/10/26 | 16:12:01 | 19.43 | 1.20 |
| 64 | 2016/10/26 | 16:13:01 | 20.02 | 0.72 |
| 65 | 2016/10/26 | 16:49:01 | 20.51 | 0.32 |
| 66 | 2016/10/26 | 16:50:01 | 19.76 | 1.02 |
| 67 | 2016/10/26 | 17:07:01 | 19.59 | 1.11 |
| 68 | 2016/10/26 | 17:08:01 | 19.94 | 0.80 |
| 69 | 2016/10/26 | 17:26:01 | 19.73 | 1.01 |
| 70 | 2016/10/26 | 17:27:01 | 20.67 | 0.23 |
| 71 | 2016/10/26 | 17:38:01 | 19.71 | 1.03 |
| 72 | 2016/10/26 | 17:39:01 | 20.01 | 0.77 |
| 73 | 2016/10/26 | 17:51:01 | 19.52 | 1.11 |
| 74 | 2016/10/26 | 17:52:01 | 20.52 | 0.34 |
| 75 | 2016/10/26 | 18:03:01 | 19.56 | 1.08 |
| 76 | 2016/10/26 | 18:04:01 | 19.89 | 0.81 |
| 77 | 2016/10/26 | 18:17:01 | 20.02 | 0.75 |
| 78 | 2016/10/26 | 18:18:01 | 20.21 | 0.62 |
| 79 | 2016/10/26 | 18:29:01 | 19.73 | 0.85 |
| 80 | 2016/10/26 | 18:30:01 | 19.70 | 0.86 |
| 81 | 2016/10/26 | 18:43:01 | 19.69 | 1.07 |
| 82 | 2016/10/26 | 18:44:01 | 20.27 | 0.57 |
| 83 | 2016/10/26 | 19:20:01 | 19.83 | 0.82 |
| 84 | 2016/10/26 | 19:21:01 | 19.91 | 0.79 |
| 85 | 2016/10/26 | 19:44:01 | 20.23 | 0.48 |
| 86 | 2016/10/26 | 19:45:01 | 19.67 | 1.05 |
| 87 | 2016/10/26 | 20:02:01 | 19.97 | 0.72 |
| 88 | 2016/10/26 | 20:03:01 | 19.90 | 0.81 |
| 89 | 2016/10/26 | 20:14:01 | 20.39 | 0.39 |
| 90 | 2016/10/26 | 20:15:01 | 19.89 | 0.90 |
| 91 | 2016/10/26 | 20:27:01 | 19.70 | 1.03 |
| 92 | 2016/10/26 | 20:28:01 | 20.44 | 0.41 |
| 93 | 2016/10/26 | 20:39:01 | 19.55 | 1.14 |
| 94 | 2016/10/26 | 20:40:01 | 20.65 | 0.21 |
| 95 | 2016/10/26 | 21:00:01 | 19.60 | 1.00 |
| 96 | 2016/10/26 | 21:01:01 | 19.95 | 0.75 |
| 97 | 2016/10/26 | 21:16:01 | 19.78 | 0.91 |
| 98 | 2016/10/26 | 21:17:01 | 20.19 | 0.63 |
| 99 | 2016/10/26 | 21:28:01 | 19.26 | 1.15 |
| 100 | 2016/10/26 | 21:29:01 | 19.56 | 0.93 |
| 101 | 2016/10/26 | 21:59:01 | 19.75 | 0.93 |
| 102 | 2016/10/26 | 22:00:01 | 20.34 | 0.49 |
| 103 | 2016/10/26 | 22:11:01 | 19.27 | 1.24 |
| 104 | 2016/10/26 | 22:12:01 | 19.86 | 0.79 |
| 105 | 2016/10/26 | 22:24:01 | 19.61 | 0.95 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 106 | 2016/10/26 | 22:25:01 | 20.12 | 0.61 |
| 107 | 2016/10/26 | 22:42:01 | 19.17 | 1.28 |
| 108 | 2016/10/26 | 22:43:01 | 19.83 | 0.79 |
| 109 | 2016/10/26 | 22:55:01 | 19.24 | 1.26 |
| 110 | 2016/10/26 | 22:56:01 | 20.59 | 0.23 |
| 111 | 2016/10/26 | 23:32:01 | 19.12 | 1.31 |
| 112 | 2016/10/26 | 23:33:01 | 19.84 | 0.78 |
| 113 | 2016/10/26 | 23:44:01 | 19.29 | 1.25 |
| 114 | 2016/10/26 | 23:45:01 | 20.29 | 0.48 |
| 115 | 2016/10/26 | 23:57:01 | 19.59 | 0.93 |
| 116 | 2016/10/26 | 23:58:01 | 19.66 | 0.89 |
| 117 | 2016/10/27 | 00:25:01 | 19.91 | 0.71 |
| 118 | 2016/10/27 | 00:26:01 | 19.76 | 0.88 |
| 119 | 2016/10/27 | 00:38:01 | 19.09 | 1.30 |
| 120 | 2016/10/27 | 00:39:01 | 19.82 | 0.75 |
| 121 | 2016/10/27 | 00:50:01 | 19.03 | 1.34 |
| 122 | 2016/10/27 | 00:51:01 | 20.13 | 0.54 |
| 123 | 2016/10/27 | 01:02:01 | 19.81 | 0.75 |
| 124 | 2016/10/27 | 01:03:01 | 19.54 | 1.03 |
| 125 | 2016/10/27 | 01:15:01 | 19.99 | 0.58 |
| 126 | 2016/10/27 | 01:16:01 | 19.22 | 1.19 |
| 127 | 2016/10/27 | 02:34:01 | 19.95 | 0.64 |
| 128 | 2016/10/27 | 02:35:01 | 19.60 | 0.94 |
| 129 | 2016/10/27 | 02:47:01 | 19.29 | 1.16 |
| 130 | 2016/10/27 | 02:48:01 | 20.07 | 0.57 |
| 131 | 2016/10/27 | 03:38:01 | 20.05 | 0.60 |
| 132 | 2016/10/27 | 03:39:01 | 19.58 | 1.07 |
| 133 | 2016/10/27 | 03:56:01 | 19.57 | 0.90 |
| 134 | 2016/10/27 | 03:57:01 | 19.51 | 0.93 |
| 135 | 2016/10/27 | 04:09:01 | 20.04 | 0.60 |
| 136 | 2016/10/27 | 04:10:01 | 19.56 | 1.08 |
| 137 | 2016/10/27 | 04:22:01 | 19.35 | 1.11 |
| 138 | 2016/10/27 | 04:23:01 | 20.21 | 0.47 |
| 139 | 2016/10/27 | 04:34:01 | 19.38 | 1.06 |
| 140 | 2016/10/27 | 04:35:01 | 19.66 | 0.86 |
| 141 | 2016/10/27 | 04:48:01 | 19.47 | 1.13 |
| 142 | 2016/10/27 | 04:49:01 | 20.48 | 0.27 |
| 143 | 2016/10/27 | 05:00:01 | 18.89 | 1.46 |
| 144 | 2016/10/27 | 05:01:01 | 19.81 | 0.76 |
| **RUN 2 AVERAGES** | | | **19.86** | **0.87** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 3** | | | | |
| 1 | 2016/10/27 | 05:51:01 | 19.57 | 0.96 |
| 2 | 2016/10/27 | 05:52:01 | 19.74 | 0.85 |
| 3 | 2016/10/27 | 06:03:01 | 20.02 | 0.63 |
| 4 | 2016/10/27 | 06:04:01 | 19.86 | 0.86 |
| 5 | 2016/10/27 | 06:18:01 | 19.48 | 1.14 |
| 6 | 2016/10/27 | 06:19:01 | 19.83 | 0.82 |
| 7 | 2016/10/27 | 06:31:01 | 19.78 | 0.84 |
| 8 | 2016/10/27 | 06:32:01 | 19.90 | 0.79 |
| 9 | 2016/10/27 | 06:45:01 | 19.80 | 0.77 |
| 10 | 2016/10/27 | 06:46:01 | 19.64 | 0.94 |
| 11 | 2016/10/27 | 07:10:01 | 20.03 | 0.54 |
| 12 | 2016/10/27 | 07:11:01 | 19.56 | 1.04 |
| 13 | 2016/10/27 | 07:34:01 | 19.35 | 1.09 |
| 14 | 2016/10/27 | 07:35:01 | 20.05 | 0.59 |
| 15 | 2016/10/27 | 07:46:01 | 19.49 | 1.05 |
| 16 | 2016/10/27 | 07:47:01 | 20.06 | 0.58 |
| 17 | 2016/10/27 | 07:59:01 | 19.97 | 0.59 |
| 18 | 2016/10/27 | 08:00:01 | 19.79 | 0.81 |
| 19 | 2016/10/27 | 08:13:01 | 19.37 | 1.11 |
| 20 | 2016/10/27 | 08:14:01 | 19.87 | 0.72 |
| 21 | 2016/10/27 | 08:28:01 | 19.50 | 1.07 |
| 22 | 2016/10/27 | 08:29:01 | 20.44 | 0.29 |
| 23 | 2016/10/27 | 08:43:01 | 19.26 | 1.14 |
| 24 | 2016/10/27 | 08:44:01 | 19.68 | 0.81 |
| 25 | 2016/10/27 | 09:29:01 | 20.38 | 0.28 |
| 26 | 2016/10/27 | 09:30:01 | 19.58 | 1.00 |
| 27 | 2016/10/27 | 09:41:01 | 19.55 | 0.96 |
| 28 | 2016/10/27 | 09:42:01 | 19.72 | 0.84 |
| 29 | 2016/10/27 | 09:53:01 | 19.54 | 0.98 |
| 30 | 2016/10/27 | 09:54:01 | 20.25 | 0.42 |
| 31 | 2016/10/27 | 10:05:01 | 19.33 | 1.16 |
| 32 | 2016/10/27 | 10:06:01 | 19.74 | 0.80 |
| 33 | 2016/10/27 | 10:18:01 | 19.50 | 1.03 |
| 34 | 2016/10/27 | 10:19:01 | 20.37 | 0.33 |
| 35 | 2016/10/27 | 10:30:01 | 19.44 | 1.00 |
| 36 | 2016/10/27 | 10:31:01 | 19.54 | 0.93 |
| 37 | 2016/10/27 | 10:47:01 | 19.59 | 0.96 |
| 38 | 2016/10/27 | 10:48:01 | 20.06 | 0.58 |
| 39 | 2016/10/27 | 11:01:01 | 19.06 | 1.18 |
| 40 | 2016/10/27 | 11:02:01 | 19.56 | 0.77 |
| 41 | 2016/10/27 | 11:15:01 | 20.01 | 0.58 |
| 42 | 2016/10/27 | 11:16:01 | 19.66 | 0.97 |
| 43 | 2016/10/27 | 12:07:01 | 19.40 | 1.02 |
| 44 | 2016/10/27 | 12:08:01 | 19.73 | 0.81 |
| 45 | 2016/10/27 | 12:30:01 | 19.58 | 1.03 |
| 46 | 2016/10/27 | 12:31:01 | 20.30 | 0.41 |
| 47 | 2016/10/27 | 12:41:01 | 20.07 | 0.55 |
| 48 | 2016/10/27 | 12:42:01 | 19.77 | 0.90 |
| 49 | 2016/10/27 | 12:54:01 | 19.43 | 1.07 |
| 50 | 2016/10/27 | 12:55:01 | 20.23 | 0.44 |
| 51 | 2016/10/27 | 13:09:01 | 20.49 | 0.20 |
| 52 | 2016/10/27 | 13:10:01 | 19.46 | 1.13 |
| 53 | 2016/10/27 | 13:22:01 | 19.63 | 0.92 |
| 54 | 2016/10/27 | 13:23:01 | 19.90 | 0.73 |
| 55 | 2016/10/27 | 13:35:01 | 19.66 | 0.90 |
| 56 | 2016/10/27 | 13:36:01 | 20.09 | 0.59 |
| 57 | 2016/10/27 | 13:56:01 | 20.06 | 0.52 |
| 58 | 2016/10/27 | 13:57:01 | 19.79 | 0.86 |
| 59 | 2016/10/27 | 14:09:01 | 19.24 | 1.15 |
| 60 | 2016/10/27 | 14:10:01 | 20.00 | 0.56 |
| 61 | 2016/10/27 | 14:24:01 | 20.54 | 0.15 |
| 62 | 2016/10/27 | 14:25:01 | 20.54 | 0.15 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 63 | 2016/10/27 | 14:42:01 | 20.28 | 0.33 |
| 64 | 2016/10/27 | 14:43:01 | 19.51 | 1.09 |
| 65 | 2016/10/27 | 14:53:01 | 19.99 | 0.55 |
| 66 | 2016/10/27 | 14:54:01 | 19.55 | 0.98 |
| 67 | 2016/10/27 | 15:28:01 | 19.48 | 1.00 |
| 68 | 2016/10/27 | 15:29:01 | 20.23 | 0.43 |
| 69 | 2016/10/27 | 15:40:01 | 19.68 | 0.81 |
| 70 | 2016/10/27 | 15:41:01 | 19.66 | 0.86 |
| 71 | 2016/10/27 | 15:53:01 | 20.29 | 0.31 |
| 72 | 2016/10/27 | 15:54:01 | 19.31 | 1.17 |
| 73 | 2016/10/27 | 16:06:01 | 19.53 | 0.94 |
| 74 | 2016/10/27 | 16:07:01 | 19.72 | 0.79 |
| 75 | 2016/10/27 | 16:21:01 | 19.24 | 1.22 |
| 76 | 2016/10/27 | 16:22:01 | 20.46 | 0.25 |
| 77 | 2016/10/27 | 16:33:01 | 19.42 | 1.03 |
| 78 | 2016/10/27 | 16:34:01 | 19.71 | 0.80 |
| 79 | 2016/10/27 | 16:48:01 | 20.38 | 0.28 |
| 80 | 2016/10/27 | 16:49:01 | 19.42 | 1.11 |
| 81 | 2016/10/27 | 17:01:01 | 20.00 | 0.55 |
| 82 | 2016/10/27 | 17:02:01 | 19.51 | 0.97 |
| 83 | 2016/10/27 | 17:50:01 | 19.98 | 0.61 |
| 84 | 2016/10/27 | 17:51:01 | 19.76 | 0.88 |
| 85 | 2016/10/27 | 18:03:01 | 19.57 | 1.03 |
| 86 | 2016/10/27 | 18:04:01 | 19.84 | 0.79 |
| 87 | 2016/10/27 | 18:18:01 | 19.44 | 1.10 |
| 88 | 2016/10/27 | 18:19:01 | 20.45 | 0.31 |
| 89 | 2016/10/27 | 18:32:01 | 19.03 | 1.31 |
| 90 | 2016/10/27 | 18:33:01 | 19.68 | 0.83 |
| 91 | 2016/10/27 | 18:45:01 | 19.18 | 1.17 |
| 92 | 2016/10/27 | 18:46:01 | 20.07 | 0.55 |
| 93 | 2016/10/27 | 18:58:01 | 18.68 | 1.50 |
| 94 | 2016/10/27 | 18:59:01 | 19.59 | 0.82 |
| 95 | 2016/10/27 | 19:11:01 | 19.09 | 1.34 |
| 96 | 2016/10/27 | 19:12:01 | 20.03 | 0.63 |
| 97 | 2016/10/27 | 19:29:01 | 18.31 | 1.69 |
| 98 | 2016/10/27 | 19:30:01 | 19.56 | 0.77 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 99 | 2016/10/27 | 19:43:01 | 20.30 | 0.39 |
| 100 | 2016/10/27 | 19:44:01 | 19.40 | 1.21 |
| 101 | 2016/10/27 | 20:21:01 | 19.26 | 1.26 |
| 102 | 2016/10/27 | 20:22:01 | 20.42 | 0.38 |
| 103 | 2016/10/27 | 20:33:01 | 19.28 | 1.25 |
| 104 | 2016/10/27 | 20:34:01 | 20.38 | 0.41 |
| 105 | 2016/10/27 | 20:45:01 | 19.92 | 0.82 |
| 106 | 2016/10/27 | 20:46:01 | 20.65 | 0.18 |
| 107 | 2016/10/27 | 21:14:01 | 19.34 | 1.18 |
| 108 | 2016/10/27 | 21:15:01 | 19.98 | 0.69 |
| 109 | 2016/10/27 | 21:27:01 | 20.11 | 0.64 |
| 110 | 2016/10/27 | 21:28:01 | 19.96 | 0.78 |
| 111 | 2016/10/27 | 21:39:01 | 19.73 | 0.87 |
| 112 | 2016/10/27 | 21:40:01 | 19.75 | 0.88 |
| 113 | 2016/10/27 | 21:51:01 | 19.94 | 0.75 |
| 114 | 2016/10/27 | 21:52:01 | 20.12 | 0.67 |
| 115 | 2016/10/27 | 22:03:01 | 20.03 | 0.67 |
| 116 | 2016/10/27 | 22:04:01 | 19.79 | 0.89 |
| 117 | 2016/10/27 | 22:16:01 | 19.44 | 1.09 |
| 118 | 2016/10/27 | 22:17:01 | 20.54 | 0.29 |
| 119 | 2016/10/27 | 22:43:01 | 19.24 | 1.20 |
| 120 | 2016/10/27 | 22:44:01 | 19.93 | 0.71 |
| 121 | 2016/10/27 | 22:56:01 | 19.87 | 0.82 |
| 122 | 2016/10/27 | 22:57:01 | 20.39 | 0.44 |
| 123 | 2016/10/27 | 23:39:01 | 19.56 | 1.11 |
| 124 | 2016/10/27 | 23:40:01 | 20.00 | 0.73 |
| 125 | 2016/10/27 | 23:50:01 | 19.73 | 0.86 |
| 126 | 2016/10/27 | 23:51:01 | 19.92 | 0.76 |
| 127 | 2016/10/28 | 00:03:01 | 19.37 | 1.14 |
| 128 | 2016/10/28 | 00:04:01 | 19.84 | 0.79 |
| 129 | 2016/10/28 | 00:18:01 | 20.36 | 0.38 |
| 130 | 2016/10/28 | 00:19:01 | 19.67 | 1.03 |
| 131 | 2016/10/28 | 00:31:01 | 20.03 | 0.63 |
| 132 | 2016/10/28 | 00:32:01 | 19.60 | 1.02 |
| 133 | 2016/10/28 | 00:50:01 | 20.22 | 0.55 |
| 134 | 2016/10/28 | 00:51:01 | 19.82 | 0.95 |
| 135 | 2016/10/28 | 01:03:01 | 19.52 | 1.08 |
| 136 | 2016/10/28 | 01:04:01 | 19.95 | 0.73 |
| 137 | 2016/10/28 | 01:43:01 | 19.99 | 0.74 |
| 138 | 2016/10/28 | 01:44:01 | 20.16 | 0.64 |
| 139 | 2016/10/28 | 01:55:01 | 19.83 | 0.86 |
| 140 | 2016/10/28 | 01:56:01 | 19.91 | 0.80 |
| 141 | 2016/10/28 | 02:08:01 | 20.13 | 0.61 |
| 142 | 2016/10/28 | 02:09:01 | 19.78 | 0.91 |
| 143 | 2016/10/28 | 02:21:01 | 19.65 | 0.97 |
| 144 | 2016/10/28 | 02:22:01 | 19.82 | 0.83 |
| **RUN 3 AVERAGES** | | | **19.79** | **0.81** |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Oct. 25-26, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 1 |
| **Unit** | Pushing Baghouse | **Start Time** | 8:27 |
| **Operation** | Normal | **End Time** | 6:12 |
| **Tester(s)** | JV, JW, TM, TL | | |

| Cal. Gas | LOW | | MID | | HIGH | | Span | Conc. Units | Tank ID | | | Response Time (sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | | | LOW | MID | HIGH | Up | Down |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | 45 | 45 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B | 50 | 50 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values | | Final Values | | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | | | | | | |
| O2 | Zero | | 0.01 | 0.12 | 0.55 | 0.12 | 0.55 | 0.00 | 20.03 | 0.12 | | | |
| | Mid | 10.01 | 10.07 | 10.20 | 0.65 | 10.04 | -0.15 | -0.80 | 20.03 | 10.12 | 19.96 | 19.86 | d. vol. % |
| CO2 | Zero | | 0.06 | -0.04 | -0.51 | -0.02 | -0.40 | 0.10 | 19.79 | -0.03 | | | |
| | Mid | 10.15 | 10.04 | 9.95 | -0.45 | 9.91 | -0.66 | -0.20 | 19.79 | 9.93 | 0.88 | 0.93 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Oct. 26-27, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 2 |
| **Unit** | Pushing Baghouse | **Start Time** | 7:33 |
| **Operation** | Normal | **End Time** | 5:02 |
| **Tester(s)** | JV, JW, TM, TL | | |

| Cal. Gas | LOW | | MID | | HIGH | | Span | Conc. Units | Tank ID | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | | | LOW | MID | HIGH |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values System Cal. Response | Initial Values System Cal. Bias (% of Span) | Final Values System Cal. Response | Final Values System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | Zero | | 0.01 | 0.12 | 0.55 | -0.04 | -0.25 | -0.80 | 20.03 | 0.04 | | | |
| | Mid | 10.01 | 10.07 | 10.04 | -0.15 | 9.94 | -0.65 | -0.50 | 20.03 | 9.99 | 19.86 | 19.94 | d. vol. % |
| CO2 | Zero | | 0.06 | -0.02 | -0.40 | 0.00 | -0.30 | 0.10 | 19.79 | -0.01 | | | |
| | Mid | 10.15 | 10.04 | 9.91 | -0.66 | 9.97 | -0.35 | 0.30 | 19.79 | 9.94 | 0.87 | 0.90 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Oct. 27-28, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 3 |
| **Unit** | Pushing Baghouse | **Start Time** | 5:49 |
| **Operation** | Normal | **End Time** | 2:22 |
| **Tester(s)** | JV, JW, TM, TL | | |

| Cal. Gas | LOW | | MID | | HIGH | | Span | Conc. Units | Tank ID | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | | | LOW | MID | HIGH |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values System Cal. Response | Initial Values System Cal. Bias (% of Span) | Final Values System Cal. Response | Final Values System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | Zero | | 0.00 | -0.04 | -0.20 | 0.11 | 0.55 | 0.75 | 20.03 | 0.04 | | | |
| | Mid | 10.01 | 10.07 | 9.94 | -0.65 | 9.88 | -0.95 | -0.30 | 20.03 | 9.91 | 19.79 | 20.02 | d. vol. % |
| CO2 | Zero | | 0.20 | 0.00 | -1.01 | 0.00 | -1.01 | 0.00 | 19.79 | 0.00 | | | |
| | Mid | 10.15 | 10.04 | 9.97 | -0.35 | 9.92 | -0.61 | -0.25 | 19.79 | 9.95 | 0.81 | 0.82 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.0 | 0.00 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.2 | 1.01 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 25-26, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 1 |
| Unit: | Pushing Baghouse | Test Start Time: | 8:27 AM |
| Unit Operation: | Normal | Test Finish Time: | 6:12 AM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 180 | minutes |
| Barometric Pressure (Pbar) | 29.44 | in. Hg |
| Stack Static Pressure (Pg) | 0.10 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 19.86 | % dv |
| CO2 | 0.93 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Semi-vols Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 62.5 | F |
| Stack Temperature (Tsavg) | 115.6 | F |
| Orifice Pressure Drop (dHavg) | 2.054 | in. $H_2O$ |
| GasVelocity Head (dP)^^avg | 0.8277 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | 0 | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 21.75 | hours |
| # of Pushes | 72 | pushes/test |
| Avg. # of pushes per hour | 3.31 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.21 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 53.1 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.504 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.504 | scf |
| Volume Dry Gas Metered (Vm) | 151.667 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 151.974 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 4.295 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 4.303 | dscm |
| Stack Absolute Pressure (Ps) | 29.45 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 575.3 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.05 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1036 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0162 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0162 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.94 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.77 | lb/lb-mole |
| Gas Velocity (Vs) | 48.99 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 83,117 | acfm |
| Standard Gas Flowrate | 75,040 | scfm |
| Dry Standard Gas Flowrate | 73,823 | dscfm |
| Dry Standard Exhaust Gas Flowrate | 332.7 | 1000 lb/hr |
| Actual Gas Flowrate | 2,354 | acm/min |
| Standard Gas Flowrate | 2,125 | scm/min |
| Dry Standard Gas Flowrate | 2,090 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 91.23 | % |

**Dioxin Furan**

| | Analyte | | TEF | Raw Data mass (pg) | Adjusted Mass (ng) | TEF Adjusted Amount (ng) |
|---|---|---|---|---|---|---|
| 1 | 2378-TCDD | < | 1 | 3.4 | 0.0034 | 0.0034 |
| 2 | 12378-PeCDD | < | 0.5 | 3.2 | 0.0032 | 0.0016 |
| 3 | 123478-HxCDD | < | 0.1 | 3.2 | 0.0032 | 0.00032 |
| 4 | 123678-HxCDD | < | 0.1 | 3.2 | 0.0032 | 0.00032 |
| 5 | 123789-HxCDD | < | 0.1 | 2.9 | 0.0029 | 0.00029 |
| 6 | 1234678-HpCDD | | 0.01 | 5.6 | 0.0056 | 0.000056 |
| 1 | 2378-TCDF (DB 225) | | 0.1 | 7.4 | 0.0074 | 0.00074 |
| 2 | 12378-PeCDF | < | 0.05 | 4.3 | 0.0043 | 0.000215 |
| 3 | 23478-PeCDF | < | 0.5 | 4.3 | 0.0043 | 0.00215 |
| 4 | 123478-HxCDF | < | 0.1 | 2.9 | 0.0029 | 0.00029 |
| 5 | 123678-HxCDF | < | 0.1 | 2.7 | 0.0027 | 0.00027 |
| 6 | 234678-HxCDF | < | 0.1 | 3 | 0.0030 | 0.0003 |
| 7 | 123789-HxCDF | < | 0.1 | 3.2 | 0.0032 | 0.00032 |
| 8 | 1234678-HpCDF | | 0.01 | 4.1 | 0.0041 | 0.000041 |
| 9 | 1234789-HpCDF | < | 0.01 | 3.3 | 0.0033 | 0.000033 |
| | | | | | TEF ADJUSTED TOTAL | 0.010 |

TEF Factors taken from USEPA 40 CFR, Chapter 1, Part 266, Appendix IX, Table 4.0.1

| | | | |
|---|---|---|---|
| TEF Total Mass Collected | < | 0.010 | ng |
| TEF Emission Concentration | < | 0.0024 | ng/$m^3$ |
| TEF Emission Rate | < | 41.6 | ng/hr |
| Emission Rate | < | 6.42E-07 | gr/hr |
| Emission Rate | < | 9.2E-11 | lb/hr |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.74 | 0.860 | 2.2 | 101 | 59 | 58 |
| A-1 | 0.72 | 0.849 | 2.2 | 120 | 59 | 60 |
| A-1 | 0.72 | 0.849 | 2.2 | 104 | 60 | 59 |
| A-2 | 0.72 | 0.849 | 2.2 | 126 | 60 | 60 |
| A-2 | 0.75 | 0.866 | 2.3 | 123 | 61 | 60 |
| A-2 | 0.76 | 0.872 | 2.3 | 102 | 61 | 60 |
| A-3 | 0.75 | 0.866 | 2.2 | 121 | 63 | 62 |
| A-3 | 0.75 | 0.866 | 2.2 | 116 | 64 | 63 |
| A-3 | 0.75 | 0.866 | 2.2 | 120 | 64 | 63 |
| A-4 | 0.74 | 0.860 | 2.2 | 117 | 64 | 63 |
| A-4 | 0.68 | 0.825 | 2.0 | 114 | 64 | 63 |
| A-4 | 0.69 | 0.831 | 2.1 | 102 | 64 | 64 |
| A-5 | 0.68 | 0.825 | 2.0 | 119 | 65 | 65 |
| A-5 | 0.68 | 0.825 | 2.0 | 114 | 65 | 64 |
| A-5 | 0.70 | 0.837 | 2.1 | 127 | 65 | 65 |
| A-6 | 0.65 | 0.806 | 2.0 | 117 | 66 | 65 |
| A-6 | 0.70 | 0.837 | 2.1 | 122 | 64 | 64 |
| A-6 | 0.66 | 0.812 | 2.0 | 119 | 65 | 64 |
| A-7 | 0.65 | 0.806 | 2.0 | 115 | 65 | 64 |
| A-7 | 0.67 | 0.819 | 2.0 | 113 | 65 | 64 |
| A-7 | 0.67 | 0.819 | 2.0 | 114 | 65 | 65 |
| A-8 | 0.67 | 0.819 | 2.0 | 117 | 66 | 65 |
| A-8 | 0.65 | 0.806 | 2.0 | 115 | 66 | 65 |
| A-8 | 0.66 | 0.812 | 2.0 | 112 | 66 | 66 |
| A-9 | 0.84 | 0.917 | 2.5 | 125 | 67 | 66 |
| A-9 | 0.80 | 0.894 | 2.4 | 118 | 67 | 67 |
| A-9 | 0.80 | 0.894 | 2.4 | 116 | 67 | 67 |
| A-10 | 0.76 | 0.872 | 2.0 | 136 | 67 | 67 |
| A-10 | 0.68 | 0.825 | 2.0 | 136 | 68 | 67 |
| A-10 | 0.71 | 0.843 | 2.1 | 130 | 68 | 67 |
| A-11 | 0.70 | 0.837 | 2.1 | 131 | 67 | 67 |
| A-11 | 0.68 | 0.825 | 2.0 | 117 | 67 | 67 |
| A-11 | 0.70 | 0.837 | 2.1 | 111 | 67 | 67 |
| A-12 | 0.70 | 0.837 | 2.1 | 113 | 67 | 67 |
| A-12 | 0.70 | 0.837 | 2.1 | 115 | 67 | 67 |
| A-12 | 0.70 | 0.837 | 2.1 | 118 | 67 | 67 |
| B-1 | 0.68 | 0.825 | 2.0 | 114 | 67 | 67 |
| B-1 | 0.65 | 0.806 | 1.9 | 118 | 68 | 67 |
| B-1 | 0.61 | 0.781 | 1.8 | 112 | 67 | 67 |
| B-2 | 0.65 | 0.806 | 2.0 | 117 | 67 | 67 |
| B-2 | 0.65 | 0.806 | 2.0 | 114 | 65 | 66 |
| B-2 | 0.62 | 0.787 | 1.9 | 116 | 65 | 66 |
| B-3 | 0.63 | 0.794 | 1.9 | 113 | 65 | 65 |
| B-3 | 0.71 | 0.843 | 2.1 | 112 | 64 | 65 |
| B-3 | 0.65 | 0.806 | 2.0 | 104 | 63 | 64 |
| B-4 | 0.68 | 0.825 | 2.0 | 122 | 63 | 64 |
| B-4 | 0.64 | 0.800 | 1.9 | 117 | 63 | 64 |
| B-4 | 0.68 | 0.825 | 2.0 | 122 | 62 | 63 |
| B-5 | 0.62 | 0.787 | 1.9 | 121 | 63 | 63 |
| B-5 | 0.67 | 0.819 | 2.0 | 116 | 62 | 61 |
| B-5 | 0.67 | 0.819 | 2.0 | 112 | 62 | 61 |
| B-6 | 0.66 | 0.812 | 2.0 | 127 | 62 | 61 |
| B-6 | 0.67 | 0.819 | 2.0 | 104 | 61 | 60 |
| B-6 | 0.70 | 0.837 | 2.1 | 120 | 61 | 60 |
| B-7 | 0.70 | 0.837 | 2.1 | 111 | 60 | 59 |
| B-7 | 0.67 | 0.819 | 2.0 | 118 | 59 | 59 |
| B-7 | 0.67 | 0.819 | 2.0 | 117 | 59 | 58 |
| B-8 | 0.65 | 0.806 | 2.0 | 134 | 59 | 58 |
| B-8 | 0.66 | 0.812 | 2.0 | 114 | 59 | 58 |
| B-8 | 0.68 | 0.825 | 2.0 | 123 | 59 | 58 |
| B-9 | 0.65 | 0.806 | 2.0 | 116 | 59 | 55 |
| B-9 | 0.69 | 0.831 | 2.1 | 104 | 58 | 57 |
| B-9 | 0.67 | 0.819 | 2.0 | 113 | 58 | 57 |
| B-10 | 0.67 | 0.819 | 2.0 | 111 | 57 | 57 |
| B-10 | 0.65 | 0.806 | 2.0 | 104 | 57 | 56 |
| B-10 | 0.64 | 0.800 | 1.9 | 107 | 57 | 56 |
| B-11 | 0.66 | 0.812 | 2.0 | 104 | 57 | 56 |
| B-11 | 0.67 | 0.819 | 2.0 | 105 | 56 | 55 |
| B-11 | 0.66 | 0.812 | 2.0 | 102 | 56 | 55 |
| B-12 | 0.67 | 0.819 | 2.0 | 103 | 55 | 55 |
| B-12 | 0.64 | 0.800 | 1.9 | 106 | 55 | 54 |
| B-12 | 0.65 | 0.806 | 2.0 | 114 | 55 | 54 |
| Average | 0.69 | 0.8277 | 2.05 | 115.6 | | 62.5 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 194.651 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 346.318 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 151.667 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 363.6 | 351.1 | 12.5 | | | 0.0 |
| 2 | 695.8 | 699.4 | -3.6 | | | 0.0 |
| 3 | 698.7 | 704.5 | -5.8 | | | 0.0 |
| 4 | 601.9 | 599.7 | 2.2 | | | 0.0 |
| 5 | 836.2 | 788.4 | 47.8 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 3196.2 | 3143.1 | 53.1 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - Vi) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 25-26, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 1 |
| Unit: | Pushing Baghouse | Test Start Time: | 8:27 AM |
| Unit Operation: | Normal | Test Finish Time: | 6:12 AM |

**USEPA Method 23 Individual Emission Rates**

| Compound | | Mass (pg) | Mass (µg) | Adjusted TEF Mass (µg) | Raw Concentration (µg/m³) | Raw ER (lb/hr) | TEF Conc. (µg/m³) | TEF Emissions (lb/hr) |
|---|---|---|---|---|---|---|---|---|
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | < | 3.4 | 0.0000034 | 0.0000034 | 7.9E-07 | 3.0E-11 | 7.9E-07 | 3.0E-11 |
| 1,2,3,7,8-Pentachlorodibenzo-p-Dioxin | < | 3.2 | 0.0000032 | 0.0000016 | 7.4E-07 | 2.8E-11 | 3.7E-07 | 1.4E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin | < | 3.2 | 0.0000032 | 0.00000032 | 7.4E-07 | 2.8E-11 | 7.4E-08 | 2.8E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin | < | 3.2 | 0.0000032 | 0.00000032 | 7.4E-07 | 2.8E-11 | 7.4E-08 | 2.8E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin | < | 2.9 | 0.0000029 | 0.00000029 | 6.7E-07 | 2.6E-11 | 6.7E-08 | 2.6E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin | | 5.6 | 0.0000056 | 0.000000056 | 1.3E-06 | 5.0E-11 | 1.3E-08 | 5.0E-13 |
| 2,3,7,8-Tetrachlorodibenzofuran | | 37.7 | 0.0000377 | 0.00000074 | 8.8E-06 | 3.3E-10 | 1.7E-07 | 6.6E-12 |
| 1,2,3,7,8-Pentachlorodibenzofuran | < | 4.3 | 0.0000043 | 0.000000215 | 1.0E-06 | 3.8E-11 | 5.0E-08 | 1.9E-12 |
| 2,3,4,7,8-Pentachlorodibenzofuran | < | 4.3 | 0.0000043 | 0.00000215 | 1.0E-06 | 3.8E-11 | 5.0E-07 | 1.9E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | < | 2.9 | 0.0000029 | 0.00000029 | 6.7E-07 | 2.6E-11 | 6.7E-08 | 2.6E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | < | 2.7 | 0.0000027 | 0.00000027 | 6.3E-07 | 2.4E-11 | 6.3E-08 | 2.4E-12 |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | < | 3 | 0.000003 | 0.0000003 | 7.0E-07 | 2.7E-11 | 7.0E-08 | 2.7E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | < | 3.2 | 0.0000032 | 0.00000032 | 7.4E-07 | 2.8E-11 | 7.4E-08 | 2.8E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | | 4.1 | 0.0000041 | 0.000000041 | 9.5E-07 | 3.6E-11 | 9.5E-09 | 3.6E-13 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | < | 3.3 | 0.0000033 | 0.000000033 | 7.7E-07 | 2.9E-11 | 7.7E-09 | 2.9E-13 |
| | | | | | | | | 9.2E-11 |

**USEPA Method 0010 Individual Emission Rates**

| Compound | | Mass (ug) | Raw Concentration (mg/m³) | Raw Emissions (lb/hr) |
|---|---|---|---|---|
| Acenaphthene | < | 20 | 0.0046 | 1.8E-04 |
| Acenaphthylene | < | 20 | 0.0046 | 1.8E-04 |
| Anthracene | < | 20 | 0.0046 | 1.8E-04 |
| Benz[a]anthracene | < | 20 | 0.0046 | 1.8E-04 |
| Benzo[a]pyrene | < | 20 | 0.0046 | 1.8E-04 |
| Benzo[b]fluoranthene | < | 20 | 0.0046 | 1.8E-04 |
| Benzo[g,h,i]perylene | < | 20 | 0.0046 | 1.8E-04 |
| Benzo[k]fluoranthene | < | 20 | 0.0046 | 1.8E-04 |
| Chrysene | < | 20 | 0.0046 | 1.8E-04 |
| Dibenz[a,h]anthracene | < | 20 | 0.0046 | 1.8E-04 |
| Fluoranthene | < | 20 | 0.0046 | 1.8E-04 |
| Fluorene | < | 20 | 0.0046 | 1.8E-04 |
| Indeno (1,2,3-cd) pyrene | < | 20 | 0.0046 | 1.8E-04 |
| Naphthalene | | 128 | 0.0297 | 1.1E-03 |
| Phenanthrene | < | 20 | 0.0046 | 1.8E-04 |
| Perylene | < | 15 | 0.0035 | 1.3E-04 |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 26-27, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 2 |
| Unit: | Pushing Baghouse | Test Start Time: | 7:33 AM |
| Unit Operation: | Normal | Test Finish Time: | 5:02 AM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 180 | minutes |
| Barometric Pressure (Pbar) | 29.52 | in. Hg |
| Stack Static Pressure (Pg) | 0.10 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 19.94 | % dv |
| CO2 | 0.90 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Semi-vols Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 60.7 | F |
| Stack Temperature (Tsavg) | 121.1 | F |
| Orifice Pressure Drop (dHavg) | 2.929 | in. $H_2O$ |
| GasVelocity Head (dP)^^avg | 0.8173 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | 0 | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 21.48 | hours |
| # of Pushes | 72 | pushes/test |
| Avg. # of pushes per hour | 3.35 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.16 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 51.9 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.447 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.447 | scf |
| Volume Dry Gas Metered (Vm) | 169.192 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 170.962 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 4.791 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 4.841 | dscm |
| Stack Absolute Pressure (Ps) | 29.53 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 580.8 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.56 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1206 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0141 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0141 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.94 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.79 | lb/lb-mole |
| Gas Velocity (Vs) | 48.53 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 82,330 | acfm |
| Standard Gas Flowrate | 73,820 | scfm |
| Dry Standard Gas Flowrate | 72,779 | dscfm |
| Dry Standard Exhaust Gas Flowrate | 328.0 | 1000 lb/hr |
| Actual Gas Flowrate | 2,331 | acm/min |
| Standard Gas Flowrate | 2,090 | scm/min |
| Dry Standard Gas Flowrate | 2,061 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 104.10 | % |

**Dioxin Furan**

| Analyte | | TEF | Raw Data mass (pg) | Adjusted Mass (ng) | TEF Adjusted Amount (ng) |
|---|---|---|---|---|---|
| 2378-TCDD | < | 1 | 3.7 | 0.0037 | 0.0037 |
| 12378-PeCDD | < | 0.5 | 3.8 | 0.0038 | 0.0019 |
| 123478-HxCDD | < | 0.1 | 3.3 | 0.0033 | 0.00033 |
| 123678-HxCDD | < | 0.1 | 3.3 | 0.0033 | 0.00033 |
| 123789-HxCDD | < | 0.1 | 3 | 0.0030 | 0.0003 |
| 1234678-HpCDD | | 0.01 | 6 | 0.0060 | 0.00006 |
| 2378-TCDF (DB 225) | | 0.1 | 36 | 0.0360 | 0.0036 |
| 12378-PeCDF | | 0.05 | 4.5 | 0.0045 | 0.000225 |
| 23478-PeCDF | | 0.5 | 9.3 | 0.0093 | 0.00465 |
| 123478-HxCDF | | 0.1 | 17.5 | 0.0175 | 0.00175 |
| 123678-HxCDF | | 0.1 | 5.5 | 0.0055 | 0.00055 |
| 234678-HxCDF | | 0.1 | 5.5 | 0.0055 | 0.00055 |
| 123789-HxCDF | < | 0.1 | 4.2 | 0.0042 | 0.00042 |
| 1234678-HpCDF | | 0.01 | 15.1 | 0.0151 | 0.000151 |
| 1234789-HpCDF | < | 0.01 | 3.1 | 0.0031 | 0.000031 |
| | | | | TEF ADJUSTED TOTAL | 0.019 |

TEF Factors taken from USEPA 40 CFR, Chapter 1, Part 266, Appendix IX, Table 4.0.1

| | | | |
|---|---|---|---|
| TEF Total Mass Collected | < | 0.019 | ng |
| TEF Emission Concentration | < | 0.004 | ng/$m^3$ |
| TEF Emission Rate | < | 66.2 | ng/hr |
| Emission Rate | < | 1.02E-06 | gr/hr |
| Emission Rate | < | 1.5E-10 | lb/hr |

**ArcelorMittal** **Run 2** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.73 | 0.854 | 3.2 | 114 | 53 | 54 |
| A-1 | 0.77 | 0.877 | 3.4 | 101 | 53 | 54 |
| A-1 | 0.74 | 0.860 | 3.3 | 116 | 53 | 54 |
| A-2 | 0.74 | 0.860 | 3.3 | 103 | 53 | 54 |
| A-2 | 0.80 | 0.894 | 3.5 | 108 | 53 | 54 |
| A-2 | 0.80 | 0.894 | 3.5 | 112 | 53 | 54 |
| A-3 | 0.80 | 0.894 | 3.4 | 116 | 54 | 54 |
| A-3 | 0.78 | 0.883 | 3.4 | 109 | 54 | 54 |
| A-3 | 0.71 | 0.843 | 3.1 | 128 | 54 | 54 |
| A-4 | 0.83 | 0.911 | 3.6 | 118 | 55 | 55 |
| A-4 | 0.74 | 0.860 | 3.3 | 141 | 55 | 55 |
| A-4 | 0.73 | 0.854 | 3.2 | 115 | 55 | 55 |
| A-5 | 0.71 | 0.843 | 3.1 | 135 | 56 | 55 |
| A-5 | 0.71 | 0.843 | 3.1 | 124 | 56 | 56 |
| A-5 | 0.70 | 0.837 | 3.1 | 108 | 57 | 57 |
| A-6 | 0.70 | 0.837 | 3.1 | 112 | 58 | 58 |
| A-6 | 0.74 | 0.860 | 3.3 | 107 | 59 | 58 |
| A-6 | 0.73 | 0.854 | 3.3 | 102 | 59 | 62 |
| A-7 | 0.68 | 0.825 | 2.9 | 114 | 61 | 59 |
| A-7 | 0.68 | 0.825 | 2.0 | 118 | 60 | 59 |
| A-7 | 0.75 | 0.866 | 3.3 | 124 | 60 | 60 |
| A-8 | 0.74 | 0.860 | 3.3 | 115 | 61 | 60 |
| A-8 | 0.75 | 0.866 | 3.3 | 131 | 61 | 60 |
| A-8 | 0.75 | 0.866 | 3.3 | 116 | 61 | 61 |
| A-9 | 0.75 | 0.866 | 3.3 | 120 | 61 | 61 |
| A-9 | 0.76 | 0.872 | 3.3 | 123 | 61 | 61 |
| A-9 | 0.77 | 0.877 | 3.4 | 127 | 62 | 61 |
| A-10 | 0.71 | 0.843 | 3.1 | 138 | 62 | 62 |
| A-10 | 0.68 | 0.825 | 2.8 | 115 | 62 | 62 |
| A-10 | 0.67 | 0.819 | 2.8 | 127 | 62 | 62 |
| A-11 | 0.67 | 0.819 | 2.8 | 117 | 62 | 62 |
| A-11 | 0.66 | 0.812 | 2.8 | 120 | 62 | 62 |
| A-11 | 0.72 | 0.849 | 3.2 | 103 | 62 | 62 |
| A-12 | 0.68 | 0.825 | 2.8 | 124 | 63 | 63 |
| A-12 | 0.66 | 0.812 | 2.8 | 108 | 63 | 63 |
| A-12 | 0.67 | 0.819 | 2.8 | 120 | 63 | 63 |
| B-1 | 0.81 | 0.900 | 3.5 | 120 | 63 | 63 |
| B-1 | 0.83 | 0.911 | 3.6 | 120 | 63 | 63 |
| B-1 | 0.82 | 0.906 | 3.6 | 122 | 63 | 63 |
| B-2 | 0.81 | 0.900 | 3.5 | 139 | 63 | 63 |
| B-2 | 0.74 | 0.860 | 3.3 | 119 | 63 | 63 |
| B-2 | 0.74 | 0.860 | 3.3 | 103 | 63 | 63 |
| B-3 | 0.77 | 0.877 | 3.4 | 114 | 63 | 63 |
| B-3 | 0.80 | 0.894 | 3.5 | 117 | 63 | 63 |
| B-3 | 0.77 | 0.877 | 3.4 | 111 | 63 | 63 |
| B-4 | 0.81 | 0.900 | 3.5 | 115 | 63 | 63 |
| B-4 | 0.78 | 0.883 | 3.4 | 117 | 63 | 63 |
| B-4 | 0.76 | 0.872 | 3.3 | 119 | 63 | 63 |
| B-5 | 0.75 | 0.866 | 3.3 | 114 | 63 | 63 |
| B-5 | 0.73 | 0.854 | 3.2 | 145 | 63 | 63 |
| B-5 | 0.62 | 0.787 | 2.7 | 109 | 63 | 63 |
| B-6 | 0.60 | 0.775 | 2.6 | 130 | 63 | 63 |
| B-6 | 0.58 | 0.762 | 2.6 | 123 | 63 | 63 |
| B-6 | 0.58 | 0.762 | 2.6 | 139 | 63 | 63 |
| B-7 | 0.57 | 0.755 | 2.5 | 126 | 63 | 63 |
| B-7 | 0.61 | 0.781 | 2.7 | 124 | 63 | 63 |
| B-7 | 0.56 | 0.748 | 2.4 | 141 | 63 | 63 |
| B-8 | 0.54 | 0.735 | 2.4 | 115 | 63 | 63 |
| B-8 | 0.55 | 0.742 | 2.4 | 135 | 63 | 63 |
| B-8 | 0.54 | 0.735 | 2.4 | 131 | 63 | 63 |
| B-9 | 0.50 | 0.707 | 2.2 | 135 | 63 | 63 |
| B-9 | 0.50 | 0.707 | 2.2 | 141 | 63 | 63 |
| B-9 | 0.48 | 0.693 | 2.1 | 137 | 63 | 63 |
| B-10 | 0.52 | 0.721 | 2.3 | 119 | 63 | 63 |
| B-10 | 0.49 | 0.700 | 2.2 | 120 | 63 | 63 |
| B-10 | 0.48 | 0.693 | 2.1 | 125 | 63 | 63 |
| B-11 | 0.46 | 0.678 | 2.0 | 143 | 63 | 63 |
| B-11 | 0.44 | 0.663 | 1.9 | 127 | 63 | 63 |
| B-11 | 0.44 | 0.663 | 1.9 | 122 | 63 | 63 |
| B-12 | 0.43 | 0.656 | 1.9 | 126 | 63 | 63 |
| B-12 | 0.43 | 0.656 | 1.9 | 118 | 63 | 63 |
| B-12 | 0.44 | 0.663 | 1.9 | 132 | 63 | 63 |
| Average | 0.67 | 0.8173 | 2.93 | 121.1 | | 60.7 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 348.231 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 517.423 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 169.192 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 371.5 | 367.5 | 4.0 | | | 0.0 |
| 2 | 698.8 | 696.5 | 2.3 | | | 0.0 |
| 3 | 676.9 | 675.6 | 1.3 | | | 0.0 |
| 4 | 614.9 | 614.2 | 0.7 | | | 0.0 |
| 5 | 846.0 | 802.4 | 43.6 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 3208.1 | 3156.2 | 51.9 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - $V_i$) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 26-27, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 2 |
| Unit: | Pushing Baghouse | Test Start Time: | 7:33 AM |
| Unit Operation: | Normal | Test Finish Time: | 5:02 AM |

**USEPA Method 23 Individual Emission Rates**

| Compound | | Mass (pg) | Mass (µg) | Adjusted TEF Mass (µg) | Raw Concentration (µg/m³) | Raw ER (lb/hr) | TEF Conc. (µg/m³) | TEF Emissions (lb/hr) |
|---|---|---|---|---|---|---|---|---|
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | < | 3.7 | 0.0000037 | 0.0000037 | 7.6E-07 | 2.9E-11 | 7.6E-07 | 2.9E-11 |
| 1,2,3,7,8-Pentachlorodibenzo-p-Dioxin | < | 3.8 | 0.0000038 | 0.0000019 | 7.8E-07 | 3.0E-11 | 3.9E-07 | 1.5E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin | < | 3.3 | 0.0000033 | 0.00000033 | 6.8E-07 | 2.6E-11 | 6.8E-08 | 2.6E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin | < | 3.3 | 0.0000033 | 0.00000033 | 6.8E-07 | 2.6E-11 | 6.8E-08 | 2.6E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin | < | 3 | 0.000003 | 0.0000003 | 6.2E-07 | 2.4E-11 | 6.2E-08 | 2.4E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin | | 6 | 0.000006 | 0.00000006 | 1.2E-06 | 4.7E-11 | 1.2E-08 | 4.7E-13 |
| 2,3,7,8-Tetrachlorodibenzofuran | | 36 | 0.000036 | 0.0000036 | 7.4E-06 | 2.8E-10 | 7.4E-07 | 2.8E-11 |
| 1,2,3,7,8-Pentachlorodibenzofuran | | 4.5 | 0.0000045 | 0.000000225 | 9.3E-07 | 3.5E-11 | 4.6E-08 | 1.8E-12 |
| 2,3,4,7,8-Pentachlorodibenzofuran | | 9.3 | 0.0000093 | 0.00000465 | 1.9E-06 | 7.3E-11 | 9.6E-07 | 3.7E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | | 17.5 | 0.0000175 | 0.00000175 | 3.6E-06 | 1.4E-10 | 3.6E-07 | 1.4E-11 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | | 5.5 | 0.0000055 | 0.00000055 | 1.1E-06 | 4.3E-11 | 1.1E-07 | 4.3E-12 |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | | 5.5 | 0.0000055 | 0.00000055 | 1.1E-06 | 4.3E-11 | 1.1E-07 | 4.3E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | < | 4.2 | 0.0000042 | 0.00000042 | 8.7E-07 | 3.3E-11 | 8.7E-08 | 3.3E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | | 15.1 | 0.0000151 | 0.000000151 | 3.1E-06 | 1.2E-10 | 3.1E-08 | 1.2E-12 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | < | 3.1 | 0.0000031 | 0.000000031 | 6.4E-07 | 2.4E-11 | 6.4E-09 | 2.4E-13 |
| | | | | | | | | 1.5E-10 |

**USEPA Method 0010 Individual Emission Rates**

| Compound | | Mass (ug) | Raw Concentration (mg/m³) | Raw Emissions (lb/hr) |
|---|---|---|---|---|
| Acenaphthene | < | 20 | 0.0041 | 1.6E-04 |
| Acenaphthylene | < | 20 | 0.0041 | 1.6E-04 |
| Anthracene | < | 20 | 0.0041 | 1.6E-04 |
| Benz[a]anthracene | < | 20 | 0.0041 | 1.6E-04 |
| Benzo[a]pyrene | < | 20 | 0.0041 | 1.6E-04 |
| Benzo[b]fluoranthene | < | 20 | 0.0041 | 1.6E-04 |
| Benzo[g,h,i]perylene | < | 20 | 0.0041 | 1.6E-04 |
| Benzo[k]fluoranthene | < | 20 | 0.0041 | 1.6E-04 |
| Chrysene | < | 20 | 0.0041 | 1.6E-04 |
| Dibenz[a,h]anthracene | < | 20 | 0.0041 | 1.6E-04 |
| Fluoranthene | < | 20 | 0.0041 | 1.6E-04 |
| Fluorene | < | 20 | 0.0041 | 1.6E-04 |
| Indeno (1,2,3-cd) pyrene | < | 20 | 0.0041 | 1.6E-04 |
| Naphthalene | | 184 | 0.0380 | 1.4E-03 |
| Phenanthrene | < | 20 | 0.0041 | 1.6E-04 |
| Perylene | < | 15 | 0.0031 | 1.2E-04 |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 27-28, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 3 |
| Unit: | Pushing Baghouse | Test Start Time: | 5:49 AM |
| Unit Operation: | Normal | Test Finish Time: | 2:22 AM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 180 | minutes |
| Barometric Pressure (Pbar) | 29.19 | in. Hg |
| Stack Static Pressure (Pg) | 0.10 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.255 | inches |
| O2 | 20.02 | % dv |
| CO2 | 0.82 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Semi-vols Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 67.2 | F |
| Stack Temperature (Tsavg) | 123.4 | F |
| Orifice Pressure Drop (dHavg) | 2.711 | in. $H_2O$ |
| GasVelocity Head (dP)^^avg | 0.7871 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | 0 | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 20.55 | hours |
| # of Pushes | 72 | pushes/test |
| Avg. # of pushes per hour | 3.50 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.16 | % dv |
| Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$ - $W_i$) | 53.2 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 2.508 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 2.508 | scf |
| Volume Dry Gas Metered (Vm) | 166.674 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 164.381 | dscf |
| Volume Dry Gas Metered ($Vm(m^3)$) | 4.720 | dacm |
| Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 4.655 | dscm |
| Stack Absolute Pressure (Ps) | 29.20 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 583.0 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 3.79 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1297 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0150 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0150 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.93 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.77 | lb/lb-mole |
| Gas Velocity (Vs) | 47.10 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 79.908 | acfm |
| Standard Gas Flowrate | 70.576 | scfm |
| Dry Standard Gas Flowrate | 69.516 | dscfm |
| Dry Standard Exhaust Gas Flowrate | 313.2 | 1000 lb/hr |
| Actual Gas Flowrate | 2.263 | acm/min |
| Standard Gas Flowrate | 1.999 | scm/min |
| Dry Standard Gas Flowrate | 1.968 | dscm/min |
| Area Nozzle (An) | 0.000355 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 104.79 | % |

**Dioxin Furan**

| Analyte | | TEF | Raw Data mass (pg) | Adjusted Mass (ng) | TEF Adjusted Amount (ng) |
|---|---|---|---|---|---|
| 2378-TCDD | < | 1 | 3.4 | 0.0034 | 0.0034 |
| 12378-PeCDD | < | 0.5 | 3 | 0.0030 | 0.0015 |
| 123478-HxCDD | < | 0.1 | 3 | 0.0030 | 0.0003 |
| 123678-HxCDD | < | 0.1 | 3 | 0.0030 | 0.0003 |
| 123789-HxCDD | < | 0.1 | 2.8 | 0.0028 | 0.00028 |
| 1234678-HpCDD | | 0.01 | 5 | 0.0050 | 0.00005 |
| 2378-TCDF (DB 225) | | 0.1 | 3.9 | 0.0039 | 0.00039 |
| 12378-PeCDF | < | 0.05 | 2.7 | 0.0027 | 0.000135 |
| 23478-PeCDF | < | 0.5 | 2.7 | 0.0027 | 0.00135 |
| 123478-HxCDF | < | 0.1 | 3.3 | 0.0033 | 0.00033 |
| 123678-HxCDF | < | 0.1 | 3.2 | 0.0032 | 0.00032 |
| 234678-HxCDF | < | 0.1 | 3.5 | 0.0035 | 0.00035 |
| 123789-HxCDF | < | 0.1 | 3.6 | 0.0036 | 0.00036 |
| 1234678-HpCDF | | 0.01 | 3.1 | 0.0031 | 0.000031 |
| 1234789-HpCDF | < | 0.01 | 3.1 | 0.0031 | 0.000031 |
| TEF Factors taken from USEPA 40 CFR, Chapter I, Part 266, Appendix IX, Table 4.0.1 | | | | TEF ADJUSTED TOTAL | 0.009 |

| | | | |
|---|---|---|---|
| TEF Total Mass Collected | < | 0.009 | ng |
| TEF Emission Concentration | < | 0.002 | $ng/m^3$ |
| TEF Emission Rate | < | 33.8 | ng/hr |
| Emission Rate | < | 5.22E-07 | gr/hr |
| Emission Rate | < | 7.5E-11 | lb/hr |

**ArcelorMittal** **Run 3** **F or C?**

**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)^1/2 | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.70 | 0.837 | 3.1 | 113 | 64 | 64 |
| A-1 | 0.69 | 0.831 | 3.0 | 113 | 64 | 64 |
| A-1 | 0.72 | 0.849 | 3.2 | 116 | 64 | 64 |
| A-2 | 0.71 | 0.843 | 3.1 | 116 | 64 | 64 |
| A-2 | 0.72 | 0.849 | 3.2 | 129 | 64 | 64 |
| A-2 | 0.72 | 0.849 | 3.2 | 119 | 63 | 63 |
| A-3 | 0.70 | 0.837 | 3.1 | 118 | 63 | 63 |
| A-3 | 0.70 | 0.837 | 3.1 | 126 | 64 | 64 |
| A-3 | 0.71 | 0.843 | 3.1 | 122 | 64 | 64 |
| A-4 | 0.72 | 0.849 | 3.2 | 132 | 64 | 64 |
| A-4 | 0.73 | 0.854 | 3.2 | 118 | 64 | 64 |
| A-4 | 0.74 | 0.860 | 3.4 | 134 | 64 | 64 |
| A-5 | 0.79 | 0.889 | 3.5 | 108 | 66 | 65 |
| A-5 | 0.76 | 0.872 | 0.4 | 133 | 66 | 65 |
| A-5 | 0.74 | 0.860 | 3.1 | 127 | 67 | 66 |
| A-6 | 0.75 | 0.866 | 3.4 | 121 | 67 | 66 |
| A-6 | 0.71 | 0.843 | 3.1 | 124 | 67 | 66 |
| A-6 | 0.55 | 0.742 | 2.4 | 153 | 68 | 67 |
| A-7 | 0.54 | 0.735 | 2.4 | 131 | 69 | 68 |
| A-7 | 0.45 | 0.671 | 2.0 | 148 | 70 | 70 |
| A-7 | 0.40 | 0.632 | 1.7 | 127 | 70 | 70 |
| A-8 | 0.40 | 0.632 | 1.7 | 113 | 70 | 70 |
| A-8 | 0.79 | 0.889 | 3.5 | 113 | 70 | 70 |
| A-8 | 0.76 | 0.872 | 3.4 | 118 | 70 | 70 |
| A-9 | 0.70 | 0.837 | 3.1 | 127 | 70 | 70 |
| A-9 | 0.65 | 0.806 | 2.9 | 123 | 70 | 70 |
| A-9 | 0.65 | 0.806 | 2.9 | 122 | 71 | 70 |
| A-10 | 0.65 | 0.806 | 2.9 | 122 | 71 | 70 |
| A-10 | 0.65 | 0.806 | 2.9 | 129 | 70 | 71 |
| A-10 | 0.65 | 0.806 | 2.9 | 128 | 70 | 70 |
| A-11 | 0.69 | 0.831 | 3.0 | 137 | 70 | 71 |
| A-11 | 0.69 | 0.831 | 3.0 | 117 | 70 | 70 |
| A-11 | 0.69 | 0.831 | 3.0 | 128 | 70 | 70 |
| A-12 | 0.66 | 0.812 | 2.9 | 121 | 71 | 70 |
| A-12 | 0.75 | 0.866 | 3.3 | 129 | 71 | 71 |
| A-12 | 0.65 | 0.806 | 2.9 | 127 | 71 | 71 |
| B-1 | 0.64 | 0.800 | 2.9 | 134 | 72 | 71 |
| B-1 | 0.70 | 0.837 | 3.1 | 129 | 72 | 71 |
| B-1 | 0.66 | 0.812 | 3.0 | 141 | 72 | 72 |
| B-2 | 0.65 | 0.806 | 2.9 | 127 | 72 | 72 |
| B-2 | 0.68 | 0.825 | 2.9 | 138 | 72 | 71 |
| B-2 | 0.67 | 0.819 | 2.9 | 112 | 70 | 71 |
| B-3 | 0.75 | 0.866 | 3.4 | 121 | 70 | 70 |
| B-3 | 0.66 | 0.812 | 3.0 | 119 | 70 | 70 |
| B-3 | 0.65 | 0.806 | 2.9 | 144 | 70 | 70 |
| B-4 | 0.65 | 0.806 | 2.9 | 138 | 69 | 70 |
| B-4 | 0.70 | 0.837 | 3.1 | 154 | 69 | 69 |
| B-4 | 0.68 | 0.825 | 3.0 | 137 | 69 | 69 |
| B-5 | 0.66 | 0.812 | 2.9 | 169 | 69 | 69 |
| B-5 | 0.62 | 0.787 | 2.7 | 136 | 69 | 69 |
| B-5 | 0.67 | 0.819 | 2.9 | 106 | 68 | 68 |
| B-6 | 0.63 | 0.794 | 2.8 | 120 | 67 | 68 |
| B-6 | 0.62 | 0.787 | 2.7 | 112 | 67 | 68 |
| B-6 | 0.62 | 0.787 | 2.7 | 117 | 66 | 67 |
| B-7 | 0.64 | 0.800 | 2.8 | 106 | 66 | 67 |
| B-7 | 0.62 | 0.787 | 2.7 | 113 | 66 | 67 |
| B-7 | 0.58 | 0.762 | 2.5 | 114 | 66 | 66 |
| B-8 | 0.48 | 0.693 | 2.1 | 113 | 66 | 66 |
| B-8 | 0.46 | 0.678 | 2.0 | 114 | 65 | 66 |
| B-8 | 0.46 | 0.678 | 2.0 | 120 | 65 | 66 |
| B-9 | 0.44 | 0.663 | 1.9 | 110 | 65 | 65 |
| B-9 | 0.44 | 0.663 | 1.9 | 110 | 64 | 65 |
| B-9 | 0.43 | 0.656 | 1.9 | 109 | 64 | 64 |
| B-10 | 0.44 | 0.663 | 1.9 | 119 | 64 | 64 |
| B-10 | 0.45 | 0.671 | 1.9 | 111 | 64 | 64 |
| B-10 | 0.48 | 0.693 | 2.1 | 128 | 63 | 64 |
| B-11 | 0.46 | 0.678 | 2.0 | 112 | 64 | 63 |
| B-11 | 0.47 | 0.686 | 2.1 | 120 | 63 | 64 |
| B-11 | 0.48 | 0.693 | 2.1 | 109 | 63 | 63 |
| B-12 | 0.46 | 0.678 | 2.0 | 113 | 63 | 63 |
| B-12 | 0.50 | 0.707 | 2.2 | 109 | 63 | 63 |
| B-12 | 0.49 | 0.700 | 2.2 | 117 | 63 | 63 |
| Average | 0.625 | 0.787 | 2.71 | 123.4 | | 67.2 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 521.100 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 687.774 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 166.674 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 367.7 | 354.9 | 12.8 | | | 0.0 |
| 2 | 693.4 | 697.0 | -3.6 | | | 0.0 |
| 3 | 695.2 | 701.0 | -5.8 | | | 0.0 |
| 4 | 603.1 | 600.9 | 2.2 | | | 0.0 |
| 5 | 812.2 | 764.6 | 47.6 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 3171.6 | 3118.4 | 53.2 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - Vi) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Oct. 27-28, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 3 |
| Unit: | Pushing Baghouse | Test Start Time: | 5:49 AM |
| Unit Operation: | Normal | Test Finish Time: | 2:22 AM |

**USEPA Method 23 Individual Emission Rates**

| Compound | | Mass (pg) | Mass (µg) | Adjusted TEF Mass (µg) | Raw Concentration (µg/m³) | Raw ER (lb/hr) | TEF Conc. (µg/m³) | TEF Emissions (lb/hr) |
|---|---|---|---|---|---|---|---|---|
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | < | 3.4 | 0.0000034 | 0.0000034 | 7.3E-07 | 2.8E-11 | 7.3E-07 | 2.8E-11 |
| 1,2,3,7,8-Pentachlorodibenzo-p-Dioxin | < | 3 | 0.000003 | 0.0000015 | 6.4E-07 | 2.4E-11 | 3.2E-07 | 1.2E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin | < | 3 | 0.000003 | 0.0000003 | 6.4E-07 | 2.4E-11 | 6.4E-08 | 2.4E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin | < | 3 | 0.000003 | 0.0000003 | 6.4E-07 | 2.4E-11 | 6.4E-08 | 2.4E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin | < | 2.8 | 0.0000028 | 0.00000028 | 6.0E-07 | 2.3E-11 | 6.0E-08 | 2.3E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin | | 5 | 0.000005 | 0.00000005 | 1.1E-06 | 4.1E-11 | 1.1E-08 | 4.1E-13 |
| 2,3,7,8-Tetrachlorodibenzofuran | | 3.9 | 0.0000039 | 0.00000039 | 8.4E-07 | 3.2E-11 | 8.4E-08 | 3.2E-12 |
| 1,2,3,7,8-Pentachlorodibenzofuran | < | 2.7 | 0.0000027 | 0.000000135 | 5.8E-07 | 2.2E-11 | 2.9E-08 | 1.1E-12 |
| 2,3,4,7,8-Pentachlorodibenzofuran | < | 2.7 | 0.0000027 | 0.00000135 | 5.8E-07 | 2.2E-11 | 2.9E-07 | 1.1E-11 |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | < | 3.3 | 0.0000033 | 0.00000033 | 7.1E-07 | 2.7E-11 | 7.1E-08 | 2.7E-12 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | < | 3.2 | 0.0000032 | 0.00000032 | 6.9E-07 | 2.6E-11 | 6.9E-08 | 2.6E-12 |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | < | 3.5 | 0.0000035 | 0.00000035 | 7.5E-07 | 2.9E-11 | 7.5E-08 | 2.9E-12 |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | < | 3.6 | 0.0000036 | 0.00000036 | 7.7E-07 | 2.9E-11 | 7.7E-08 | 2.9E-12 |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | | 3.1 | 0.0000031 | 0.000000031 | 6.7E-07 | 2.5E-11 | 6.7E-09 | 2.5E-13 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | < | 3.1 | 0.0000031 | 0.000000031 | 6.7E-07 | 2.5E-11 | 6.7E-09 | 2.5E-13 |
| | | | | | | | | 7.5E-11 |

**USEPA Method 0010 Individual Emission Rates**

| Compound | | Mass (ug) | Raw Concentration (mg/m³) | Raw Emissions (lb/hr) |
|---|---|---|---|---|
| Acenaphthene | < | 20 | 0.0043 | 1.6E-04 |
| Acenaphthylene | < | 20 | 0.0043 | 1.6E-04 |
| Anthracene | < | 20 | 0.0043 | 1.6E-04 |
| Benz[a]anthracene | < | 20 | 0.0043 | 1.6E-04 |
| Benzo[a]pyrene | < | 20 | 0.0043 | 1.6E-04 |
| Benzo[b]fluoranthene | < | 20 | 0.0043 | 1.6E-04 |
| Benzo[g,h,i]perylene | < | 20 | 0.0043 | 1.6E-04 |
| Benzo[k]fluoranthene | < | 20 | 0.0043 | 1.6E-04 |
| Chrysene | < | 20 | 0.0043 | 1.6E-04 |
| Dibenz[a,h]anthracene | < | 20 | 0.0043 | 1.6E-04 |
| Fluoranthene | < | 20 | 0.0043 | 1.6E-04 |
| Fluorene | < | 20 | 0.0043 | 1.6E-04 |
| Indeno (1,2,3-cd) pyrene | < | 20 | 0.0043 | 1.6E-04 |
| Naphthalene | | 301 | 0.0647 | 2.5E-03 |
| Phenanthrene | < | 20 | 0.0043 | 1.6E-04 |
| Perylene | < | 15 | 0.0032 | 1.2E-04 |

# This page intentionally left blank

# MONTROSE METHOD 23 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Client: | Arcelor Mittal | Test Type: | Method 0010/23 | Meter ΔH : | 1.971 | Start Time: | 0827 10/25/16 |
| Date: | 10/25/16 - 10/26/16 | Run Number: | 1 | Meter Correction (γ): | 1.003 | Stop Time: | 0612 10/26/16 |
| Plant: | Monessen, PA | Nozzle Diameter (inches): | 0.255 | Pitot Correction: | 0.84 | T/C ID: | 7-9 |
| Sampling Location: | PEC Stack Outlet | Static Press (in. $H_2O$): | 0.1 | Control Box ID: | 1618 | Probe ID: | 7-9 |
| | | Baro. Pres. (in. Hg): | 29.44 | Assumed Moisture (%): | 3 | Pitot ID: | 7-9 |
| Project Number: | Proj106377 (16-167) | Ambient Temp (°F): | 43 | Umbilical Length (Feet): | 200' | Filter ID: | NA / trap#1 |
| Test Crew: | BC JW CB TM | Initial K-factor | 3.0 4.4 | | | Stack Diameter (inches): | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume (ft³) 194.651 | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-1 | 0:02:30 | 197.629 | 0.74 | 2.2 | 8 | 101 | 252 | 254 | 41 | 42 | 59 | 58 | Push @ 0827 |
| A-1 | 0:05:00 | 200.607 | 0.72 | 2.2 | 8 | 120 | 253 | 256 | 45 | 41 | 59 | 60 | Push @ 0906 |
| A-1 | 0:07:30 | 203.585 | 0.72 | 2.2 | 8 | 104 | 251 | 253 | 47 | 41 | 60 | 59 | Push @ 0918 |
| A-2 | 0:10:00 | 206.563 | 0.72 | 2.2 | 8 | 126 | 256 | 251 | 48 | 40 | 60 | 60 | Push @ 0931 |
| A-2 | 0:12:30 | 209.043 | 0.75 | 2.3 | 9 | 123 | 251 | 253 | 46 | 40 | 61 | 60 | Push @ 0946 |
| A-2 | 0:15:00 | 211.363 | 0.76 | 2.3 | 9 | 102 | 249 | 252 | 46 | 43 | 61 | 60 | Push @ 1038 |
| A-3 | 0:17:30 | 213.223 | 0.75 | 2.2 | 7 | 121 | 255 | 249 | 50 | 50 | 63 | 62 | Push @ 1048 |
| A-3 | 0:20:00 | 215.333 | 0.75 | 2.2 | 7 | 116 | 760 | 252 | 49 | 46 | 64 | 63 | Push @ 1101 |
| A-3 | 0:22:30 | 217.353 | 0.75 | 2.2 | 8 | 120 | 254 | 251 | 49 | 46 | 64 | 63 | Push @ 1116 |
| A-4 | 0:25:00 | 219.463 | 0.74 | 2.2 | 8 | 117 | 248 | 254 | 49 | 46 | 64 | 63 | Push @ 1130 |
| A-4 | 0:27:30 | 221.405 | 0.68 | 2.0 | 7 | 114 | 249 | 254 | 51 | 48 | 64 | 63 | Push @ 1143 |
| A-4 | 0:30:00 | 222.993 | 0.69 | 2.1 | 8 | 102 | 250 | 250 | 52 | 51 | 64 | 64 | Push @ 1211 |
| A-5 | 0:32:30 | 225.203 | 0.68 | 2.0 | 7 | 119 | 252 | 255 | 52 | 52 | 65 | 65 | Push @ 1224 |
| A-5 | 0:35:00 | 227.273 | 0.68 | 2.0 | 7 | 114 | 251 | 256 | 53 | 53 | 65 | 64 | Push @ 1239 |
| A-5 | 0:37:30 | 229.263 | 0.70 | 2.1 | 7 | 127 | 250 | 254 | 48 | 43 | 65 | 65 | Push @ 1256 |
| A-6 | 0:40:00 | 231.233 | 0.65 | 2.0 | 8 | 117 | 249 | 251 | 47 | 43 | 66 | 65 | Push @ ~~1255~~ 1322 |
| A-6 | 0:42:30 | 233.243 | 0.70 | 2.1 | 8 | 122 | 251 | 255 | 45 | 41 | 64 | 64 | Push @ 1341 |
| A-6 | 0:45:00 | 235.223 | 0.66 | 2.0 | 8 | 119 | 250 | 249 | 46 | 42 | 65 | 64 | Push @ 1351 |
| A-7 | 0:47:30 | 237.265 | 0.65 | 2.0 | 8 | 115 | 250 | 251 | 48 | 44 | 65 | 64 | Push @ 1404 |
| A-7 | 0:50:00 | 240.153 | 0.67 | 2.0 | 8 | 113 | 252 | 251 | 48 | 44 | 65 | 64 | Push @ 1416 |
| A-7 | 0:52:30 | 241.113 | 0.67 | 2.0 | 8 | 114 | 248 | 249 | 48 | 44 | 65 | 65 | Push @ 1427 |
| A-8 | 0:55:00 | 243.143 | 0.67 | 2.0 | 8 | 117 | 250 | 249 | 50 | 48 | 66 | 65 | Push @ 1448 |
| A-8 | 0:57:30 | 245.103 | 0.65 | 2.0 | 8 | 115 | 252 | 253 | 50 | 49 | 66 | 65 | Push @ 1504 |
| A-8 | 1:00:00 | 247.173 | 0.66 | 2.0 | 8 | 112 | 252 | 256 | 52 | 51 | 66 | 66 | Push @ 1533 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.000 |
| Check | Final | 11 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |

Fyrite Kit ID: NA Fyrite $O_2$ Check %

Balance ID: BAL-017

Reference Weight (200g): NA Tolerance = +/- 0.5 g

Reference Weight (500g): 500.0 Tolerance = +/- 0.5 g

| Imp | Contents | Final | Initial | Difference | |
|---|---|---|---|---|---|
| 1 | Empty (mL) | 363.6 | ~~0~~ | | 351.1 |
| 2 | $H_2O$ (mL) | ~~695.8~~ 695.8 | ~~100~~ | | 699.4 |
| 3 | $H_2O$ (mL) | 698.7 | ~~100~~ | | 704.5 |
| 4 | Empty (mL) | 601.9 | ~~0~~ | | 599.1 |
| 5 | Silica (g) | 836.2 | | | 788.4 |

# MONTROSE METHOD 23 DATA SHEET

**Client:** ~~#REF!~~ ArcelorMittal **Test Type:** Method 0010/23 **Project Number:** Proj106377 (16-167)

**Date:** 10/25/16 - 10/26/16 **Run Number:** 1 **Sampling Location:** PEC Stack Outlet

**Test Crew:** BC JW CB TM

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-9 | 1:02:30 | 249.233 | 0.84 | 2.5 | 9 | 125 | 254 | 249 | 52 | 52 | 67 | 66 | Push @ 1549 |
| A-9 | 1:05:00 | 251.363 | 0.80 | 2.4 | 8 | 118 | 252 | 248 | 52 | 53 | 67 | 67 | Push @ 1613 |
| A-9 | 1:07:30 | 253.513 | 0.80 | 2.4 | 9 | 116 | 254 | 249 | 56 | 54 | 67 | 67 | Push @ 1628 |
| A-10 | 1:10:00 | 255.593 | 0.76 | 2.3 | 9 | 136 | 251 | 250 | 54 | 55 | 67 | 67 | Push @ 1643 |
| A-10 | 1:12:30 | 257.633 | 0.68 | 2.0 | 8 | 136 | 250 | 248 | 56 | 57 | 68 | 67 | Push @ 1655 |
| A-10 | 1:15:00 | 259.693 | 0.71 | 2.1 | 8 | 130 | 252 | 248 | 56 | 57 | 68 | 67 | Push @ 1709 |
| A-11 | 1:17:30 | 261.803 | 0.70 | 2.1 | 8 | 131 | 253 | 250 | 55 | 57 | 67 | 67 | Push @ 1723 |
| A-11 | 1:20:00 | 263.806 | 0.68 | 2.0 | 8 | 117 | 250 | 253 | 55 | 56 | 67 | 67 | Push @ 1807 |
| A-11 | 1:22:30 | 265.703 | 0.70 | 2.1 | 8 | 111 | 251 | 255 | 55 | 57 | 67 | 67 | Push @ 1814 |
| A-12 | 1:25:00 | 267.873 | 0.70 | 2.1 | 8 | 113 | 252 | 256 | 53 | 56 | 67 | 67 | Push @ 1827 |
| A-12 | 1:27:30 | 269.823 | 0.70 | 2.1 | 7 | 115 | 248 | 253 | 53 | ~~67~~ 56 | 67 | 67 | Push @ 1848 54 |
| A-12 | 1:30:00 | 272.003 | 0.70 | 2.1 | 7 | 118 | 251 | 256 | 53 | 56 | 67 | 67 | Push @ 1915 |
| B-1 | 1:32:30 | 273.955 | 0.68 | 2.0 | 7 | 114 | 250 | 258 | 56 | 55 | 67 | 67 | Push @ 1928 |
| B-1 | 1:35:00 | 275.765 | 0.65 | 1.9 | 7 | 118 | 252 | 257 | 53 | 58 | 68 | 67 | Push @ ~~2001~~ 1946 |
| B-1 | 1:37:30 | 277.735 | 0.61 | 1.8 | 6 | 112 | 253 | 257 | 52 | 56 | 67 | 67 | Push @ ~~2014~~ 2001 |
| B-2 | 1:40:00 | 279.675 | 0.65 | 2.0 | 7 | 117 | 252 | 254 | 53 | 56 | 67 | 67 | Push @ 2014 |
| B-2 | 1:42:30 | 281.635 | 0.65 | 2.0 | 7 | 114 | 250 | 254 | 53 | 53 | 65 | 66 | Push @ 2024 |
| B-2 | 1:45:00 | 283.535 | 0.62 | 1.9 | 6 | 116 | 249 | 253 | 53 | 56 | 65 | 66 | Push @ 2050 |
| B-3 | 1:47:30 | 285.435 | 0.63 | 1.9 | 6 | 113 | 248 | 252 | 52 | 56 | 65 | 65 | Push @ 2105 |
| B-3 | 1:50:00 | 287.525 | 0.71 | 2.1 | 7 | 112 | 251 | 257 | 48 | 54 | 64 | 65 | Push @ 2153 |
| B-3 | 1:52:30 | 289.515 | 0.65 | 2.0 | 7 | 104 | 249 | 258 | 48 | 54 | 63 | 64 | Push @ 2207 |
| B-4 | 1:55:00 | 291.505 | 0.68 | 2.0 | 7 | 122 | 256 | 253 | 50 | 55 | 63 | 64 | Push @ 2220 |
| B-4 | 1:57:30 | 293.455 | 0.64 | 1.9 | 6 | 117 | 252 | 255 | 54 | 54 | 63 | 64 | Push @ 2233 |
| B-4 | 2:00:00 | 295.435 | 0.68 | 2.0 | 7 | 122 | 252 | 254 | 51 | 55 | 62 | 63 | Push @ 2246 |
| B-5 | 2:02:30 | 297.365 | ~~0.67~~ JW | ~~1.9~~ JW | 6 | 121 | 252 | 255 | 49 | 55 | 63 | 63 | Push @ ~~0023~~ 2300 ΔP=0.6 |
| B-5 | 2:05:00 | 299.305 | 0.67 | 2.0 | 6 | 116 | 252 | 257 | 47 | 53 | 62 | 61 | Push @ ~~0234~~ ΔH=1.9 |
| B-5 | 2:07:30 | 301.255 | 0.67 | 2.0 | 6 | 112 | 249 | 253 | 46 | 52 | 62 | 61 | Push @ 0023~~46~~ 2333 |
| B-6 | 2:10:00 | 303.195 | 0.66 | 2.0 | 6 | 127 | 248 | 256 | 47 | 53 | 62 | 61 | Push @ 0003 |
| B-6 | 2:12:30 | 305.195 | 0.67 | 2.0 | 6 | 104 | 248 | 257 | 45 | 51 | 61 | 60 | Push @ 0034 |
| B-6 | 2:15:00 | 307.185 | 0.70 | 2.1 | 7 | 120 | 249 | 256 | 45 | 52 | 61 | 60 | Push @ 0049 |
| B-7 | 2:17:30 | 309.205 | 0.70 | 2.1 | 7 | 111 | 250 | 254 | 45 | 51 | 60 | 59 | Push @ 103 |
| B-7 | 2:20:00 | 311.185 | 0.67 | 2.0 | 6 | 118 | 248 | 253 | 44 | 47 | 59 | 59 | Push @ 121 |
| B-7 | 2:22:30 | 313.125 | 0.67 | 2.0 | 6 | 117 | 249 | 256 | 46 | 51 | 59 | 58 | Push @ 133 |
| B-8 | 2:25:00 | 315.055 | 0.65 | 2.0 | 6 | 114 | 250 | 255 | 47 | 52 | 59 | 58 | Push @ 147 |
| B-8 | 2:27:30 | 316.995 | 0.66 | 2.0 | 6 | 114 | 248 | 254 | 43 | 50 | 59 | 58 | Push @ 204 |
| B-8 | 2:30:00 | 318.935 | 0.68 | 2.0 | 6 | 123 | 248 | 251 | 43 | 50 | 59 | 58 | Push @ 221 |
| B-9 | 2:32:30 | 320.875 | 0.65 | 2.0 | 6 | 116 | 249 | 253 | 44 | 50 | 59 | 58 | Push @ 238 |
| B-9 | 2:35:00 | 322.825 | 0.69 | 2.1 | 7 | 104 | 248 | 252 | 44 | 50 | 58 | 57 | Push @ |

# MONTROSE METHOD 23 DATA SHEET

**Client:** ~~#REF!~~ ArcelorMittal **Test Type:** Method 0010/23 **Project Number:** Proj106377 (16-167)

**Date:** 10/25/16 - 10/26/16 **Run Number:** 1 **Sampling Location:** PEC Stack Outlet

**Test Crew:** BC JW CB TM

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-9 | 2:37:30 | ~~328.725~~ | 0.67 | 2.0 | 7 | 113 | 248 | 254 | 46 | 50 | 58 | 57 | Push @ 315 |
| B-10 | 2:40:00 | 328.705 | 0.67 | 2.0 | 7 | 111 | 249 | 251 | 44 | 50 | 57 | 57 | Push @ 332 |
| B-10 | 2:42:30 | 330.605 | 0.65 | 2.0 | 7 | 104 | 248 | 254 | 42 | 49 | 57 | 56 | Push @ 351 |
| B-10 | 2:45:00 | 331.615 | 0.64 | 1.9 | 7 | 107 | 250 | 257 | 43 | 48 | 57 | 56 | Push @ 409 |
| B-11 | 2:47:30 | 334.485 | 0.66 | 2.0 | 7 | 104 | 248 | 250 | 41 | 47 | 57 | 56 | Push @ 430 |
| B-11 | 2:50:00 | 336.455 | 0.67 | 2.0 | 7 | 105 | 249 | 252 | 42 | 48 | 56 | 55 | Push @ 450 |
| B-11 | 2:52:30 | 338.335 | 0.66 | 2.0 | 7 | 102 | 254 | 254 | 40 | 46 | 56 | 55 | Push @ 517 |
| B-12 | 2:55:00 | 340.405 | 0.67 | 2.0 | 7 | 103 | 249 | 254 | 40 | 46 | 55 | 55 | Push @ 541 |
| B-12 | 2:57:30 | 343.403 | 0.64 | 1.9 | 7 | 106 | 250 | 253 | 40 | 46 | 55 | 54 | Push @ 554 |
| B-12 | 3:00:00 | 346.318 | 0.65 | 2.0 | 7 | 114 | 248 | 255 | 40 | 45 | 55 | 54 | Push @ 600 |

326.72

10/26/16

# MONTROSE METHOD 23 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Client: | ArcelorMittal | Test Type: | Method 0010/23 | Meter ΔH : | 1.971 | Start Time: | 0733 10/26/16 |
| Date: | 10/26/16 - 10/27/16 | Run Number: | 2 | Meter Correction (γ): | 1.003 | Stop Time: | 0502 10/27/16 |
| Plant: | Monesson, PA | Nozzle Diameter (inches): | 0.255 | Pitot Correction: | 0.84 | T/C ID: | 7-9 |
| Sampling Location: | PEC Stack Outlet | Static Press (in. $H_2O$): | 0.1 | Control Box ID: | 1618 | Probe ID: | 7-9 |
| | | Baro. Pres. (in. Hg): | 29.52 | Assumed Moisture (%): | 2% | Pitot ID: | 7-9 |
| Project Number: | Proj106377 (16-167) | Ambient Temp (°F): | 37 | Umbilical Length (Feet): | 200' | Filter ID: | |
| Test Crew: | BC JW CB TM | Initial K-factor | 4.4 | | | Stack Diameter (inches): | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume (ft³) 348.231 | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-1 | 0:02:00 | 350.601 | 0.73 | 3.2 | 10 | 114 | 253 | 251 | 38 | 36 | 53 | 54 | Push @ 0733 |
| A-1 | 0:05:00 | 353.111 | 0.77 | 3.4 | 11 | 101 | 253 | 250 | 37 | 36 | 53 | 54 | Push @ 0748 |
| A-1 | 0:07:30 | 355.531 | 0.74 | 3.3 | 11 | 116 | 255 | 253 | 37 | 36 | 53 | 54 | Push @ 0804 |
| A-2 | 0:10:00 | 358.001 | 0.74 | 3.3 | 12 | 103 | 254 | 250 | 37 | 36 | 53 | 54 | Push @ 0820 |
| A-2 | 0:12:30 | 360.991 | 0.80 | 3.5 | 13 | 108 | 256 | 250 | 38 | 38 | 53 | 54 | Push @ 0835 |
| A-2 | 0:15:00 | 363.111 | 0.80 | 3.5 | 13 | 112 | 251 | 249 | 38 | 38 | 53 | 54 | Push @ 0913 |
| A-3 | 0:17:30 | 365.591 | 0.80 | 3.4 | 12 | 116 | 252 | 250 | 40 | 40 | 54 | 54 | Push @ 0931 |
| A-3 | 0:20:00 | 368.021 | 0.78 | 3.4 | 12 | 109 | 250 | 251 | 43 | 39 | 54 | 54 | Push @ 0947 |
| A-3 | 0:22:30 | 370.541 | 0.71 | ~~3.6~~ 3.1 | 13 | 128 | 253 | 254 | 43 | 41 | 54 | 54 | Push @ 1004 |
| A-4 | 0:25:00 | 373.101 | 0.83 | 3.6 | 13 | 118 | 255 | 253 | 44 | 43 | 55 | 55 | Push @ 1016 |
| A-4 | 0:27:30 | 376.041 | 0.74 | 3.3 | 13 | 141 | 253 | 252 | 45 | 42 | 55 | 55 | Push @ 1028 |
| A-4 | 0:30:00 | 377.821 | 0.73 | 3.2 | 12 | 115 | 251 | 254 | 46 | 44 | 55 | 55 | Push @ 1041 |
| A-5 | 0:32:30 | 380.161 | 0.71 | 3.1 | 12 | 135 | 252 | 250 | 47 | 45 | 56 | 55 | Push @ 1052 |
| A-5 | 0:35:00 | 382.571 | 0.71 | 3.1 | 12 | 124 | 250 | 259 | 47 | 45 | 56 | 56 | Push @ 1104 |
| A-5 | 0:37:30 | 385.001 | 0.70 | 3.1 | 12 | 108 | 251 | 254 | 51 | 46 | 57 | 57 | Push @ 1159 |
| A-6 | 0:40:00 | 387.471 | 0.70 | 3.1 | 12 | 112 | 252 | 254 | 51 | 54 | 58 | 58 | Push @ 1218 |
| A-6 | 0:42:30 | 390.151 | 0.74 | 3.3 | 12 | 107 | 250 | 253 | 53 | 53 | 59 | 58 | Push @ 1246 |
| A-6 | 0:45:00 | 392.621 | 0.73 | 3.3 | 12 | 102 | 253 | 252 | 53 | 54 | 59 | 62 | Push @ 1254 |
| A-7 | 0:47:30 | 394.981 | 0.68 | 2.9 | 10 | 114 | 252 | 253 | 54 | 55 | 61 | 59 | Push @ 1304 |
| A-7 | 0:50:00 | 397.351 | 0.68 | 2.9 | 11 | 118 | 252 | 254 | 55 | 57 | 60 | 59 | Push @ 1318 |
| A-7 | 0:52:30 | 399.701 | 0.75 | 3.3 | 10 | 124 | 251 | 258 | 63 | 57 | 60 | 60 | Push @ 1332 |
| A-8 | 0:55:00 | 402.101 | 0.74 | 3.3 | 10 | 115 | 254 | 257 | 57 | 57 | 61 | 60 | Push @ 1343 |
| A-8 | 0:57:30 | 404.581 | 0.75 | 3.3 | 11 | 131 | 250 | 259 | 54 | 58 | 61 | 60 | Push @ 1355 |
| A-8 | 1:00:00 | 407.121 | 0.75 | 3.3 | 13 | 116 | 251 | 254 | 47 | 62 | 61 | 61 | Push @ 1414 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.002 |
| Check | Final | 15 | 0.002 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |
| Fyrite Kit ID: | NA | Fyrite $O_2$ Check | | NA % |

Balance ID: BAL-017

| | | |
|---|---|---|
| Reference Weight (200g): | NA | Tolerance = +/- 0.5 g |
| Reference Weight (500g): | 500.0 | Tolerance = +/- 0.5 g |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | Empty (mL) | 371.5 | 367.5 | 4.0 |
| 2 | $H_2O$ (mL) | 698.8 | 696.5 | 2.3 |
| 3 | $H_2O$ (mL) | 676.9 | 675.6 | 1.3 |
| 4 | Empty (mL) | 614.9 | 614.2 | 0.7 |
| 5 | Silica (g) | 846.0 | 802.4 | 43.6 |

**MONTROSE METHOD 23 DATA SHEET**

**Client:** Arcelor Mittal **Test Type:** Method 0010/23 **Project Number:** Proj106377(16-167)

**Date:** 10/26/16 - 10/27/16 **Run Number:** 2 **Sampling Location:** PEC Stack Outlet

**Test Crew:** BC JW CB TM

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-9 | 1:02:30 | 409.741 | 0.75 | 3.3 | 11 | 120 | 256 | 249 | 47 | 62 | 61 | 61 | Push @ 1425 |
| A-9 | 1:05:00 | 412.181 | 0.76 | 3.3 | 11 | 123 | 254 | 251 | 45 | 61 | 61 | 61 | Push @ 1437 |
| A-9 | 1:07:30 | 414.661 | 0.77 | 3.4 | 12 | 127 | 256 | 253 | 45 | 58 | 62 | 61 | Push @ 1450 |
| A-10 | 1:10:00 | 418.191 | 0.71 | 3.1 | 11 | 138 | 251 | 248 | 46 | 49 | 62 | 62 | Push @ 1501 |
| A-10 | 1:12:30 | 419.581 | 0.68 | 2.8 | 10 | 115 | 250 | 251 | 45 | 45 | 62 | 62 | Push @ 1530 |
| A-10 | 1:15:00 | 421.931 | 0.67 | 2.8 | 9 | 127 | 253 | 256 | 46 | 46 | 62 | 62 | Push @ 1545 |
| A-11 | 1:17:30 | 424.411 | 0.67 | 2.8 | 10 | 117 | 251 | 249 | 48 | 47 | 62 | 62 | Push @ 1559 |
| A-11 | 1:20:00 | 426.591 | 0.66 | 2.8 | 10 | 120 | 250 | 256 | 49 | 47 | 62 | 62 | Push @ 1609 |
| A-11 | 1:22:30 | 428.701 | 0.72 | 3.2 | 10 | 103 | 253 | 249 | 46 | 48 | 62 | 62 | Push @ 1649 |
| A-12 | 1:25:00 | 430.771 | 0.68 | 2.8 | 10 | 124 | 253 | 254 | 49 | 50 | 63 | 63 | Push @ 1706 |
| A-12 | 1:27:30 | 433.101 | 0.66 | 2.8 | 10 | 108 | 256 | 252 | 48 | 49 | 63 | 63 | Push @ 1725 |
| A-12 | 1:30:00 | 435.511 | 0.67 | 2.8 | 10 | 120 | 251 | 257 | 50 | 50 | 63 | 63 | Push @ 1737 |
| B-1 | 1:32:30 | 437.781 | 0.81 | 3.5 | 13 | 120 | 253 | 254 | 50 | 50 | 63 | 63 | Push @ 1748 |
| B-1 | 1:35:00 | 440.371 | 0.83 | 3.6 | 13 | 120 | 254 | 254 | 51 | 51 | 63 | 63 | Push @ 1801 |
| B-1 | 1:37:30 | 442.591 | 0.82 | 3.6 | 13 | 122 | 250 | 251 | 52 | 51 | 63 | 63 | Push @ 1815 |
| B-2 | 1:40:00 | 445.181 | 0.81 | 3.5 | 13 | 139 | 257 | 253 | 52 | 51 | 63 | 63 | Push @ 1826 |
| B-2 | 1:42:30 | 447.721 | 0.74 | 3.3 | 12 | 119 | 256 | 254 | 53 | 52 | 63 | 63 | Push @ 1841 |
| B-2 | 1:45:00 | 450.241 | 0.74 | 3.3 | 13 | 103 | 252 | 254 | 53 | 54 | 63 | 63 | Push @ 1919 |
| B-3 | 1:47:30 | 452.751 | 0.77 | 3.4 | 13 | 114 | 253 | 258 | 54 | 55 | 63 | 63 | Push @ 1943 |
| B-3 | 1:50:00 | 455.361 | 0.80 | 3.5 | 13 | 117 | 251 | 249 | 54 | 55 | 63 | 63 | Push @ 2000 |
| B-3 | 1:52:30 | 457.931 | 0.77 | 3.4 | 13 | 111 | 249 | 254 | 55 | 56 | 63 | 63 | Push @ 2013 |
| B-4 | 1:55:00 | 460.531 | 0.81 | 3.5 | 13 | 115 | 250 | 257 | 56 | 56 | 63 | 63 | Push @ 2025 |
| B-4 | 1:57:30 | 463.141 | 0.78 | 3.4 | 13 | 117 | 251 | 251 | 57 | 57 | 63 | 63 | Push @ 2037 |
| B-4 | 2:00:00 | 465.731 | 0.76 | 3.3 | 12 | 119 | 248 | 252 | 56 | 57 | 63 | 63 | Push @ 2058 |
| B-5 | 2:02:30 | 468.221 | 0.75 | 3.3 | 12 | 114 | 250 | 251 | 57 | 57 | 63 | 63 | Push @ 2114 |
| B-5 | 2:05:00 | 470.791 | 0.73 | 3.2 | 11 | 145 | 252 | 249 | 59 | 59 | 63 | 63 | Push @ 2127 |
| B-5 | 2:07:30 | 473.201 | 0.62 | 2.7 | 10 | 109 | 249 | 253 | 57 | 57 | 63 | 63 | Push @ 2158 |
| B-6 | 2:10:00 | 475.461 | 0.60 | 2.6 | 10 | 130 | 254 | 253 | 58 | 59 | 63 | 63 | Push @ 2209 |
| B-6 | 2:12:30 | 477.731 | 0.58 | 2.6 | 10 | 123 | 248 | 249 | 58 | 59 | 63 | 63 | Push @ 2223 |
| B-6 | 2:15:00 | 479.971 | 0.58 | 2.6 | 9 | 139 | 255 | 254 | 58 | 59 | 63 | 63 | Push @ 2240 |
| B-7 | 2:17:30 | 482.211 | 0.57 | 2.5 | 9 | 126 | 251 | 253 | 59 | 60 | 63 | 63 | Push @ 2254 |
| B-7 | 2:20:00 | 484.511 | 0.61 | 2.7 | 10 | 124 | 251 | 256 | 58 | 59 | 63 | 63 | Push @ 2330 |
| B-7 | 2:22:30 | 486.751 | 0.56 | 2.4 | 9 | 141 | 250 | 254 | 59 | 60 | 63 | 63 | Push @ 2342 |
| B-8 | 2:25:00 | 488.951 | 0.54 | 2.4 | 9 | 115 | 252 | 251 | 59 | 60 | 63 | 63 | Push @ 2355 |
| B-8 | 2:27:30 | 491.141 | 0.55 | 2.4 | 9 | 135 | 248 | 253 | 59 | 59 | 63 | 63 | Push @ 0024 |
| B-8 | 2:30:00 | 493.291 | 0.54 | 2.4 | 9 | 131 | 251 | 255 | 60 | 60 | 63 | 63 | Push @ 0036 |
| B-9 | 2:32:30 | 495.381 | 0.50 | 2.2 | 8 | 135 | 250 | 255 | 60 | 61 | 63 | 63 | Push @ 0048 |
| B-9 | 2:35:00 | 497.461 | 0.50 | 2.2 | 8 | 141 | 253 | 255 | 60 | 60 | 63 | 63 | Push @ 101 |

**MONTROSE METHOD 23 DATA SHEET**

**Client:** ~~#REF!~~ Arcelor Mittal **Test Type:** Method 0010/23 **Project Number:** Proj106377 (16-167)

**Date:** 10/26/16 - 10/27/16 **Run Number:** 2 **Sampling Location:** PEC Stack Outlet

**Test Crew:** BC JW CB TM

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-9 | 2:37:30 | 499.501 | 0.48 | 2.1 | 9 | 137 | 249 | 257 | 60 | 61 | 63 | 63 | Push @ 0114 |
| B-10 | 2:40:00 | 501.621 | 0.52 | 2.3 | 8 | 119 | 250 | 252 | 57 | 59 | 63 | 63 | Push @ 232 |
| B-10 | 2:42:30 | 503.711 | 0.49 | 2.2 | 8 | 120 | 250 | 252 | 59 | 62 | 63 | 63 | Push @ 245 |
| B-10 | 2:45:00 | 505.801 | 0.48 | 2.1 | 8 | 125 | 252 | 255 | 57 | 57 | 63 | 63 | Push @ 336 |
| B-11 | 2:47:30 | 507.781 | 0.46 | 2.0 | 7 | 143 | 251 | 255 | 57 | 59 | 63 | 63 | Push @ 355 |
| B-11 | 2:50:00 | 509.741 | 0.44 | 1.9 | 7 | 122 | 250 | 253 | 57 | 58 | 63 | 63 | Push @ 408 |
| B-11 | 2:52:30 | 511.651 | 0.44 | 1.9 | 7 | 122 | 249 | 255 | 58 | 59 | 63 | 63 | Push @ 421 |
| B-12 | 2:55:00 | 513.581 | 0.43 | 1.9 | 7 | 126 | 248 | 255 | 57 | 59 | 63 | 63 | Push @ 433 |
| B-12 | 2:57:30 | 515.511 | 0.43 | 1.9 | 7 | 118 | 252 | 255 | 57 | 58 | 63 | 63 | Push @ 447 |
| B-12 | 3:00:00 | 517.423 | 0.44 | 1.9 | 7 | 132 | 249 | 254 | 57 | 59 | 63 | 63 | Push @ 458 10/27/16 |

# MONTROSE METHOD 0010/23 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | ArcelorMittal | **Test Type:** | Method 0010/23 | **Meter ΔH :** | 1.971 | **Start Time:** | 0549 |
| **Date:** | 10/27/16 - 10/28/16 | **Run Number:** | 3 | **Meter Correction (γ):** | 1.003 | **Stop Time:** | 0222 |
| **Plant:** | Monessen, PA | **Nozzle Diameter (inches):** | 0.255 | **Pitot Correction:** | 0.84 | **T/C ID:** | 7-9 |
| **Sampling Location:** | PEC Stack Outlet | **Static Press (in. $H_2O$):** | 0.1 | **Control Box ID:** | 1618 | **Probe ID:** | 7-9 |
| | | **Baro. Pres. (in. Hg):** | 29.19 | **Assumed Moisture (%):** | 20.0 | **Pitot ID:** | 7-9 |
| **Project Number:** | Proj106377 (16-167) | **Ambient Temp (°F):** | 54 | **Umbilical Length (Feet):** | 200' | **Filter ID:** | NA/ Trap # 3 |
| **Test Crew:** | BC JW CB TM | **Initial K-factor** | 4.4 | | | **Stack Diameter (inches):** | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume (ft³) 521.100 | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-1 | 0:02:30 | 523.45 | 0.70 | 3.1 | 8 | 113 | 251 | 264 | 54 | 54 | 64 | 64 | Push @ 549 |
| A-1 | 0:05:00 | 525.90 | 0.69 | 3.0 | 8 | 113 | 265 | 260 | 52 | 40 | 64 | 64 | Push @ 601 |
| A-1 | 0:07:30 | 528.39 | 0.72 | 3.2 | 9 | 116 | 270 | 263 | 51 | 40 | 64 | 64 | Push @ 616 |
| A-2 | 0:10:00 | 530.79 | 0.71 | 3.1 | 9 | 116 | 266 | 264 | 51 | 40 | 64 | 64 | Push @ 629 |
| A-2 | 0:12:30 | 533.27 | 0.72 | 3.2 | 10 | 129 | 268 | 259 | 50 | 41 | 64 | 64 | Push @ 643 |
| A-2 | 0:15:00 | 535.76 | 0.72 | 3.2 | 10 | 119 | 262 | 260 | 51 | 43 | 63 | 63 | Push @ 0709 |
| A-3 | 0:17:30 | 538.21 | 0.70 | 3.1 | 10 | 119 | 256 | 265 | 52 | 45 | 63 | 63 | Push @ 0732 |
| A-3 | 0:20:00 | ~~540.17~~ 0.00 | 0.70 | 3.1 | 10 | 126 | 254 | 260 | 53 | 46 | 64 | 64 | Push @ 0744 |
| A-3 | 0:22:30 | 543.07 | 0.71 | 3.1 | 9 | 122 | 250 | 258 | 54 | 47 | 64 | 64 | Push @ 0758 |
| A-4 | 0:25:00 | 545.53 | 0.72 | 3.2 | 10 | 132 | 251 | 262 | 56 | 49 | 64 | 64 | Push @ 0811 |
| A-4 | 0:27:30 | 548.01 | 0.73 | 3.2 | 10 | 118 | 253 | 253 | 57 | 50 | 64 | 64 | Push @ 0827 |
| A-4 | 0:30:00 | 550.53 | 0.74 | 3.4 | 10 | 134 | 251 | 259 | 59 | 53 | 64 | 64 | Push @ 0842 |
| A-5 | 0:32:30 | 553.15 | 0.80 | 3.5 | 11 | 108 | 256 | 259 | 61 | 57 | 66 | 65 | Push @ 0929 |
| A-5 | 0:35:00 | 555.67 | 0.76 | 3.4 | 10 | 133 | 250 | 258 | 59 | 45 | 66 | 65 | Push @ 0941 |
| A-5 | 0:37:30 | 558.16 | 0.71 | 3.1 | 10 | 127 | 257 | 256 | 55 | 43 | 67 | 66 | Push @ 0951 |
| A-6 | 0:40:00 | 560.66 | 0.75 | 3.4 | 10 | 121 | 254 | 255 | 55 | 44 | 67 | 66 | Push @ 1003 |
| A-6 | 0:42:30 | 563.16 | 0.71 | 3.1 | 10 | 124 | 251 | 259 | 56 | 47 | 67 | 66 | Push @ 1016 |
| A-6 | 0:45:00 | 565.44 | 0.55 | 2.4 | 8 | 153 | 250 | 248 | 59 | 49 | 68 | 67 | Push @ 1029 |
| A-7 | 0:47:30 | 567.49 | 0.54 | 2.4 | 8 | 131 | 253 | 262 | 61 | 53 | 69 | 68 | Push @ 1045 |
| A-7 | 0:50:00 | 569.62 | 0.45 | 2.0 | 7 | 140 | 257 | 258 | 62 | 56 | 70 | 70 | Push @ 1100 |
| A-7 | 0:52:30 | 571.54 | 0.40 | 1.7 | 6 | 127 | 252 | 255 | 64 | 58 | 70 | 70 | Push @ 1114 |
| A-8 | 0:55:00 | 573.43 | 0.40 | 1.7 | 6 | 113 | 259 | 258 | 61 | 60 | 70 | 70 | Push @ 1206 |
| A-8 | 0:57:30 | 575.96 | 0.79 | 3.5 | 10 | 113 | 254 | 249 | 62 | 61 | 70 | 70 | Push @ 1229 |
| A-8 | 1:00:00 | 578.50 | 0.76 | 3.4 | 10 | 118 | 250 | 256 | 63 | 62 | 70 | 70 | Push @ 1240 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.001 |
| Check | Final | 12 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |
| Fyrite Kit ID: NA | | Fyrite $O_2$ Check | | NA % |
| Balance ID: BAL - 017 | | | | |
| Reference Weight (200g): NA | | Tolerance = +/- 0.5 g | | |
| Reference Weight (500g): 500.0 | | Tolerance = +/- 0.5 g | | |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | Empty (g) | 367.7 | 354.9 | |
| 2 | $H_2O$ (g) | 693.4 | 697.0 | |
| 3 | $H_2O$ (g) | 695.2 | 701.0 | |
| 4 | Empty (g) | 603.1 | 600.9 | |
| 5 | Silica (g) | 812.2 | 786.6 | |

-540.4

0.79

**MONTROSE METHOD 0010/23 DATA SHEET**

**Client:** ArcelorMittal **Test Type:** Method 0010/23 **Project Number:** Proj106377 (16-167)

**Date:** 10/27/16 **Run Number:** 3 **Sampling Location:** PEC Stack Outlet

**Test Crew:** BC JW CB TM, TL

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-9 | 1:02:30 | 581.03 | 0.70 | 3.1 | 10 | 127 | 251 | 249 | 62 | 63 | 70 | 70 | Pusn @ 1252 |
| A-9 | 1:05:00 | 583.47 | 0.65 | 2.9 | 10 | 123 | 254 | 258 | 62 | 63 | 70 | 70 | Push @ 1307 |
| A-9 | 1:07:30 | 585.81 | 0.65 | 2.9 | 8 | 122 | 252 | 253 | 48 | 48 | 71 | 70 | Push@ 1324 |
| A-10 | 1:10:00 | 588.15 | 0.65 | 2.9 | 9 | 122 | 255 | 249 | 53 | 47 | 71 | 70 | Push@ 1333 |
| A-10 | 1:12:30 | 590.51 | 0.65 | 2.9 | 9 | 129 | 254 | 255 | 52 | 43 | 70 | 71 | Push@ 1354 |
| A-10 | 1:15:00 | 592.82 | 0.65 | 2.9 | 9 | 128 | 256 | 251 | 51 | 43 | 70 | 70 | Push@ 1408 |
| A-11 | 1:17:30 | 595.16 | 0.69 | 3.0 | 9 | 137 | 255 | 257 | 52 | 44 | 70 | 71 | Push@ ~~1422~~ 1422 |
| A-11 | 1:20:00 | 597.68 | 0.69 | 3.0 | 9 | 117 | 255 | 254 | 52 | 45 | 70 | 70 | Push@ 1422 |
| A-11 | 1:22:30 | 600.08 | 0.69 | 3.0 | 9 | 128 | 255 | 249 | 52 | 45 | 70 | 70 | Push@ 1453 |
| A-12 | 1:25:00 | 602.51 | 0.66 | 2.9 | 9 | 121 | 256 | 251 | 54 | 48 | 71 | 70 | Push@ 1526 |
| A-12 | 1:27:30 | 605.02 | 0.75 | 3.3 | 10 | 129 | 256 | 253 | 55 | 50 | 71 | 71 | Push@ 1539 |
| A-12 | 1:30:00 | 607.58 | 0.65 | 2.9 | 10 | 127 | 254 | 255 | 59 | 53 | 71 | 71 | Push@ 1552 |
| B-1 | 1:32:30 | 609.95 | 0.64 | 2.9 | 10 | 134 | 252 | 254 | 63 | 54 | 72 | 71 | Push@ 1604 |
| B-1 | 1:35:00 | 612.40 | 0.70 | 3.1 | 9 | 129 | 250 | 251 | 60 | 55 | 72 | 71 | Push@ 1619 |
| B-1 | 1:37:30 | 614.83 | 0.66 | 3.0 | 9 | 141 | 251 | 252 | 59 | 56 | 72 | 72 | Push@ 1631 |
| B-2 | 1:40:00 | 617.25 | 0.65 | 2.9 | 9 | 127 | 251 | 253 | 60 | 57 | 72 | 72 | Push@ 1647 |
| B-2 | 1:42:30 | 619.66 | 0.68 | 2.9 | 9 | 138 | 250 | 256 | 59 | 57 | 72 | 71 | Push@ 1700 |
| B-2 | 1:45:00 | 622.06 | 0.67 | 2.9 | 9 | 117 | 252 | 255 | 57 | 58 | 70 | 71 | Push@ 1719 |
| B-3 | 1:47:30 | 624.62 | 0.75 | 3.4 | 10 | 121 | 254 | 254 | 59 | 59 | 70 | 70 | Push@ 1801 |
| B-3 | 1:50:00 | 627.18 | 0.66 | 3.0 | 9 | 119 | 254 | 252 | 57 | 59 | 70 | 70 | Push@ 1816 |
| B-3 | 1:52:30 | 629.54 | 0.65 | 2.9 | 9 | 144 | 251 | 254 | 58 | 59 | 70 | 70 | Push@ 1830 -0.65 |
| B-4 | 1:55:00 | 631.91 | 0.65 | 2.9 | 9 | 138 | 252 | 253 | 58 | 59 | 69 | 70 | Push@ 1844 |
| B-4 | 1:57:30 | 634.33 | 0.70 | 3.1 | 9 | 154 | 252 | 253 | 57 | 58 | 69 | 69 | Push@ 1857 |
| B-4 | 2:00:00 | 636.75 | 0.68 | 3.0 | 9 | 137 | 254 | 252 | 57 | 58 | 69 | 69 | Push@ 1910 |
| B-5 | 2:02:30 | 639.17 | 0.66 | 2.9 | 9 | 169 | 251 | 252 | 56 | 58 | 69 | 69 | Push@ 1927 |
| B-5 | 2:05:00 | 641.53 | 0.62 | 2.7 | 9 | 136 | 252 | 251 | 55 | 58 | 69 | 69 | Push@ 1942 |
| B-5 | 2:07:30 | 643.92 | 0.67 | 2.9 | 9 | 106 | 249 | 250 | 53 | 53 | 68 | 68 | Push@ 2020 |
| B-6 | 2:10:00 | 646.29 | 0.63 | 2.8 | 8 | 120 | 250 | 249 | 54 | 56 | 67 | 68 | Push@ 2031 |
| B-6 | 2:12:30 | 648.65 | 0.62 | 2.7 | 8 | 112 | 249 | 252 | 54 | 55 | 67 | 68 | Push@ 2043 |
| B-6 | 2:15:00 | 651.18 | 0.62 | 2.7 | 8 | 117 | 251 | 253 | 52 | 53 | 66 | 67 | Push@ 2112 |
| B-7 | 2:17:30 | 653.39 | 0.64 | 2.8 | 8 | 106 | 254 | 254 | 53 | 55 | 66 | 67 | Push@ 2126 |
| B-7 | 2:20:00 | 655.74 | 0.62 | 2.7 | 8 | 113 | 257 | 254 | 51 | 52 | 66 | 67 | Push@ ~~2038~~ 2138 |
| B-7 | 2:22:30 | 658.01 | 0.58 | 2.5 | 7 | 114 | 255 | 248 | 53 | 55 | 66 | 66 | Push@ 2149 |
| B-8 | 2:25:00 | 660.06 | 0.48 | 2.1 | 6 | 113 | 255 | 253 | 53 | 54 | 66 | 66 | Push@ 2201 |
| B-8 | 2:27:30 | 662.04 | 0.46 | 2.0 | 6 | 114 | 251 | 248 | 52 | 53 | 65 | 66 | Push@ 2214 |
| B-8 | 2:30:00 | 664.02 | 0.46 | 2.0 | 6 | 120 | 254 | 251 | 49 | 51 | 65 | 66 | Push@ 2242 |
| B-9 | 2:32:30 | 665.98 | 0.44 | 1.9 | 5 | 110 | 255 | 254 | 50 | 52 | 65 | 65 | Push@ 2255 |
| B-9 | 2:35:00 | 667.92 | 0.44 | 1.9 | 5 | 110 | 254 | 249 | 50 | 52 | 64 | 65 | Push@ 2338 |

**MONTROSE METHOD 0010/23 DATA SHEET**

**Client:** ArcelorMittal **Test Type:** Method 0010/23 **Project Number:** Proj106377 (16-167)

**Date:** 10/27/16 **Run Number:** 3 **Sampling Location:** PEC Stack Outlet

**Test Crew:** BC JW CB TM

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°-273° | Oven Temp. (°F) 248°-273° | Imp Exit Temp. (°F) ≤ 68° | Condenser Temp. (°F) ≤68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-9 | 2:37:30 | 669.86 | 0.43 | 1.9 | 5 | 109 | 255 | 250 | 50 | 52 | 64 | 64 | Push @ 2349 |
| B-10 | 2:40:00 | 671.82 | 0.44 | 1.9 | 5 | 119 | 255 | 251 | 49 | 47 | 64 | 64 | Push @ 0002 |
| B-10 | 2:42:30 | 673.77 | 0.45 | 1.9 | 5 | 111 | 254 | 253 | 49 | 59 | 64 | 64 | Push @ 0017 |
| B-10 | 2:45:00 | 675.64 | 0.48 | 2.1 | 6 | 128 | 255 | 249 | 48 | 50 | 63 | 64 | Push @ 0030 |
| B-11 | 2:47:30 | 677.64 | 0.46 | 2.0 | 6 | 112 | 254 | 248 | 49 | 51 | 64 | 63 | Push @ 0048 |
| B-11 | 2:50:00 | 679.64 | 0.47 | 2.1 | 6 | 120 | 255 | 253 | 49 | 50 | 63 | 64 | Push @ 102 |
| B-11 | 2:52:30 | 681.65 | 0.48 | 2.1 | 6 | 109 | 254 | 249 | 49 | 51 | 63 | 63 | Push @ 141 |
| B-12 | 2:55:00 | 683.66 | 0.46 | 2.0 | 6 | 113 | 255 | 252 | 49 | 50 | 63 | 63 | Push @ 153 |
| B-12 | 2:57:30 | 685.70 | 0.50 | 2.2 | ~~6~~ 7 | 109 | 255 | 249 | 48 | 50 | 63 | 63 | Push @ 206 |
| B-12 | 3:00:00 | 687.774 | 0.49 | 2.2 | 7 | 117 | 256 | 250 | 48 | 50 | 63 | 63 | Push @ 219 10/28/16 |
| | | | | | | | | | | | | | ~~Push @~~ |

# Method 316

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 1** | | | | |
| 1 | 2016/11/01 | 14:38:40 | 19.99 | 0.84 |
| 2 | 2016/11/01 | 14:39:40 | 20.33 | 0.56 |
| 3 | 2016/11/01 | 14:50:40 | 19.87 | 0.91 |
| 4 | 2016/11/01 | 14:51:40 | 19.77 | 0.98 |
| 5 | 2016/11/01 | 15:02:40 | 19.98 | 0.85 |
| 6 | 2016/11/01 | 15:03:40 | 20.13 | 0.74 |
| 7 | 2016/11/01 | 15:15:40 | 19.88 | 0.84 |
| 8 | 2016/11/01 | 15:16:40 | 19.93 | 0.81 |
| 9 | 2016/11/01 | 15:33:40 | 20.32 | 0.49 |
| 10 | 2016/11/01 | 15:34:40 | 19.89 | 0.93 |
| 11 | 2016/11/01 | 15:47:40 | 19.86 | 0.92 |
| 12 | 2016/11/01 | 15:48:40 | 20.31 | 0.57 |
| 13 | 2016/11/01 | 15:59:40 | 20.10 | 0.70 |
| 14 | 2016/11/01 | 16:00:40 | 19.80 | 0.99 |
| 15 | 2016/11/01 | 16:44:40 | 20.24 | 0.50 |
| 16 | 2016/11/01 | 16:45:40 | 19.83 | 0.87 |
| 17 | 2016/11/01 | 16:56:40 | 20.22 | 0.55 |
| 18 | 2016/11/01 | 16:57:40 | 19.81 | 0.91 |
| 19 | 2016/11/01 | 17:11:40 | 19.92 | 0.82 |
| 20 | 2016/11/01 | 17:12:40 | 20.33 | 0.54 |
| 21 | 2016/11/01 | 17:35:40 | 19.89 | 0.84 |
| 22 | 2016/11/01 | 17:36:40 | 19.76 | 0.91 |
| 23 | 2016/11/01 | 17:48:40 | 19.85 | 0.90 |
| 24 | 2016/11/01 | 17:49:40 | 20.36 | 0.50 |
| 25 | 2016/11/01 | 18:00:40 | 20.04 | 0.69 |
| 26 | 2016/11/01 | 18:01:40 | 19.79 | 0.93 |
| 27 | 2016/11/01 | 18:13:40 | 20.34 | 0.47 |
| 28 | 2016/11/01 | 18:14:40 | 19.91 | 0.88 |
| 29 | 2016/11/01 | 19:10:40 | 19.89 | 0.86 |
| 30 | 2016/11/01 | 19:11:40 | 20.43 | 0.45 |
| 31 | 2016/11/01 | 19:21:40 | 19.97 | 0.78 |
| 32 | 2016/11/01 | 19:22:40 | 19.77 | 0.97 |
| 33 | 2016/11/01 | 19:35:40 | 20.11 | 0.70 |
| 34 | 2016/11/01 | 19:36:40 | 19.93 | 0.88 |
| 35 | 2016/11/01 | 19:49:40 | 20.11 | 0.66 |
| 36 | 2016/11/01 | 19:50:40 | 19.84 | 0.91 |
| 37 | 2016/11/01 | 20:02:40 | 20.06 | 0.77 |
| 38 | 2016/11/01 | 20:03:40 | 20.35 | 0.53 |
| 39 | 2016/11/01 | 20:14:40 | 19.92 | 0.84 |
| 40 | 2016/11/01 | 20:15:40 | 19.77 | 0.96 |
| 41 | 2016/11/01 | 20:27:40 | 20.00 | 0.82 |
| 42 | 2016/11/01 | 20:28:40 | 20.17 | 0.70 |
| 43 | 2016/11/01 | 20:40:40 | 19.83 | 0.83 |
| 44 | 2016/11/01 | 20:41:40 | 19.75 | 0.88 |
| 45 | 2016/11/01 | 21:01:40 | 20.16 | 0.67 |
| 46 | 2016/11/01 | 21:02:40 | 19.90 | 0.91 |
| 47 | 2016/11/01 | 21:39:40 | 20.02 | 0.81 |
| 48 | 2016/11/01 | 21:40:40 | 20.27 | 0.61 |
| 49 | 2016/11/01 | 21:52:40 | 20.05 | 0.84 |
| 50 | 2016/11/01 | 21:53:40 | 20.33 | 0.60 |
| 51 | 2016/11/01 | 22:03:40 | 19.96 | 0.85 |
| 52 | 2016/11/01 | 22:04:40 | 20.44 | 0.46 |
| 53 | 2016/11/01 | 22:13:40 | 20.10 | 0.72 |
| 54 | 2016/11/01 | 22:14:40 | 20.08 | 0.76 |
| 55 | 2016/11/01 | 22:25:40 | 20.40 | 0.44 |
| 56 | 2016/11/01 | 22:26:40 | 20.00 | 0.82 |
| 57 | 2016/11/01 | 22:38:40 | 20.07 | 0.75 |
| 58 | 2016/11/01 | 22:39:40 | 19.88 | 0.90 |
| 59 | 2016/11/01 | 22:50:40 | 20.04 | 0.87 |
| 60 | 2016/11/01 | 22:51:40 | 20.34 | 0.60 |
| 61 | 2016/11/01 | 23:38:40 | 20.01 | 0.81 |
| 62 | 2016/11/01 | 23:39:40 | 20.42 | 0.50 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 63 | 2016/11/01 | 23:49:40 | 20.06 | 0.85 |
| 64 | 2016/11/01 | 23:50:40 | 20.37 | 0.58 |
| 65 | 2016/11/02 | 00:01:40 | 19.90 | 0.83 |
| 66 | 2016/11/02 | 00:02:40 | 19.89 | 0.85 |
| 67 | 2016/11/02 | 00:38:40 | 19.98 | 0.83 |
| 68 | 2016/11/02 | 00:39:40 | 20.45 | 0.47 |
| 69 | 2016/11/02 | 00:49:40 | 19.54 | 1.02 |
| 70 | 2016/11/02 | 00:50:40 | 19.43 | 1.12 |
| 71 | 2016/11/02 | 01:10:40 | 19.60 | 1.04 |
| 72 | 2016/11/02 | 01:11:40 | 19.71 | 1.02 |
| 73 | 2016/11/02 | 02:27:40 | 19.84 | 0.81 |
| 74 | 2016/11/02 | 02:28:40 | 20.18 | 0.64 |
| 75 | 2016/11/02 | 02:41:40 | 20.09 | 0.80 |
| 76 | 2016/11/02 | 02:42:40 | 20.25 | 0.69 |
| 77 | 2016/11/02 | 02:55:40 | 20.13 | 0.66 |
| 78 | 2016/11/02 | 02:56:40 | 19.94 | 0.85 |
| 79 | 2016/11/02 | 03:07:40 | 20.37 | 0.60 |
| 80 | 2016/11/02 | 03:08:40 | 20.59 | 0.40 |
| 81 | 2016/11/02 | 03:18:40 | 20.26 | 0.61 |
| 82 | 2016/11/02 | 03:19:40 | 20.03 | 0.80 |
| 83 | 2016/11/02 | 03:29:40 | 20.14 | 0.75 |
| 84 | 2016/11/02 | 03:30:40 | 20.46 | 0.48 |
| 85 | 2016/11/02 | 03:40:40 | 20.20 | 0.64 |
| 86 | 2016/11/02 | 03:41:40 | 20.45 | 0.48 |
| 87 | 2016/11/02 | 04:15:40 | 20.18 | 0.74 |
| 88 | 2016/11/02 | 04:16:40 | 20.47 | 0.48 |
| 89 | 2016/11/02 | 04:26:40 | 20.12 | 0.76 |
| 90 | 2016/11/02 | 04:27:40 | 20.09 | 0.81 |
| 91 | 2016/11/02 | 04:36:40 | 20.31 | 0.56 |
| 92 | 2016/11/02 | 04:37:40 | 20.50 | 0.43 |
| **RUN 1 AVERAGES** | | | **20.07** | **0.74** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **Run 2** | | | | |
| 1 | 2016/11/02 | 05:12:40 | 19.80 | 0.92 |
| 2 | 2016/11/02 | 05:13:40 | 19.68 | 0.97 |
| 3 | 2016/11/02 | 05:25:40 | 20.14 | 0.65 |
| 4 | 2016/11/02 | 05:26:40 | 20.32 | 0.57 |
| 5 | 2016/11/02 | 05:40:40 | 19.82 | 0.92 |
| 6 | 2016/11/02 | 05:41:40 | 19.76 | 0.96 |
| 7 | 2016/11/02 | 05:52:40 | 20.24 | 0.67 |
| 8 | 2016/11/02 | 05:53:40 | 20.43 | 0.54 |
| 9 | 2016/11/02 | 06:07:40 | 20.16 | 0.70 |
| 10 | 2016/11/02 | 06:08:40 | 20.40 | 0.53 |
| 11 | 2016/11/02 | 06:22:40 | 20.19 | 0.64 |
| 12 | 2016/11/02 | 06:23:40 | 20.48 | 0.44 |
| 13 | 2016/11/02 | 06:35:40 | 20.27 | 0.67 |
| 14 | 2016/11/02 | 06:36:40 | 20.58 | 0.41 |
| 15 | 2016/11/02 | 06:46:40 | 19.59 | 1.05 |
| 16 | 2016/11/02 | 06:47:40 | 19.64 | 1.04 |
| 17 | 2016/11/02 | 06:57:40 | 20.19 | 0.73 |
| 18 | 2016/11/02 | 06:58:40 | 20.45 | 0.52 |
| 19 | 2016/11/02 | 07:39:40 | 20.11 | 0.69 |
| 20 | 2016/11/02 | 07:40:40 | 20.52 | 0.40 |
| 21 | 2016/11/02 | 07:53:40 | 20.22 | 0.77 |
| 22 | 2016/11/02 | 07:54:40 | 20.51 | 0.49 |
| 23 | 2016/11/02 | 08:05:40 | 20.17 | 0.76 |
| 24 | 2016/11/02 | 08:06:40 | 19.96 | 0.93 |
| 25 | 2016/11/02 | 08:21:40 | 20.17 | 0.79 |
| 26 | 2016/11/02 | 08:22:40 | 20.48 | 0.51 |
| 27 | 2016/11/02 | 09:02:50 | 20.03 | 0.68 |
| 28 | 2016/11/02 | 09:03:50 | 20.04 | 0.77 |
| 29 | 2016/11/02 | 09:20:50 | 19.76 | 1.12 |
| 30 | 2016/11/02 | 09:21:50 | 20.61 | 0.39 |
| 31 | 2016/11/02 | 09:33:50 | 20.01 | 0.87 |
| 32 | 2016/11/02 | 09:34:50 | 20.04 | 0.82 |
| 33 | 2016/11/02 | 09:49:50 | 19.94 | 0.89 |
| 34 | 2016/11/02 | 09:50:50 | 20.63 | 0.37 |
| 35 | 2016/11/02 | 10:00:50 | 20.34 | 0.43 |
| 36 | 2016/11/02 | 10:01:50 | 20.05 | 0.74 |
| 37 | 2016/11/02 | 10:15:50 | 20.27 | 0.70 |
| 38 | 2016/11/02 | 10:16:50 | 20.74 | 0.28 |
| 39 | 2016/11/02 | 10:26:50 | 19.79 | 1.06 |
| 40 | 2016/11/02 | 10:27:50 | 19.96 | 0.89 |
| 41 | 2016/11/02 | 10:39:50 | 19.91 | 1.01 |
| 42 | 2016/11/02 | 10:40:50 | 20.63 | 0.37 |
| 43 | 2016/11/02 | 10:51:50 | 19.95 | 0.87 |
| 44 | 2016/11/02 | 10:52:50 | 19.96 | 0.85 |
| 45 | 2016/11/02 | 11:49:50 | 20.41 | 0.48 |
| 46 | 2016/11/02 | 11:50:50 | 20.11 | 0.77 |
| 47 | 2016/11/02 | 12:02:50 | 20.24 | 0.62 |
| 48 | 2016/11/02 | 12:03:50 | 20.08 | 0.81 |
| 49 | 2016/11/02 | 12:16:50 | 20.05 | 0.85 |
| 50 | 2016/11/02 | 12:17:50 | 20.64 | 0.36 |
| 51 | 2016/11/02 | 12:31:50 | 20.08 | 0.86 |
| 52 | 2016/11/02 | 12:32:50 | 20.04 | 0.86 |
| 53 | 2016/11/02 | 13:37:50 | 19.81 | 1.10 |
| 54 | 2016/11/02 | 13:38:50 | 20.13 | 0.82 |
| 55 | 2016/11/02 | 13:54:50 | 19.08 | 1.53 |
| 56 | 2016/11/02 | 13:55:50 | 20.17 | 0.68 |
| 57 | 2016/11/02 | 14:09:50 | 19.88 | 0.96 |
| 58 | 2016/11/02 | 14:10:50 | 20.02 | 0.86 |
| 59 | 2016/11/02 | 14:23:50 | 19.93 | 0.94 |
| 60 | 2016/11/02 | 14:24:50 | 20.56 | 0.39 |
| 61 | 2016/11/02 | 14:35:50 | 19.83 | 1.02 |
| 62 | 2016/11/02 | 14:36:50 | 20.29 | 0.65 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 63 | 2016/11/02 | 14:47:50 | 19.85 | 0.99 |
| 64 | 2016/11/02 | 14:48:50 | 20.58 | 0.35 |
| 65 | 2016/11/02 | 14:57:50 | 19.81 | 0.99 |
| 66 | 2016/11/02 | 14:58:50 | 20.25 | 0.65 |
| 67 | 2016/11/02 | 15:36:50 | 19.89 | 1.01 |
| 68 | 2016/11/02 | 15:37:50 | 20.46 | 0.50 |
| 69 | 2016/11/02 | 15:49:50 | 19.86 | 0.98 |
| 70 | 2016/11/02 | 15:50:50 | 20.25 | 0.68 |
| 71 | 2016/11/02 | 16:11:50 | 20.63 | 0.29 |
| 72 | 2016/11/02 | 16:12:50 | 20.24 | 0.71 |
| 73 | 2016/11/02 | 16:27:50 | 20.28 | 0.49 |
| 74 | 2016/11/02 | 16:28:50 | 19.96 | 0.78 |
| 75 | 2016/11/02 | 16:44:50 | 19.72 | 0.99 |
| 76 | 2016/11/02 | 16:45:50 | 20.43 | 0.49 |
| 77 | 2016/11/02 | 17:04:50 | 19.93 | 0.82 |
| 78 | 2016/11/02 | 17:05:50 | 20.47 | 0.43 |
| 79 | 2016/11/02 | 17:24:50 | 19.92 | 0.88 |
| 80 | 2016/11/02 | 17:25:50 | 20.60 | 0.32 |
| 81 | 2016/11/02 | 18:33:50 | 19.28 | 1.02 |
| 82 | 2016/11/02 | 18:34:50 | 19.55 | 0.96 |
| 83 | 2016/11/02 | 18:46:50 | 20.17 | 0.67 |
| 84 | 2016/11/02 | 18:47:50 | 20.67 | 0.26 |
| 85 | 2016/11/02 | 18:58:50 | 20.00 | 0.76 |
| 86 | 2016/11/02 | 18:59:50 | 20.47 | 0.44 |
| 87 | 2016/11/02 | 19:10:50 | 19.85 | 0.97 |
| 88 | 2016/11/02 | 19:11:50 | 20.45 | 0.49 |
| **RUN 2 AVERAGES** | | | **20.14** | **0.73** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 3** | | | | |
| 1 | 2016/11/02 | 19:49:50 | 19.99 | 0.79 |
| 2 | 2016/11/02 | 19:50:50 | 20.15 | 0.70 |
| 3 | 2016/11/02 | 20:37:50 | 19.93 | 0.91 |
| 4 | 2016/11/02 | 20:38:50 | 20.58 | 0.36 |
| 5 | 2016/11/02 | 20:49:50 | 20.11 | 0.75 |
| 6 | 2016/11/02 | 20:50:50 | 20.63 | 0.32 |
| 7 | 2016/11/02 | 20:59:50 | 20.31 | 0.53 |
| 8 | 2016/11/02 | 21:00:50 | 20.46 | 0.49 |
| 9 | 2016/11/02 | 21:10:50 | 19.79 | 0.87 |
| 10 | 2016/11/02 | 21:11:50 | 19.98 | 0.81 |
| 11 | 2016/11/02 | 21:21:50 | 20.61 | 0.28 |
| 12 | 2016/11/02 | 21:22:50 | 20.12 | 0.69 |
| 13 | 2016/11/02 | 21:32:50 | 19.04 | 1.50 |
| 14 | 2016/11/02 | 21:33:50 | 19.76 | 0.90 |
| 15 | 2016/11/02 | 21:43:50 | 19.78 | 0.99 |
| 16 | 2016/11/02 | 21:44:50 | 20.55 | 0.37 |
| 17 | 2016/11/02 | 21:53:50 | 19.96 | 0.74 |
| 18 | 2016/11/02 | 21:54:50 | 20.45 | 0.44 |
| 19 | 2016/11/02 | 22:04:50 | 19.87 | 0.96 |
| 20 | 2016/11/02 | 22:05:50 | 20.56 | 0.37 |
| 21 | 2016/11/02 | 22:06:50 | 20.80 | 0.16 |
| 22 | 2016/11/02 | 22:16:50 | 20.28 | 0.60 |
| 23 | 2016/11/02 | 22:17:50 | 20.71 | 0.24 |
| 24 | 2016/11/02 | 22:25:50 | 19.74 | 1.00 |
| 25 | 2016/11/02 | 22:26:50 | 20.44 | 0.48 |
| 26 | 2016/11/02 | 22:35:50 | 19.91 | 0.86 |
| 27 | 2016/11/02 | 22:36:50 | 20.47 | 0.44 |
| 28 | 2016/11/02 | 22:44:50 | 19.92 | 0.71 |
| 29 | 2016/11/02 | 22:45:50 | 19.99 | 0.76 |
| 30 | 2016/11/02 | 22:46:50 | 20.66 | 0.25 |
| 31 | 2016/11/02 | 23:32:50 | 20.52 | 0.34 |
| 32 | 2016/11/02 | 23:33:50 | 20.03 | 0.73 |
| 33 | 2016/11/02 | 23:48:50 | 20.04 | 0.80 |
| 34 | 2016/11/02 | 23:49:50 | 20.61 | 0.31 |
| 35 | 2016/11/03 | 00:15:50 | 19.86 | 0.97 |
| 36 | 2016/11/03 | 00:16:50 | 20.53 | 0.38 |
| 37 | 2016/11/03 | 01:06:50 | 19.78 | 0.76 |
| 38 | 2016/11/03 | 01:07:50 | 19.89 | 0.78 |
| 39 | 2016/11/03 | 01:18:50 | 19.82 | 0.97 |
| 40 | 2016/11/03 | 01:19:50 | 20.47 | 0.46 |
| 41 | 2016/11/03 | 01:31:50 | 19.83 | 0.78 |
| 42 | 2016/11/03 | 01:32:50 | 20.29 | 0.54 |
| 43 | 2016/11/03 | 01:42:50 | 20.34 | 0.46 |
| 44 | 2016/11/03 | 01:43:50 | 20.49 | 0.43 |
| 45 | 2016/11/03 | 01:57:50 | 19.22 | 1.22 |
| 46 | 2016/11/03 | 01:58:50 | 19.77 | 0.84 |
| 47 | 2016/11/03 | 02:15:50 | 19.78 | 1.02 |
| 48 | 2016/11/03 | 02:16:50 | 20.48 | 0.43 |
| 49 | 2016/11/03 | 02:33:50 | 19.71 | 0.96 |
| 50 | 2016/11/03 | 02:34:50 | 19.92 | 0.81 |
| 51 | 2016/11/03 | 02:51:50 | 19.92 | 0.88 |
| 52 | 2016/11/03 | 02:52:50 | 20.53 | 0.37 |
| 53 | 2016/11/03 | 03:05:50 | 19.81 | 0.87 |
| 54 | 2016/11/03 | 03:06:50 | 20.05 | 0.68 |
| 55 | 2016/11/03 | 03:49:50 | 19.97 | 0.68 |
| 56 | 2016/11/03 | 03:50:50 | 20.04 | 0.74 |
| 57 | 2016/11/03 | 04:01:50 | 20.03 | 0.73 |
| 58 | 2016/11/03 | 04:02:50 | 20.01 | 0.76 |
| 59 | 2016/11/03 | 04:13:50 | 19.80 | 0.91 |
| 60 | 2016/11/03 | 04:14:50 | 20.48 | 0.37 |
| 61 | 2016/11/03 | 04:26:50 | 20.00 | 0.73 |
| 62 | 2016/11/03 | 04:27:50 | 20.09 | 0.71 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client:** | ArcelorMittal | **Unit:** | Pushing Baghouse |
| **Project No.:** | 16-167 | **Unit Operation:** | Normal |
| **Plant:** | Monessen, PA | **Test Location:** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 63 | 2016/11/03 | 04:38:50 | 19.97 | 0.78 |
| 64 | 2016/11/03 | 04:39:50 | 20.56 | 0.30 |
| 65 | 2016/11/03 | 04:52:50 | 19.84 | 0.91 |
| 66 | 2016/11/03 | 04:53:50 | 19.95 | 0.78 |
| 67 | 2016/11/03 | 05:21:50 | 19.36 | 1.12 |
| 68 | 2016/11/03 | 05:22:50 | 19.77 | 0.82 |
| 69 | 2016/11/03 | 05:33:50 | 19.78 | 0.97 |
| 70 | 2016/11/03 | 05:34:50 | 20.45 | 0.41 |
| 71 | 2016/11/03 | 07:01:50 | 20.06 | 0.72 |
| 72 | 2016/11/03 | 07:02:50 | 20.54 | 0.32 |
| 73 | 2016/11/03 | 07:11:50 | 19.89 | 0.90 |
| 74 | 2016/11/03 | 07:12:50 | 20.48 | 0.38 |
| 75 | 2016/11/03 | 07:32:50 | 20.56 | 0.28 |
| 76 | 2016/11/03 | 07:33:50 | 20.09 | 0.70 |
| 77 | 2016/11/03 | 07:47:50 | 19.86 | 0.97 |
| 78 | 2016/11/03 | 07:48:50 | 20.50 | 0.40 |
| 79 | 2016/11/03 | 08:02:50 | 19.91 | 0.88 |
| 80 | 2016/11/03 | 08:03:50 | 20.42 | 0.47 |
| 81 | 2016/11/03 | 08:21:50 | 19.82 | 1.01 |
| 82 | 2016/11/03 | 08:22:50 | 20.49 | 0.41 |
| 83 | 2016/11/03 | 08:34:50 | 20.18 | 0.55 |
| 84 | 2016/11/03 | 08:35:50 | 19.93 | 0.80 |
| 85 | 2016/11/03 | 08:48:50 | 19.43 | 1.06 |
| 86 | 2016/11/03 | 08:49:50 | 19.78 | 0.84 |
| 87 | 2016/11/03 | 09:32:50 | 20.12 | 0.64 |
| 88 | 2016/11/03 | 09:33:50 | 20.44 | 0.45 |
| 89 | 2016/11/03 | 09:51:50 | 20.01 | 0.76 |
| 90 | 2016/11/03 | 09:52:50 | 20.01 | 0.76 |
| 91 | 2016/11/03 | 10:04:50 | 19.79 | 0.93 |
| 92 | 2016/11/03 | 10:05:50 | 20.54 | 0.33 |
| 93 | 2016/11/03 | 10:20:50 | 19.64 | 1.04 |
| 94 | 2016/11/03 | 10:21:50 | 19.82 | 0.87 |
| 95 | 2016/11/03 | 10:36:50 | 20.44 | 0.38 |
| 96 | 2016/11/03 | 10:37:50 | 20.08 | 0.78 |
| **RUN 3 AVERAGES** | | | **20.11** | **0.68** |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1-2, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 1 |
| **Unit** | Pushing Baghouse | **Start Time** | 14:13 |
| **Operation** | Normal | **End Time** | 4:40 |
| **Tester(s)** | JV, JW, TM, TL | | |

| Cal. Gas | LOW | | MID | | HIGH | | Span | Conc. Units | Tank ID | | | Response Time (sec) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | | | LOW | MID | HIGH | Up | Down |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | 45 | 45 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B | 50 | 50 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values: System Cal. Response | Initial Values: System Cal. Bias (% of Span) | Final Values: System Cal. Response | Final Values: System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | Zero | | 0.01 | 0.11 | 0.50 | 0.07 | 0.30 | -0.20 | 20.03 | 0.09 | | | |
| | Mid | 10.01 | 10.07 | 10.04 | -0.15 | 10.05 | -0.10 | 0.05 | 20.03 | 10.05 | 20.07 | 20.09 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.15 | 0.45 | 0.12 | 0.30 | -0.15 | 19.79 | 0.14 | | | |
| | Mid | 10.15 | 10.04 | 10.01 | -0.15 | 10.01 | -0.15 | 0.00 | 19.79 | 10.01 | 0.74 | 0.63 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 2, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 2 |
| **Unit** | Pushing Baghouse | **Start Time** | 5:13 |
| **Operation** | Normal | **End Time** | 19:10 |
| **Tester(s)** | JV, JW, TM, TL | | |

| Cal. | LOW | | MID | | HIGH | | | Conc. | Tank ID | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Units | LOW | MID | HIGH |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210574 | XC034406B |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210574 | XC034406B |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | |

| | Upscale: Enter "Low" "Mid" or "High" | | | Initial Values | | Final Values | | | | Average of Initial and Final | Average Indicated | Corrected | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Responses | Gas Conc. | Gas Conc. | Conc. Units |
| O2 | Zero | | 0.01 | 0.07 | 0.30 | 0.09 | 0.40 | 0.10 | 20.03 | 0.08 | | | |
| | Mid | 10.01 | 10.07 | 10.05 | -0.10 | 10.08 | 0.05 | 0.15 | 20.03 | 10.07 | 20.14 | 20.11 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.12 | 0.30 | 0.10 | 0.20 | -0.10 | 19.79 | 0.11 | | | |
| | Mid | 10.15 | 10.04 | 10.01 | -0.15 | 10.03 | -0.05 | 0.10 | 19.79 | 10.02 | 0.73 | 0.63 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 2-3, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 3 |
| **Unit** | Pushing Baghouse | **Start Time** | 19:49 |
| **Operation** | Normal | **End Time** | 10:56 |
| **Tester(s)** | JV, JW, TM, TL | | |

| Cal. | LOW | | MID | | HIGH | | | Conc. | Tank ID | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Units | LOW | MID | HIGH |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210574 | XC034406B |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210574 | XC034406B |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | |

| | | | | Initial Values | | Final Values | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
| O2 | Zero | | 0.00 | 0.09 | 0.45 | 0.09 | 0.45 | 0.00 | 20.03 | 0.09 | | | |
| | Mid | 10.01 | 10.07 | 10.08 | 0.05 | 10.09 | 0.10 | 0.05 | 20.03 | 10.09 | 20.11 | 20.05 | d. vol. % |
| CO2 | Zero | | 0.20 | 0.10 | -0.51 | 0.11 | -0.45 | 0.05 | 19.79 | 0.11 | | | |
| | Mid | 10.15 | 10.04 | 10.03 | -0.05 | 10.06 | 0.10 | 0.15 | 19.79 | 10.05 | 0.68 | 0.59 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.0 | 0.00 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.2 | 1.01 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Nov. 1-2, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 1 |
| Unit: | Pushing Baghouse | Test Start Time: | 2:13 PM |
| Unit Operation: | Normal | Test Finish Time: | 4:40 AM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.33 | in. Hg |
| Stack Static Pressure (Pg) | 0.11 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.155 | inches |
| O2 | 20.09 | % dv |
| CO2 | 0.63 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Formaldehyde Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 73.4 | F |
| Stack Temperature (Tsavg) | 131.9 | F |
| Orifice Pressure Drop (dHavg) | 0.442 | in. $H_2O$ |
| GasVelocity Head (dP)¯avg | 0.8603 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | 0 | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 14.45 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.32 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.28 | % dv |
| Water Collected ($V_f$- $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$- $W_i$) | 27.2 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 1.282 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.282 | scf |
| Volume Dry Gas Metered (Vm) | 46.103 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 44.901 | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | 1.305 | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 1.271 | dscm |
| Stack Absolute Pressure (Ps) | 29.34 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 591.5 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.76 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1623 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0278 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0278 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.90 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.60 | lb/lb-mole |
| Gas Velocity (Vs) | 51.89 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | ft¯ |
| Actual Gas Flowrate | 88,026 | acfm |
| Standard Gas Flowrate | 77,002 | scfm |
| Dry Standard Gas Flowrate | 74,863 | dscfm |
| Actual Gas Flowrate | 2,493 | acm/min |
| Standard Gas Flowrate | 2,180 | scm/min |
| Dry Standard Gas Flowrate | 2,120 | dscm/min |
| Area Nozzle (An) | 0.000131 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 107.91 | % |

**Formaldehyde**

| | | | |
|---|---|---|---|
| Front Half Gain | < | 8.50 | (µg) |
| Back Half Gain | | | (µg) |
| Emission Mass | < | 0.0085 | (mg) |
| Emission Concentration | < | 0.0067 | (mg/DSCM) |
| Emission Rate | < | 0.000078 | (lb/push) |
| Emission Rate | < | 0.00026 | (lb/hr) |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.71 | 0.843 | 0.43 | 122 | 71 | 69 |
| A-1 | 0.72 | 0.849 | 0.44 | 148 | 72 | 70 |
| A-2 | 0.72 | 0.849 | 0.44 | 132 | 72 | 71 |
| A-2 | 0.75 | 0.866 | 0.45 | 152 | 73 | 72 |
| A-3 | 0.76 | 0.872 | 0.46 | 138 | 73 | 72 |
| A-3 | 0.74 | 0.860 | 0.44 | 158 | 74 | 73 |
| A-4 | 0.74 | 0.860 | 0.44 | 144 | 74 | 73 |
| A-4 | 0.78 | 0.883 | 0.47 | 132 | 75 | 74 |
| A-5 | 0.78 | 0.883 | 0.47 | 135 | 75 | 75 |
| A-5 | 0.82 | 0.906 | 0.49 | 145 | 77 | 76 |
| A-6 | 0.81 | 0.900 | 0.49 | 139 | 77 | 76 |
| A-6 | 0.77 | 0.877 | 0.46 | 147 | 77 | 76 |
| A-7 | 0.65 | 0.806 | 0.39 | 158 | 77 | 77 |
| A-7 | 0.65 | 0.806 | 0.39 | 139 | 77 | 77 |
| A-8 | 0.68 | 0.825 | 0.41 | 144 | 77 | 77 |
| A-8 | 0.69 | 0.831 | 0.41 | 138 | 78 | 77 |
| A-9 | 0.70 | 0.837 | 0.42 | 125 | 77 | 77 |
| A-9 | 0.75 | 0.866 | 0.45 | 137 | 77 | 77 |
| A-10 | 0.70 | 0.837 | 0.42 | 124 | 76 | 77 |
| A-10 | 0.68 | 0.825 | 0.41 | 135 | 76 | 77 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 76 | 76 |
| A-11 | 0.68 | 0.825 | 0.41 | 153 | 76 | 76 |
| A-12 | 0.70 | 0.837 | 0.42 | 138 | 76 | 76 |
| A-12 | 0.68 | 0.825 | 0.41 | 170 | 76 | 76 |
| B-1 | 0.91 | 0.954 | 0.43 | 129 | 74 | 76 |
| B-1 | 0.72 | 0.849 | 0.43 | 110 | 75 | 75 |
| B-2 | 0.75 | 0.866 | 0.45 | 117 | 74 | 75 |
| B-2 | 0.69 | 0.831 | 0.41 | 125 | 74 | 75 |
| B-3 | 0.72 | 0.849 | 0.43 | 122 | 74 | 75 |
| B-3 | 0.73 | 0.854 | 0.44 | 124 | 74 | 74 |
| B-4 | 0.71 | 0.843 | 0.43 | 119 | 74 | 74 |
| B-4 | 0.68 | 0.825 | 0.40 | 121 | 73 | 74 |
| B-5 | 0.80 | 0.894 | 0.48 | 108 | 73 | 73 |
| B-5 | 0.74 | 0.860 | 0.44 | 119 | 72 | 73 |
| B-6 | 0.74 | 0.860 | 0.44 | 138 | 72 | 73 |
| B-6 | 0.80 | 0.894 | 0.48 | 113 | 71 | 72 |
| B-7 | 0.74 | 0.860 | 0.44 | 145 | 71 | 72 |
| B-7 | 0.79 | 0.889 | 0.46 | 134 | 71 | 72 |
| B-8 | 0.82 | 0.906 | 0.50 | 123 | 70 | 70 |
| B-8 | 0.82 | 0.906 | 0.50 | 124 | 69 | 70 |
| B-9 | 0.78 | 0.883 | 0.47 | 131 | 69 | 70 |
| B-9 | 0.76 | 0.872 | 0.46 | 118 | 69 | 70 |
| B-10 | 0.74 | 0.860 | 0.44 | 127 | 69 | 70 |
| B-10 | 0.74 | 0.860 | 0.44 | 121 | 69 | 70 |
| B-11 | 0.77 | 0.877 | 0.46 | 138 | 69 | 70 |
| B-11 | 0.75 | 0.866 | 0.45 | 104 | 69 | 69 |
| B-12 | 0.77 | 0.877 | 0.46 | 126 | 69 | 69 |
| B-12 | 0.76 | 0.872 | 0.46 | 116 | 68 | 69 |
| Average | 0.74 | 0.8603 | 0.44 | 131.9 | | 73.4 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 51.423 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 97.526 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 46.103 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 755.1 | 738.0 | 17.1 | | | 0.0 |
| 2 | 636.9 | 634.9 | 2.0 | | | 0.0 |
| 3 | 615.8 | 615.6 | 0.2 | | | 0.0 |
| 4 | 789.1 | 781.2 | 7.9 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2796.9 | 2769.7 | 27.2 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$- $W_i$) | $V_f$ | $V_i$ | ($V_f$- Vi) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Nov. 2, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 2 |
| Unit: | Pushing Baghouse | Test Start Time: | 5:13 AM |
| Unit Operation: | Normal | Test Finish Time: | 7:10 PM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.07 | in. Hg |
| Stack Static Pressure (Pg) | -1.20 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.155 | inches |
| O2 | 20.11 | % dv |
| CO2 | 0.63 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Formaldehyde Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 72.0 | F |
| Stack Temperature (Tsavg) | 131.3 | F |
| Orifice Pressure Drop (dHavg) | 0.424 | in. $H_2O$ |
| GasVelocity Head (dP)^avg | 0.8418 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | 0 | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 13.95 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.44 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.26 | % dv |
| Water Collected ($V_f$- $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$- $W_i$) | 20.6 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 0.971 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 0.971 | scf |
| Volume Dry Gas Metered (Vm) | 44.942 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 43.500 | dscf |
| Volume Dry Gas Metered ($Vm(m^3)$) | 1.273 | dacm |
| Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.232 | dscm |
| Stack Absolute Pressure (Ps) | 28.98 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 590.9 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.68 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1616 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0218 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0218 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.67 | lb/lb-mole |
| Gas Velocity (Vs) | 51.00 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | ft² |
| Actual Gas Flowrate | 86,517 | acfm |
| Standard Gas Flowrate | 74,839 | scfm |
| Dry Standard Gas Flowrate | 73,204 | dscfm |
| Actual Gas Flowrate | 2,450 | acm/min |
| Standard Gas Flowrate | 2,119 | scm/min |
| Dry Standard Gas Flowrate | 2,073 | dscm/min |
| Area Nozzle (An) | 0.000131 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 106.91 | % |

**Formaldehyde**

| | | |
|---|---|---|
| Front Half Gain | 14.00 | (µg) |
| Back Half Gain | | (µg) |
| Emission Mass | 0.0140 | (mg) |
| Emission Concentration | 0.0114 | (mg/DSCM) |
| Emission Rate | 0.000130 | (lb/push) |
| Emission Rate | 0.00045 | (lb/hr) |

**ArcelorMittal** **Run 2** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP $(in. H2O)^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In (F or C) | Meter Temp Out (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.62 | 0.787 | 0.37 | 113 | 68 | 69 |
| A-1 | 0.73 | 0.854 | 0.44 | 119 | 68 | 69 |
| A-2 | 0.75 | 0.866 | 0.45 | 122 | 68 | 68 |
| A-2 | 0.67 | 0.819 | 0.40 | 120 | 68 | 68 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 |
| A-4 | 0.72 | 0.849 | 0.43 | 109 | 67 | 68 |
| A-4 | 0.74 | 0.860 | 0.44 | 122 | 67 | 68 |
| A-5 | 0.73 | 0.854 | 0.44 | 116 | 67 | 68 |
| A-5 | 0.72 | 0.849 | 0.43 | 115 | 67 | 67 |
| A-6 | 0.72 | 0.849 | 0.43 | 124 | 67 | 67 |
| A-6 | 0.73 | 0.854 | 0.44 | 117 | 66 | 67 |
| A-7 | 0.79 | 0.889 | 0.47 | 113 | 66 | 67 |
| A-7 | 0.80 | 0.894 | 0.48 | 121 | 66 | 66 |
| A-8 | 0.72 | 0.849 | 0.43 | 114 | 66 | 66 |
| A-8 | 0.74 | 0.860 | 0.44 | 122 | 66 | 66 |
| A-9 | 0.71 | 0.843 | 0.43 | 117 | 66 | 66 |
| A-9 | 0.72 | 0.849 | 0.43 | 133 | 66 | 66 |
| A-10 | 0.69 | 0.831 | 0.41 | 121 | 66 | 66 |
| A-10 | 0.71 | 0.843 | 0.43 | 131 | 67 | 67 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 67 | 67 |
| A-11 | 0.69 | 0.831 | 0.41 | 143 | 68 | 67 |
| A-12 | 0.73 | 0.854 | 0.44 | 127 | 70 | 69 |
| A-12 | 0.72 | 0.849 | 0.43 | 136 | 70 | 69 |
| B-1 | 0.70 | 0.837 | 0.42 | 136 | 71 | 70 |
| B-1 | 0.66 | 0.812 | 0.40 | 151 | 71 | 71 |
| B-2 | 0.67 | 0.819 | 0.40 | 131 | 72 | 71 |
| B-2 | 0.65 | 0.806 | 0.39 | 155 | 73 | 71 |
| B-3 | 0.65 | 0.806 | 0.39 | 145 | 73 | 71 |
| B-3 | 0.71 | 0.843 | 0.45 | 164 | 74 | 73 |
| B-4 | 0.68 | 0.825 | 0.41 | 151 | 74 | 73 |
| B-4 | 0.67 | 0.819 | 0.40 | 147 | 75 | 74 |
| B-5 | 0.70 | 0.837 | 0.40 | 132 | 76 | 75 |
| B-5 | 0.70 | 0.837 | 0.40 | 136 | 76 | 75 |
| B-6 | 0.72 | 0.849 | 0.43 | 143 | 77 | 76 |
| B-6 | 0.75 | 0.866 | 0.45 | 144 | 77 | 76 |
| B-7 | 0.72 | 0.849 | 0.43 | 147 | 78 | 76 |
| B-7 | 0.76 | 0.872 | 0.46 | 129 | 79 | 78 |
| B-8 | 0.75 | 0.866 | 0.45 | 124 | 79 | 78 |
| B-8 | 0.75 | 0.866 | 0.45 | 135 | 80 | 79 |
| B-9 | 0.74 | 0.860 | 0.44 | 155 | 80 | 79 |
| B-9 | 0.73 | 0.854 | 0.44 | 142 | 80 | 80 |
| B-10 | 0.64 | 0.800 | 0.38 | 150 | 81 | 80 |
| B-10 | 0.67 | 0.819 | 0.40 | 135 | 81 | 80 |
| B-11 | 0.71 | 0.843 | 0.43 | 127 | 81 | 81 |
| B-11 | 0.70 | 0.837 | 0.40 | 138 | 81 | 81 |
| B-12 | 0.67 | 0.819 | 0.40 | 149 | 80 | 81 |
| B-12 | 0.67 | 0.819 | 0.40 | 123 | 80 | 80 |
| Average | 0.71 | 0.842 | 0.42 | 131.3 | | 72.0 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 97.700 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 142.642 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 44.942 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 711.1 | 706.8 | 4.3 | | | 0.0 |
| 2 | 711.8 | 706.8 | 5.0 | | | 0.0 |
| 3 | 605.1 | 603.1 | 2.0 | | | 0.0 |
| 4 | 757.8 | 748.5 | 9.3 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 2785.8 | 2765.2 | 20.6 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$- $W_i$) | $V_f$ | $V_i$ | ($V_f$- Vi) |

| | | | |
|---|---|---|---|
| Client: | ArcelorMittal | Test Date: | Nov. 2-3, 2016 |
| Project No.: | 16-167 | Test Location: | Baghouse Exhaust |
| Plant: | Monessen, PA | Test Run: | Run 3 |
| Unit: | Pushing Baghouse | Test Start Time: | 7:49 PM |
| Unit Operation: | Normal | Test Finish Time: | 10:56 AM |

Blue is data input. Red is a calculation. Pink is a reference to a cell on another sheet. Green is a reference to a cell on this sheet.

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Test Time (Theta) | 120 | minutes |
| Barometric Pressure (Pbar) | 29.26 | in. Hg |
| Stack Static Pressure (Pg) | 0.12 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter 0 if circular stack) | 0.0 | inches |
| Nozzle Diameter (Dn) | 0.155 | inches |
| O2 | 20.05 | % dv |
| CO2 | 0.59 | % dv |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Formaldehyde Test Results | |
| $F_d$ @ 68 F and 760 mm Hg | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 72.8 | F |
| Stack Temperature (Tsavg) | 128.3 | F |
| Orifice Pressure Drop (dHavg) | 0.455 | in. $H_2O$ |
| GasVelocity Head (dP)^^avg | 0.8691 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | 0 | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | 0 | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 15.12 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.18 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.37 | % dv |
| Water Collected ($V_f$- $V_i$) | 0.0 | ml |
| Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Water Collected ($W_f$- $W_i$) | 27.9 | g |
| Water Vapor in Silica Gel (Vwsg(std)) | 1.315 | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.315 | scf |
| Volume Dry Gas Metered (Vm) | 47.470 | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | 46.179 | dscf |
| Volume Dry Gas Metered ($Vm(m^3)$) | 1.344 | dacm |
| Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.308 | dscm |
| Stack Absolute Pressure (Ps) | 29.27 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 587.9 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.32 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1477 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0277 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0277 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.90 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.59 | lb/lb-mole |
| Gas Velocity (Vs) | 52.33 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | ft^ |
| Actual Gas Flowrate | 88,770 | acfm |
| Standard Gas Flowrate | 77,944 | scfm |
| Dry Standard Gas Flowrate | 75,785 | dscfm |
| Actual Gas Flowrate | 2,514 | acm/min |
| Standard Gas Flowrate | 2,207 | scm/min |
| Dry Standard Gas Flowrate | 2,146 | dscm/min |
| Area Nozzle (An) | 0.000131 | $ft^2$ |
| Percent of Isokinetic Sampling (I) | 109.63 | % |

**Formaldehyde**

| | | |
|---|---|---|
| Front Half Gain | 12.00 | (µg) |
| Back Half Gain | | (µg) |
| Emission Mass | 0.0120 | (mg) |
| Emission Concentration | 0.0092 | (mg/DSCM) |
| Emission Rate | 0.000109 | (lb/push) |
| Emission Rate | 0.00034 | (lb/hr) |

**ArcelorMittal** **Run 3** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.76 | 0.872 | 0.46 | 129 | 78 | 79 |
| A-1 | 0.84 | 0.917 | 0.50 | 113 | 77 | 78 |
| A-2 | 0.78 | 0.883 | 0.47 | 123 | 76 | 77 |
| A-2 | 0.73 | 0.854 | 0.44 | 126 | 76 | 77 |
| A-3 | 0.75 | 0.866 | 0.45 | 138 | 76 | 77 |
| A-3 | 0.76 | 0.872 | 0.46 | 132 | 76 | 77 |
| A-4 | 0.80 | 0.894 | 0.48 | 152 | 75 | 76 |
| A-4 | 0.76 | 0.872 | 0.46 | 138 | 75 | 76 |
| A-5 | 0.75 | 0.866 | 0.45 | 148 | 75 | 76 |
| A-5 | 0.77 | 0.877 | 0.46 | 137 | 75 | 76 |
| A-6 | 0.72 | 0.849 | 0.43 | 128 | 75 | 76 |
| A-6 | 0.72 | 0.849 | 0.43 | 133 | 75 | 76 |
| A-7 | 0.75 | 0.866 | 0.45 | 126 | 75 | 76 |
| A-7 | 0.72 | 0.849 | 0.43 | 133 | 75 | 75 |
| A-8 | 0.77 | 0.877 | 0.46 | 127 | 74 | 74 |
| A-8 | 0.75 | 0.866 | 0.45 | 117 | 73 | 74 |
| A-9 | 0.70 | 0.837 | 0.43 | 119 | 72 | 73 |
| A-9 | 0.68 | 0.825 | 0.40 | 128 | 72 | 72 |
| A-10 | 0.65 | 0.806 | 0.39 | 119 | 71 | 72 |
| A-10 | 0.66 | 0.812 | 0.40 | 143 | 71 | 72 |
| A-11 | 0.63 | 0.794 | 0.38 | 127 | 72 | 72 |
| A-11 | 0.67 | 0.819 | 0.40 | 143 | 71 | 72 |
| A-12 | 0.65 | 0.806 | 0.39 | 123 | 71 | 72 |
| A-12 | 0.65 | 0.806 | 0.39 | 131 | 71 | 71 |
| B-1 | 0.78 | 0.883 | 0.47 | 117 | 70 | 71 |
| B-1 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 |
| B-2 | 0.82 | 0.906 | 0.50 | 112 | 70 | 70 |
| B-2 | 0.82 | 0.906 | 0.50 | 130 | 70 | 71 |
| B-3 | 0.77 | 0.877 | 0.46 | 123 | 70 | 70 |
| B-3 | 0.84 | 0.917 | 0.50 | 125 | 70 | 70 |
| B-4 | 0.78 | 0.883 | 0.47 | 130 | 71 | 70 |
| B-4 | 0.82 | 0.906 | 0.50 | 140 | 71 | 71 |
| B-5 | 0.80 | 0.894 | 0.48 | 134 | 71 | 71 |
| B-5 | 0.75 | 0.866 | 0.45 | 132 | 71 | 71 |
| B-6 | 0.84 | 0.917 | 0.50 | 114 | 73 | 73 |
| B-6 | 0.82 | 0.906 | 0.50 | 119 | 73 | 73 |
| B-7 | 0.85 | 0.922 | 0.51 | 124 | 74 | 73 |
| B-7 | 0.82 | 0.906 | 0.49 | 118 | 73 | 73 |
| B-8 | 0.82 | 0.906 | 0.49 | 117 | 73 | 73 |
| B-8 | 0.75 | 0.866 | 0.45 | 126 | 72 | 72 |
| B-9 | 0.78 | 0.883 | 0.47 | 122 | 72 | 72 |
| B-9 | 0.76 | 0.872 | 0.46 | 138 | 71 | 72 |
| B-10 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 |
| B-10 | 0.78 | 0.883 | 0.47 | 119 | 70 | 71 |
| B-11 | 0.72 | 0.849 | 0.43 | 121 | 70 | 70 |
| B-11 | 0.71 | 0.843 | 0.43 | 140 | 70 | 70 |
| B-12 | 0.74 | 0.860 | 0.44 | 136 | 70 | 70 |
| B-12 | 0.72 | 0.849 | 0.43 | 120 | 70 | 70 |
| Average | 0.756 | 0.869 | 0.45 | 128.3 | | 72.8 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 142.800 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 190.270 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 47.470 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 726.3 | 708.7 | 17.6 | | | 0.0 |
| 2 | 709.6 | 707.7 | 1.9 | | | 0.0 |
| 3 | 605.6 | 605.4 | 0.2 | | | 0.0 |
| 4 | 759.4 | 751.2 | 8.2 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2800.9 | 2773.0 | 27.9 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$- $W_i$) | $V_f$ | $V_i$ | ($V_f$- Vi) |

# This page intentionally left blank

# MONTROSE METHOD 316 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Client: | ArcelorMittal | Test Type: | Method 316 Formaldehyde | Meter ΔH : | 1.971 | Start Time: | 1413 11/1/16 |
| Date: | 11/1/16 | Run Number: | 1 | Meter Correction (y): | 1.003 | Stop Time: | 0440 11/2/16 |
| Plant: | Monessen, PA | Nozzle Diameter (inches): | 0.155 | Pitot Correction: | 0.84 | T/C ID: | 7-9 |
| Sampling Location: | PEC Stack Outlet | Static Press (in. $H_2O$): | 0.11 | Control Box ID: | 1618 | Probe ID: | 7-9 |
| | | Baro. Pres. (in. Hg): | 29.33 | Assumed Moisture (%): | 2 | Pitot ID: | 7-9 |
| Project Number: | 106377 (16-167) | Ambient Temp (°F): | 70°F | Umbilical Length (Feet): | 100' | Filter ID: | NA |
| Test Crew: | JV JW TM (TI) | Initial K-factor | 0.6 | | | Stack Diameter (inches): | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume (ft³) ~~058.000 ft~~ 51.423 | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Filter Exit Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-1 | 0:02:30 | 052.360 | 0.71 | 0.43 | 1.0 | 122 | 243 | N/A | 65 | 71 | 69 | Push @ 1413 |
| A-1 | 0:05:00 | 053.650 | 0.72 | 0.44 | 1.0 | 148 | 246 | | 63 | 72 | 70 | Push @ 1425 |
| A-2 | 0:07:30 | 054.609 | 0.72 | 0.44 | 1.0 | 132 | 239 | | 61 | 72 | 71 | Push @ 1436 |
| A-2 | 0:10:00 | 055.558 | 0.75 | 0.45 | 1.0 | 152 | 246 | | 60 | 73 | 72 | Push @ 1450 |
| A-3 | 0:12:30 | 056.493 | 0.76 | 0.46 | 1.0 | 138 | 249 | | 59 | 73 | 72 | Push @ 1503 |
| A-3 | 0:15:00 | 057.425 | 0.74 | 0.44 | 1.0 | 158 | 250 | | 58 | 74 | 73 | Push @ 1514 |
| A-4 | 0:17:30 | 058.380 | 0.74 | 0.44 | 1.0 | 144 | 250 | | 59 | 74 | 73 | Push @ 1533 |
| A-4 | 0:20:00 | 059.361 | 0.78 | 0.47 | 1.0 | 132 | 247 | | 60 | 75 | 74 | Push @ 1547 |
| A-5 | 0:22:30 | 060.389 | 0.78 | 0.47 | 1.0 | 135 | 246 | | 61 | 75 | 75 | Push @ 1559 |
| A-5 | 0:25:00 | 061.388 | 0.82 | 0.49 | 1.0 | 145 | 250 | | 63 | 77 | 76 | Push @ 1644 |
| A-6 | 0:27:30 | 062.350 | 0.81 | 0.49 | 1.0 | 139 | 251 | | 62 | 77 | 76 | Push @ 1656 |
| A-6 | 0:30:00 | 063.306 | 0.79 | 0.46 | 1.0 | 147 | 254 | | 62 | 77 | 76 | Push @ 1711 0.77 ft |
| A-7 | 0:32:30 | 064.179 | 0.65 | 0.39 | 1.0 | 158 | 254 | | 61 | 77 | 77 | Push @ 1735 |
| A-7 | 0:35:00 | 065.076 | 0.65 | 0.39 | 1.0 | 139 | 253 | | 60 | 77 | 77 | Push @ 1747 |
| A-8 | 0:37:30 | 066.001 | 0.68 | 0.41 | 1.0 | 144 | 237 | | 61 | 77 | 77 | Push @ 1800 |
| A-8 | 0:40:00 | 066.998 | 0.69 | 0.41 | 1.0 | 138 | 236 | | 62 | 78 | 77 | Push @ 1813 |
| A-9 | 0:42:30 | 067.813 | 0.70 | 0.42 | 1.0 | 125 | 256 | | 62 | 77 | 77 | Push @ 1909 |
| A-9 | 0:45:00 | 068.765 | 0.75 | 0.45 | 1.0 | 137 | 242 | | 61 | 77 | 77 | Push @ 1921 |
| A-10 | 0:47:30 | 69.710 | 0.70 | 0.42 | 1.0 | 124 | 262 | | 58 | 76 | 77 | Push @ ~~1425~~ 1435 |
| A-10 | 0:50:00 | 70.673 | 0.68 | 0.41 | 1.0 | 135 | 249 | | 57 | 76 | 77 | Push @ 1949 |
| A-11 | 0:52:30 | 71.615 | 0.68 | 0.41 | 1.0 | 124 | 254 | | 57 | 76 | 76 | Push @ 2002 |
| A-11 | 0:55:00 | 72.548 | 0.68 | 0.41 | 1.0 | 153 | 262 | | 58 | 76 | 76 | Push @ ~~2009~~ 2015 |
| A-12 | 0:57:30 | 73.511 | 0.70 | 0.42 | 1.0 | 138 | 259 | | 56 | 76 | 76 | Push @ 2027 |
| A-12 | 1:00:00 | 74.465 | 0.68 | 0.41 | 1.0 | 170 | 264 | | 56 | 76 | 76 | Push @ 2040 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 14 | 0.00 |
| Check | Final | 5 | 0.00 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |
| Fyrite Kit ID: | NA | Fyrite $O_2$ Check | | NA % |
| Balance ID: | | BAL-017 | | |
| Ref. Weight (200g): | | NA | Tolerance = +/- 0.5 g | |
| Ref. Weight (500g): | | 500.0 | Tolerance = +/- 0.5 g | |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | $H_2O$ (g)* | 755.1 | 738.0 | |
| 2 | $H_2O$ (g)* | 636.9 | 634.9 | |
| 3 | Empty (g) | 615.8 | 615.6 | |
| 4 | Silica (g) | 789.1 | 781.2 | |

* Type 1 High Purity HPLC Water

# MONTROSE METHOD 316 DATA SHEET

**Client:** ArcelorMittal **Test Type:** Method 316 Formaldehyde **Project Number:** 106377 (16-167)

**Date:** 11/1/16 - 11/2/16 **Run Number:** 1 **Sampling Location:** PEC Stack Outlet

**Test Crew:** JV JW TM TL

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Filter Exit Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 1:02:30 | 75.397 | ~~0.91~~ | 0.43 | 1.0 | 129 | 236 | N/A | 61 | 74 | 76 | 2101 0.71 TL |
| B-1 | 1:05:00 | 76.352 | 0.72 | 0.43 | 1.0 | 110 | 241 | | 60 | 75 | 75 | 2139 |
| B-2 | 1:07:30 | 77.320 | 0.75 | 0.45 | 1.0 | 117 | 237 | | 58 | 74 | 75 | 2153 |
| B-2 | 1:10:00 | 78.268 | 0.69 | 0.41 | 1.0 | 125 | 238 | | 58 | 74 | 75 | 2203 |
| B-3 | 1:12:30 | 79.212 | 0.72 | 0.43 | 1.0 | 122 | 236 | | 58 | 74 | 75 | 2214 |
| B-3 | 1:15:00 | 80.149 | 0.73 | 0.44 | 1.0 | 124 | 241 | | 58 | 74 | 74 | 2226 |
| B-4 | 1:17:30 | 81.016 | 0.71 | 0.43 | 1.0 | 119 | 232 | | 58 | 74 | 74 | 2238 |
| B-4 | 1:20:00 | 82.005 | 0.68 | 0.40 | 1.0 | 121 | 234 | | 56 | 73 | 74 | 2250 |
| B-5 | 1:22:30 | 82.997 | 0.80 | 0.48 | 1.0 | 108 | 243 | | 54 | 73 | 73 | 2337 |
| B-5 | 1:25:00 | 83.952 | 0.74 | 0.44 | 1.0 | 119 | 250 | | 53 | 72 | 73 | 2349 |
| B-6 | 1:27:30 | 84.901 | 0.74 | 0.44 | 1.0 | 138 | 255 | | 55 | 72 | 73 | 0001 |
| B-6 | 1:30:00 | 85.889 | 0.80 | 0.48 | 1.0 | 113 | 256 | | 54 | 71 | 72 | 0038 |
| B-7 | 1:32:30 | 86.857 | 0.74 | 0.44 | 1.0 | 145 | 243 | | 54 | 71 | 72 | 0051 |
| B-7 | 1:35:00 | 87.812 | 0.79 | 0.46 | 1.0 | ~~244~~* | 244 | | 53 | 71 | 72 | ~~010~~0112 Stack = 134 |
| B-8 | 1:37:30 | 88.834 | 0.82 | 0.50 | 1.0 | 123 | 255 | | 51 | 70 | 70 | 0226 |
| B-8 | 1:40:00 | 89.816 | 0.82 | 0.50 | 1.0 | 124 | 259 | | 54 | 69 | 70 | 0241 |
| B-9 | 1:42:30 | 90.812 | 0.78 | 0.47 | 1.0 | 131 | 260 | | 52 | 69 | 70 | 0255 |
| B-9 | 1:45:00 | 91.776 | 0.76 | 0.46 | 1.0 | 118 | 244 | | 54 | 69 | 70 | 0307 |
| B-10 | 1:47:30 | 92.749 | 0.74 | 0.44 | 1.0 | 127 | 254 | | 53 | 69 | 70 | 0318 |
| B-10 | 1:50:00 | 93.688 | 0.74 | 0.44 | 1.0 | 121 | 257 | | 54 | 69 | 70 | 0329 |
| B-11 | 1:52:30 | 94.644 | 0.77 | 0.46 | 1.0 | 138 | 248 | | 55 | 69 | 70 | 0340 |
| B-11 | 1:55:00 | 95.616 | 0.75 | 0.45 | 1.0 | 104 | 251 | | 55 | 69 | 69 | 0415 |
| B-12 | 1:57:30 | 96.564 | 0.77 | 0.46 | 1.0 | 126 | 246 | | 54 | 69 | 69 | 0427 |
| B-12 | 2:00:00 | 97.526 | 0.76 | 0.46 | 1.0 | 116 | 253 | | 54 | 68 | 69 | 0436 |

# MONTROSE METHOD 316 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | ArcelorMittal | **Test Type:** | Method 316 Formaldehyde | **Meter ΔH :** | 1.971 | **Start Time:** | 513 |
| **Date:** | 4/21/16 | **Run Number:** | 2 | **Meter Correction (γ):** | 1.003 | **Stop Time:** | 1910 |
| **Plant:** | Monessen, PA | **Nozzle Diameter (inches):** | 0.165 | **Pitot Correction:** | 0.84 | **T/C ID:** | 7-9 |
| **Sampling Location:** | PEC Stack Outlet | **Static Press (in. $H_2O$):** | +0.12 | **Control Box ID:** | 1618 | **Probe ID:** | 7-9 |
| | | **Baro. Pres. (in. Hg):** | 29.29 | **Assumed Moisture (%):** | 2% | **Pitot ID:** | 7-9 |
| **Project Number:** | 106377 (16-167) | **Ambient Temp (°F):** | 60 | **Umbilical Length (Feet):** | 100' | **Filter ID:** | NA |
| **Test Crew:** | JV JW TM TL | **Initial K-factor** | 0.6 | | | **Stack Diameter (inches):** | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume (ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Filter Exit Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 97.700 | | | | | | | | | | |
| A-1 | 0:02:30 | 98.8 | 0.62 | 0.37 | 1 | 113 | 233 | 250 | 60 | 68 | 69 | Start 513 |
| A-1 | 0:05:00 | 99.65 | 0.73 | 0.44 | 1 | 119 | 246 | 249 | 60 | 68 | 69 | 526 |
| A-2 | 0:07:30 | 100.64 | 0.75 | 0.45 | 1 | 122 | 248 | 249 | 58 | 68 | 68 | 540 |
| A-2 | 0:10:00 | 101.53 | 0.67 | 0.40 | 1 | 120 | 246 | 248 | 54 | 68 | 68 | 552 |
| A-3 | 0:12:30 | 102.55 | 0.72 | 0.43 | 1 | 116 | 237 | 248 | 54 | 68 | 68 | 607 |
| A-3 | 0:15:00 | 103.42 | 0.72 | 0.43 | 1 | 116 | 241 | 248 | 54 | 68 | 68 | 621 |
| A-4 | 0:17:30 | 104.35 | 0.72 | 0.43 | 1 | 109 | 244 | 248 | 54 | 67 | 68 | 634 |
| A-4 | 0:20:00 | 105.28 | 0.74 | 0.44 | 1 | 122 | 239 | 248 | 53 | 67 | 68 | 646 |
| A-5 | 0:22:30 | 106.230 | 0.73 | 0.44 | 1 | 116 | 243 | 249 | 53 | 67 | 68 | 657 |
| A-5 | 0:25:00 | 107.148 | 0.72 | 0.43 | 1 | 115 | 246 | 245 | 53 | 67 | 67 | 738 |
| A-6 | 0:27:30 | 108.110 | 0.72 | 0.43 | 1 | 124 | 245 | 245 | 55 | 67 | 67 | 753 |
| A-6 | 0:30:00 | 109.000 | 0.73 | 0.44 | 1 | 117 | 251 | 246 | 53 | 66 | 67 | 806 |
| A-7 | 0:32:30 | 110.015 | 0.79 | 0.47 | 1 | 113 | 247 | 239 | 53 | 66 | 67 | 822 |
| A-7 | 0:35:00 | 111.057 | 0.80 | 0.48 | 1 | 121 | 247 | 243 | 55 | 66 | 66 | 902 |
| A-8 | 0:37:30 | 111.890 | 0.72 | 0.43 | 1 | 114 | 241 | 239 | 57 | 66 | 66 | 921 |
| A-8 | 0:40:00 | 112.909 | 0.74 | 0.44 | 1 | 122 | 249 | 243 | 57 | 66 | 66 | 933 |
| A-9 | 0:42:30 | 113.717 | 0.71 | 0.43 | 1 | 117 | 252 | 246 | 60 | 66 | 66 | 0949 |
| A-9 | 0:45:00 | 114.634 | 0.72 | 0.43 | 1 | 133 | 254 | 246 | 59 | 66 | 66 | 1000 |
| A-10 | 0:47:30 | 115.536 | 0.69 | 0.41 | 1 | 121 | 249 | 257 | 58 | 66 | 66 | 1014 |
| A-10 | 0:50:00 | 116.471 | 0.71 | 0.43 | 1 | 131 | 238 | 244 | 60 | 67 | 67 | 1026 |
| A-11 | 0:52:30 | 117.352 | 0.68 | 0.41 | 1 | 124 | 257 | 251 | 61 | 67 | 67 | 1039 |
| A-11 | 0:55:00 | 118.236 | 0.69 | 0.41 | 1 | 143 | 265 | 254 | 62 | 68 | 67 | 1051 |
| A-12 | 0:57:30 | 119.218 | 0.73 | 0.44 | 1 | 127 | 243 | 250 | 64 | 70 | 69 | 1150 |
| A-12 | 1:00:00 | 120.146 | 0.72 | 0.43 | 1 | 136 | 259 | 247 | 65 | 70 | 69 | 1202 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.000 |
| Check | Final | 8 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | E | M | S |
| $O_2$ (%) | | | | |
| Fyrite Kit ID: | NA | Fyrite $O_2$ Check | | NO % |
| Balance ID: | | BAL-017 | | |
| Ref. Weight (200g): | | NA | Tolerance = +/- 0.5 g | |
| Ref. Weight (500g): | | 500.0 | Tolerance = +/- 0.5 g | |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | $H_2O$ (g)* | 711.1 | 706.8 | |
| 2 | $H_2O$ (g)* | 711.8 | 706.8 | |
| 3 | Empty (g) | 605.1 | 603.1 | |
| 4 | Silica (g) | 757.8 | 748.5 | |

* Type 1 High Purity HPLC Water

# MONTROSE METHOD 316 DATA SHEET

**Client:** ArcelorMittal **Test Type:** Method 316 Formaldehyde **Project Number:** 106377 (16-167)

**Date:** 11/2/16 **Run Number:** 2 **Sampling Location:** PEC Stack Outlet

**Test Crew:** JV JW TM TL

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Filter Exit Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 1:02:30 | 121.061 | 0.70 | 0.42 | 1 | 136 | 238 | 246 | 64 | 71 | 70 | 1215 |
| B-1 | 1:05:00 | 121.966 | 0.66 | 0.40 | 1 | 151 | 239 | 246 | 65 | 71 | 71 | 1231 |
| B-2 | 1:07:30 | 122.836 | 0.67 | 0.40 | 1 | 131 | 255 | 241 | 63 | 72 | 71 | 1249 |
| B-2 | 1:10:00 | 123.739 | 0.65 | 0.39 | 1 | 155 | 256 | 243 | 62 | 73 | 71 | 1255 |
| B-3 | 1:12:30 | 124.631 | 0.65 | 0.39 | 1 | 145 | 262 | 246 | 62 | 73 | 71 | 1311 |
| B-3 | 1:15:00 | 125.554 | 0.71 | 0.45 | 1 | 164 | 257 | 252 | 60 | 74 | 73 | 1324 |
| B-4 | 1:17:30 | 126.465 | 0.68 | 0.41 | 1 | 151 | 255 | 252 | 61 | 74 | 73 | 1337 |
| B-4 | 1:20:00 | 127.557 | 0.67 | 0.40 | 1 | 147 | 253 | 250 | 62 | 75 | 74 | 1354 |
| B-5 | 1:22:30 | 128.613 | 0.70 | 0.40 | 1 | 132 | 256 | 245 | 60 | 76 | 75 | 1410 |
| B-5 | 1:25:00 | 129.418 | 0.70 | 0.40 | 1 | 136 | 254 | 247 | 60 | 76 | 75 | 1423 |
| B-6 | 1:27:30 | 130.375 | 0.72 | 0.43 | 1 | 143 | 246 | 240 | 59 | 77 | 76 | 1435 |
| B-6 | 1:30:00 | 131.359 | 0.75 | 0.45 | 1 | 144 | 243 | 234 | 59 | 77 | 76 | 1447 |
| B-7 | 1:32:30 | 132.273 | 0.72 | 0.43 | 1 | 147 | 237 | 234 | 60 | 78 | 76 | 1457 |
| B-7 | 1:35:00 | 133.256 | 0.76 | 0.46 | 1 | 129 | 239 | 240 | 62 | 79 | 78 | 1536 |
| B-8 | 1:37:30 | 134.221 | 0.75 | 0.45 | 1 | 124 | 240 | 251 | 61 | 79 | 78 | 1549 |
| B-8 | 1:40:00 | 135.241 | 0.75 | 0.45 | 1 | 135 | 238 | 247 | 62 | 80 | 79 | 1612 |
| B-9 | 1:42:30 | 136.119 | 0.74 | 0.44 | 1 | 155 | 254 | 249 | 63 | 80 | 79 | 1629 |
| B-9 | 1:45:00 | 137.053 | 0.73 | 0.44 | 1 | 142 | 248 | 253 | 61 | 80 | 80 | 1644 |
| B-10 | 1:47:30 | 137.955 | 0.64 | 0.38 | 1 | 150 | 257 | 253 | 61 | 81 | 80 | 1705 |
| B-10 | 1:50:00 | 138.882 | 0.67 | 0.40 | 1 | 135 | 253 | 256 | 60 | 81 | 80 | 1724 |
| B-11 | 1:52:30 | 139.890 | 0.71 | 0.43 | 1 | 127 | 248 | 250 | 62 | 81 | 81 | 1835 |
| B-11 | 1:55:00 | 140.825 | 0.70 | 0.40 | 1 | 138 | 251 | 250 | 63 | 81 | 81 | 1847 |
| B-12 | 1:57:30 | 141.745 | 0.67 | 0.40 | 1 | 149 | 248 | 248 | 62 | 80 | 81 | 1858 |
| B-12 | 2:00:00 | 142.642 | 0.67 | 0.40 | 1 | 123 | 261 | 248 | 63 | 80 | 80 | 1910 |

# MONTROSE METHOD 316 DATA SHEET

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | ArcelorMittal | **Test Type:** | Method 316 Formaldehyde | **Meter ΔH :** | 1.971 | **Start Time:** | 1949 11/2/16 |
| **Date:** | 11/2/16 - 11/3/16 | **Run Number:** | 3 | **Meter Correction (γ):** | 1.003 | **Stop Time:** | 1056 11/3/16 |
| **Plant:** | Monessen, PA | **Nozzle Diameter (inches):** | 0.155 | **Pitot Correction:** | 0.84 | **T/C ID:** | 7-9 |
| **Sampling Location:** | PEC Stack Outlet | **Static Press (in. $H_2O$):** | Tw ~~29.2~~ 0.12 | **Control Box ID:** | 1618 | **Probe ID:** | 7-9 |
| | | **Baro. Pres. (in. Hg):** | 29.26 | **Assumed Moisture (%):** | 2% | **Pitot ID:** | 7-9 |
| **Project Number:** | 106377 (16-167) | **Ambient Temp (°F):** | 72 | **Umbilical Length (Feet):** | 100' | **Filter ID:** | NA |
| **Test Crew:** | JV JW TM TL | **Initial K-factor** | 0.6 | | | **Stack Diameter (inches):** | 72" |

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume (ft³) | Velocity Head (ΔP) (in $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Filter Exit Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 142.800 | | | | | | | | | | |
| A-1 | 0:02:30 | 143.818 | 0.76 | 0.46 | 1.0 | 129 | 234 | N/A | 68 | 78 | 79 | 1949 |
| A-1 | 0:05:00 | 144.875 | 0.84 | 0.50 | 1.0 | 113 | 237 | | 51 | 77 | 78 | 2038 |
| A-2 | 0:07:30 | 145.874 | 0.78 | 0.47 | 1.0 | 123 | 235 | | 52 | 76 | 77 | 2050 |
| A-2 | 0:10:00 | 146.844 | 0.73 | 0.44 | 1.0 | 126 | 236 | | 52 | 76 | 77 | 2100 |
| A-3 | 0:12:30 | 147.825 | 0.75 | 0.45 | 1.0 | 138 | 241 | | 52 | 76 | 77 | 2110 |
| A-3 | 0:15:00 | 148.842 | 0.76 | 0.46 | 1.0 | 132 | 237 | | 52 | 76 | 77 | 2121 |
| A-4 | 0:17:30 | 149.843 | 0.80 | 0.48 | 1.0 | 152 | 238 | | 52 | 75 | 76 | 2133 |
| A-4 | 0:20:00 | 150.824 | 0.76 | 0.46 | 1.0 | 138 | 237 | | 50 | 75 | 76 | 2144 |
| A-5 | 0:22:30 | 151.815 | 0.75 | 0.45 | 1.0 | 148 | 243 | | 52 | 75 | 76 | 2154 |
| A-5 | 0:25:00 | 152.812 | 0.77 | 0.46 | 1.0 | 137 | 236 | | 51 | 75 | 76 | 2205 |
| A-6 | 0:27:30 | 153.767 | 0.72 | 0.43 | 1.0 | 128 | 246 | | 53 | 75 | 76 | 2217 |
| A-6 | 0:30:00 | 154.748 | 0.72 | 0.43 | 1.0 | 133 | 244 | | 52 | 75 | 76 | 2226 |
| A-7 | 0:32:30 | 155.737 | 0.75 | 0.45 | 1.0 | 126 | 248 | | 50 | 75 | 76 | 2236 |
| A-7 | 0:35:00 | 156.701 | 0.72 | 0.43 | 1.0 | 133 | 242 | | 53 | 75 | 75 | 2246 |
| A-8 | 0:37:30 | 157.864 | 0.77 | 0.46 | 1.0 | 127 | 241 | | 51 | 74 | 74 | 2332 |
| A-8 | 0:40:00 | 158.719 | 0.75 | 0.45 | 1.0 | 117 | 246 | | 52 | 73 | 74 | 2348 |
| A-9 | 0:42:30 | 159.731 | 0.70 | 0.43 | 1.0 | 119 | 238 | | 49 | 72 | 73 | 0015 |
| A-9 | 0:45:00 | 160.644 | 0.68 | 0.40 | 1.0 | 128 | 235 | | 49 | 72 | 72 | 107 |
| A-10 | 0:47:30 | 161.569 | 0.65 | 0.39 | 1.0 | 119 | 237 | | 49 | 71 | 72 | 119 |
| A-10 | 0:50:00 | 162.514 | 0.66 | 0.40 | 1.0 | 143 | 234 | | 50 | 71 | 72 | 131 |
| A-11 | 0:52:30 | 163.403 | 0.63 | 0.38 | 1.0 | 127 | 239 | | 50 | 72 | 72 | 144 |
| A-11 | 0:55:00 | 164.356 | 0.67 | 0.40 | 1.0 | 143 | 236 | | 50 | 71 | 72 | 157 |
| A-12 | 0:57:30 | 165.264 | 0.65 | 0.39 | 1.0 | 123 | 240 | | 51 | 71 | 72 | 216 |
| A-12 | 1:00:00 | 166.174 | 0.65 | 0.39 | 1.0 | 131 | 239 | | 51 | 71 | 71 | 233 |

(max leak rate = 0.02 ft³/min)

| Sample | | (in. Hg) | (ft³/min) |
|---|---|---|---|
| Train Leak | Initial | 15 | 0.000 |
| Check | Final | 12 | 0.000 |
| | | Pressure (+) | Static (-) |
| Pitot Leak | Initial | ✓ | ✓ |
| Check | Final | ✓ | ✓ |

(≥ 3.0 inches and stable for 15 sec)

| Sample # | 1 | 2 | 3 | Average |
|---|---|---|---|---|
| $CO_2$ (%) | C | C | M | S |
| $O_2$ (%) | | | | |
| Fyrite Kit ID: | NA | Fyrite $O_2$ Check | | NA % |
| Balance ID: | BAL017 | | | |
| Ref. Weight (200g): | NA | Tolerance = +/- 0.5 g | | |
| Ref. Weight (500g): | 500.0 | Tolerance = +/- 0.5 g | | |

| Imp | Contents | Final | Initial | Difference |
|---|---|---|---|---|
| 1 | $H_2O$ (g)* | 726.3 | 708.7 | |
| 2 | $H_2O$ (g)* | 709.6 | 707.7 | |
| 3 | Empty (g) | 605.6 | 605.4 | |
| 4 | Silica (g) | 759.4 | 751.2 | |

* Type 1 High Purity HPLC Water

# MONTROSE METHOD 316 DATA SHEET

**Client:** ArcelorMittal **Test Type:** Method 316 Formaldehyde **Project Number:** 106377 (16-167)

**Date:** 11/2/16 **Run Number:** 3 **Sampling Location:** PEC Stack Outlet

**Test Crew:** JV JW TM TL

*(Please Circle Initials of Meter Box Operator)*

| Traverse Point Number | Elapsed Time (mins) | Metered Volume ( ft³) | Velocity Head (ΔP) (in. $H_2O$) | Orifice (ΔH) (in. $H_2O$) | Meter Vacuum (in. Hg) | Stack Temp. (°F) | Probe Temp. (°F) 248°+/- 25° | Filter Exit Temp. (°F) 248°+/- 25° | Imp Exit Temp. (°F) ≤ 68° | Meter Temp. (°F) IN/AVG | Meter Temp. (°F) OUT | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 1:02:30 | 167.159 | 0.78 | 0.47 | 1 | 117 | 244 | N/A | 50 | 70 | 71 | 291 |
| B-1 | 1:05:00 | 168.187 | 0.80 | 0.48 | 1 | 132 | 242 | | 50 | 70 | 71 | 305 |
| B-2 | 1:07:30 | 169.194 | 0.82 | 0.50 | 1 | 112 | 240 | | 53 | 70 | 70 | 349 |
| B-2 | 1:10:00 | 170.225 | 0.82 | 0.50 | 1 | 130 | 239 | | 55 | 70 | 71 | 400 |
| B-3 | 1:12:30 | 171.126 | 0.77 | 0.46 | 1 | 123 | 246 | | 56 | 70 | 70 | 413 |
| B-3 | 1:15:00 | 172.251 | 0.84 | 0.50 | 1 | 125 | 249 | | 56 | 70 | 70 | 425 |
| B-4 | 1:17:30 | 173.242 | 0.78 | 0.47 | 1 | 130 | 240 | | 55 | 71 | 70 | 438 |
| B-4 | 1:20:00 | 174.280 | 0.82 | 0.50 | 1 | 140 | 236 | | 57 | 71 | 71 | 452 |
| B-5 | 1:22:30 | 175.335 | 0.80 | 0.48 | 1 | 134 | 245 | | 59 | 71 | 71 | 521 |
| B-5 | 1:25:00 | 176.306 | 0.75 | 0.45 | 1 | 132 | 242 | | 59 | 71 | 71 | 534 |
| B-6 | 1:27:30 | 177.531 | 0.84 | 0.50 | 1 | 114 | 243 | | 61 | 73 | 73 | 0701 |
| B-6 | 1:30:00 | 178.553 | 0.82 | 0.50 | 1 | 119 | 240 | | 62 | 73 | 73 | 0710 |
| B-7 | 1:32:30 | 179.728 | 0.85 | 0.51 | 1 | 121 | 246 | | 62 | 74 | 73 | 733 |
| B-7 | 1:35:00 | 180.732 | 0.82 | 0.49 | 1 | 118 | 246 | | 58 | 73 | 73 | 747 |
| B-8 | 1:37:30 | 181.727 | 0.82 | 0.49 | 1 | 117 | 248 | | 57 | 73 | 73 | 800 |
| B-8 | 1:40:00 | 182.310 | 0.75 | 0.45 | 1 | 126 | 248 | | 56 | 72 | 72 | 821 |
| B-9 | 1:42:30 | 183.684 | 0.78 | 0.47 | 1 | 122 | 250 | | 57 | 72 | 72 | 834 |
| B-9 | 1:45:00 | 184.646 | 0.76 | 0.46 | 1 | 138 | 253 | | 57 | 70 | 72 | 848 |
| B-10 | 1:47:30 | 185.475 | 0.80 | 0.48 | 1 | 133 | 249 | | 58 | 71 | 71 | 932 |
| B-10 | 1:50:00 | 186.494 | 0.78 | 0.47 | 1 | 119 | 252 | | 58 | 71 | 71 | 950 |
| B-11 | 1:52:30 | 187.437 | 0.72 | 0.43 | 1 | 121 | 250 | | 58 | 70 | 70 | 1004 |
| B-11 | 1:55:00 | 188.393 | 0.71 | 0.43 | 1 | 170 | 248 | | 58 | 70 | 70 | 1020 |
| B-12 | 1:57:30 | 189.334 | 0.74 | 0.44 | 1 | 136 | 248 | | 58 | 70 | 70 | 1036 |
| B-12 | 2:00:00 | 190.270 | 0.72 | 0.43 | 1 | 120 | 245 | | 55 | 70 | 70 | 1054 |

# Methods 0031

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 1-2, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 1 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 2:13 PM | |
| Unit Operation: | Normal | | Test Finish Time: | 4:40 AM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Barometric Pressure (Pbar) | 29.33 | in. Hg |
| Stack Static Pressure (Pg) | 0.11 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter NA if circular) | 0.0 | inches |
| O2 (taken from CEMs spreadsheet) | 20.09 | % dv |
| CO2 (taken from CEMs spreadsheet) | 0.63 | % dv |
| Product Rate (enter NA if not needed) | NA | ton/hr |
| Is the input ton/hr metric? (YES=1) | 0 | |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Flow, Moisture, Select VOC's | |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 73.4 | F |
| Stack Temperature (Tsavg) | 131.9 | F |
| Orifice Pressure Drop (dHavg) | 0.442 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8603 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 14.45 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.32 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.28 | % dv |
| Water Collected ($V_f$- $V_i$) | NA | ml |
| Water Vapor Condensed (Vwc(std)) | NA | scf |
| Water Collected ($W_f$- $W_i$) | NA | g |
| Water Vapor in Silica Gel (Vwsg(std)) | NA | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | NA | scf |
| Volume Dry Gas Metered (Vm) | NA | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | NA | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | NA | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | NA | dscm |
| Stack Absolute Pressure (Ps) | 29.34 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 591.5 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.76 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1623 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0278 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0278 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.90 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.60 | lb/lb-mole |
| Gas Velocity (Vs) | 51.89 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 88,026 | acfm |
| Standard Gas Flowrate | 77,002 | scfm |
| Dry Standard Gas Flowrate | 74,863 | dscfm |
| Actual Gas Flowrate | 2,493 | acm/min |
| Standard Gas Flowrate | 2,180 | scm/min |
| Dry Standard Gas Flowrate | 2,120 | dscm/min |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Acrylonitrile (107-13-1)** | | | | **Ethylbenzene (100-41-4)** | | | |
| Emission Mass | < | 0.70 | µg | Emission Mass | < | 0.69 | µg |
| Molecular Weight | | 53.06 | lb/lb-mole | Molecular Weight | | 106.17 | lb/lb-mole |
| Emission Concentration | < | 0.0115 | mg/DSCM | Emission Concentration | < | 0.0114 | mg/DSCM |
| Emission Concentration | < | 7.15E-10 | lb/dscf | Emission Concentration | < | 7.05E-10 | lb/dscf |
| Emission Concentration | < | 0.0052 | $ppm_{dv}$ | Emission Concentration | < | 0.0026 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr | Emission Rate | < | 0.00044 | lb/hr |
| **Benzene** | | | | **Iodomethane (74-88-4)** | | | |
| Emission Mass | < | 2.02 | µg | Emission Mass | < | 0.82 | µg |
| Molecular Weight | | 78.11 | lb/lb-mole | Molecular Weight | | 141.94 | lb/lb-mole |
| Emission Concentration | < | 0.0333 | mg/DSCM | Emission Concentration | < | 0.0136 | mg/DSCM |
| Emission Concentration | < | 2.06E-09 | lb/dscf | Emission Concentration | < | 8.42E-10 | lb/dscf |
| Emission Concentration | < | 0.0102 | $ppm_{dv}$ | Emission Concentration | < | 0.0023 | $ppm_{dv}$ |
| Emission Rate | < | 0.00128 | lb/hr | Emission Rate | < | 0.00052 | lb/hr |
| **Bromoform (75-25-2)** | | | | **Methylene chloride (75-09-2)** | | | |
| Emission Mass | < | 0.55 | µg | Emission Mass | < | 2.09 | µg |
| Molecular Weight | | 252.731 | lb/lb-mole | Molecular Weight | | 84.93 | lb/lb-mole |
| Emission Concentration | < | 0.0091 | mg/DSCM | Emission Concentration | < | 0.0344 | mg/DSCM |
| Emission Concentration | < | 5.66E-10 | lb/dscf | Emission Concentration | < | 2.14E-09 | lb/dscf |
| Emission Concentration | < | 0.0009 | $ppm_{dv}$ | Emission Concentration | < | 0.0097 | $ppm_{dv}$ |
| Emission Rate | < | 0.00035 | lb/hr | Emission Rate | < | 0.00133 | lb/hr |
| **Bromomethane (74-83-9)** | | | | **Styrene (100-42-5)** | | | |
| Emission Mass | < | 4.06 | µg | Emission Mass | < | 0.73 | µg |
| Molecular Weight | | 252.731 | lb/lb-mole | Molecular Weight | | 104.15 | lb/lb-mole |
| Emission Concentration | < | 0.0669 | mg/DSCM | Emission Concentration | < | 0.0120 | mg/DSCM |
| Emission Concentration | < | 4.15E-09 | lb/dscf | Emission Concentration | < | 7.43E-10 | lb/dscf |
| Emission Concentration | < | 0.0063 | $ppm_{dv}$ | Emission Concentration | < | 0.0027 | $ppm_{dv}$ |
| Emission Rate | < | 0.00258 | lb/hr | Emission Rate | < | 0.00046 | lb/hr |
| **Carbon disulfide (75-15-0)** | | | | **1,1,2,2-Tetrachloroethane (79-34-5)** | | | |
| Emission Mass | < | 0.82 | µg | Emission Mass | < | 1.36 | µg |
| Molecular Weight | | 76.139 | lb/lb-mole | Molecular Weight | | 167.848 | lb/lb-mole |
| Emission Concentration | < | 0.0136 | mg/DSCM | Emission Concentration | < | 0.0224 | mg/DSCM |
| Emission Concentration | < | 8.43E-10 | lb/dscf | Emission Concentration | < | 1.39E-09 | lb/dscf |
| Emission Concentration | < | 0.0043 | $ppm_{dv}$ | Emission Concentration | < | 0.0032 | $ppm_{dv}$ |
| Emission Rate | < | 0.00052 | lb/hr | Emission Rate | < | 0.00087 | lb/hr |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP $(in. H2O)^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) | Sample Train Temp Side A |
|---|---|---|---|---|---|---|---|
| A-1 | 0.71 | 0.843 | 0.43 | 122 | 71 | 69 | 9 |
| A-1 | 0.72 | 0.849 | 0.44 | 148 | 72 | 70 | 10 |
| A-2 | 0.72 | 0.849 | 0.44 | 132 | 72 | 71 | 10 |
| A-2 | 0.75 | 0.866 | 0.45 | 152 | 73 | 72 | 10 |
| A-3 | 0.76 | 0.872 | 0.46 | 138 | 73 | 72 | 10 |
| A-3 | 0.74 | 0.860 | 0.44 | 158 | 74 | 73 | 11 |
| A-4 | 0.74 | 0.860 | 0.44 | 144 | 74 | 73 | 11 |
| A-4 | 0.78 | 0.883 | 0.47 | 132 | 75 | 74 | 11 |
| A-5 | 0.78 | 0.883 | 0.47 | 135 | 75 | 75 | 11 |
| A-5 | 0.82 | 0.906 | 0.49 | 145 | 77 | 76 | 12 |
| A-6 | 0.81 | 0.900 | 0.49 | 139 | 77 | 76 | 13 |
| A-6 | 0.77 | 0.877 | 0.46 | 147 | 77 | 76 | 13 |
| A-7 | 0.65 | 0.806 | 0.39 | 158 | 77 | 77 | 14 |
| A-7 | 0.65 | 0.806 | 0.39 | 139 | 77 | 77 | 14 |
| A-8 | 0.68 | 0.825 | 0.41 | 144 | 77 | 77 | 15 |
| A-8 | 0.69 | 0.831 | 0.41 | 138 | 78 | 77 | 15 |
| A-9 | 0.70 | 0.837 | 0.42 | 125 | 77 | 77 | 15 |
| A-9 | 0.75 | 0.866 | 0.45 | 137 | 77 | 77 | 14 |
| A-10 | 0.70 | 0.837 | 0.42 | 124 | 76 | 77 | 14 |
| A-10 | 0.68 | 0.825 | 0.41 | 135 | 76 | 77 | 14 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 76 | 76 | 14 |
| A-11 | 0.68 | 0.825 | 0.41 | 153 | 76 | 76 | 14 |
| A-12 | 0.70 | 0.837 | 0.42 | 138 | 76 | 76 | 14 |
| A-12 | 0.68 | 0.825 | 0.41 | 170 | 76 | 76 | 14 |
| B-1 | 0.91 | 0.954 | 0.43 | 129 | 74 | 76 | 14 |
| B-1 | 0.72 | 0.849 | 0.43 | 110 | 75 | 75 | 14 |
| B-2 | 0.75 | 0.866 | 0.45 | 117 | 74 | 75 | 14 |
| B-2 | 0.69 | 0.831 | 0.41 | 125 | 74 | 75 | 14 |
| B-3 | 0.72 | 0.849 | 0.43 | 122 | 74 | 75 | 14 |
| B-3 | 0.73 | 0.854 | 0.44 | 124 | 74 | 74 | 14 |
| B-4 | 0.71 | 0.843 | 0.43 | 119 | 74 | 74 | |
| B-4 | 0.68 | 0.825 | 0.40 | 121 | 73 | 74 | |
| B-5 | 0.80 | 0.894 | 0.48 | 108 | 73 | 73 | |
| B-5 | 0.74 | 0.860 | 0.44 | 119 | 72 | 73 | |
| B-6 | 0.74 | 0.860 | 0.44 | 138 | 72 | 73 | |
| B-6 | 0.80 | 0.894 | 0.48 | 113 | 71 | 72 | |
| B-7 | 0.74 | 0.860 | 0.44 | 145 | 71 | 72 | |
| B-7 | 0.79 | 0.889 | 0.46 | 134 | 71 | 72 | |
| B-8 | 0.82 | 0.906 | 0.50 | 123 | 70 | 70 | |
| B-8 | 0.82 | 0.906 | 0.50 | 124 | 69 | 70 | |
| B-9 | 0.78 | 0.883 | 0.47 | 131 | 69 | 70 | |
| B-9 | 0.76 | 0.872 | 0.46 | 118 | 69 | 70 | |
| B-10 | 0.74 | 0.860 | 0.44 | 127 | 69 | 70 | |
| B-10 | 0.74 | 0.860 | 0.44 | 121 | 69 | 70 | |
| B-11 | 0.77 | 0.877 | 0.46 | 138 | 69 | 70 | |
| B-11 | 0.75 | 0.866 | 0.45 | 104 | 69 | 69 | |
| B-12 | 0.77 | 0.877 | 0.46 | 126 | 69 | 69 | |
| B-12 | 0.76 | 0.872 | 0.46 | 116 | 68 | 69 | |
| **Average** | 0.7410 | 0.8603 | 0.44 | 131.9 | | 73.4 | 12.9 |

1st Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 19.945 | liters |
| Total metered | 19.945 | dry actual liters |

Leak Check Volume 0.000 dry actual liters

2nd Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 19.980 | liters |
| Total metered | 19.980 | dry actual liters |

Leak Check Volume 0.000 dry actual liters

3rd Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 19.950 | liters |
| Total metered | 19.950 | dry actual liters |

| | | |
|---|---|---|
| Sample Train Volume | 59.875 | (liters) |
| Unspiked Train Meter ID | VOST-1 | |
| Meter Correction Factor | 1.008 | |
| VOST meter Temp | 12.9 | (def C) |
| VOST meter Temp | 55.2 | (def F) |
| Corrected Volume | 60.614 | (liters, dry standard) |
| Corrected Volume | 0.061 | (dscm) |

**Carbon tetrachloride (56-23-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.69 | µg |
| Molecular Weight | | 153.82 | lb/lb-mole |
| Emission Concentration | < | 0.0114 | mg/DSCM |
| Emission Concentration | < | 7.05E-10 | lb/dscf |
| Emission Concentration | < | 0.0018 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr |

**Chlorobenzene (108-90-7)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.68 | µg |
| Molecular Weight | | 112.56 | lb/lb-mole |
| Emission Concentration | < | 0.0113 | mg/DSCM |
| Emission Concentration | < | 7.00E-10 | lb/dscf |
| Emission Concentration | < | 0.0024 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr |

**Chloroethane (75-00-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.36 | µg |
| Molecular Weight | | 64.51 | lb/lb-mole |
| Emission Concentration | < | 0.0224 | mg/DSCM |
| Emission Concentration | < | 1.39E-09 | lb/dscf |
| Emission Concentration | < | 0.0083 | $ppm_{dv}$ |
| Emission Rate | < | 0.00086 | lb/hr |

**Chloroform (67-66-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.55 | µg |
| Molecular Weight | | 119.38 | lb/lb-mole |
| Emission Concentration | < | 0.0091 | mg/DSCM |
| Emission Concentration | < | 5.63E-10 | lb/dscf |
| Emission Concentration | < | 0.0018 | $ppm_{dv}$ |
| Emission Rate | < | 0.00035 | lb/hr |

**Chloromethane (74-87-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 2.75 | µg |
| Molecular Weight | | 50.488 | lb/lb-mole |
| Emission Concentration | < | 0.0453 | mg/DSCM |
| Emission Concentration | < | 2.81E-09 | lb/dscf |
| Emission Concentration | < | 0.0215 | $ppm_{dv}$ |
| Emission Rate | < | 0.00175 | lb/hr |

**1,2-Dichloroethane (107-06-2)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.68 | µg |
| Molecular Weight | | 98.95 | lb/lb-mole |
| Emission Concentration | < | 0.0112 | mg/DSCM |
| Emission Concentration | < | 6.96E-10 | lb/dscf |
| Emission Concentration | < | 0.0027 | $ppm_{dv}$ |
| Emission Rate | < | 0.00043 | lb/hr |

**1,1-Dichloroethene (75-35-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.55 | µg |
| Molecular Weight | | 96.94 | lb/lb-mole |
| Emission Concentration | < | 0.0091 | mg/DSCM |
| Emission Concentration | < | 5.63E-10 | lb/dscf |
| Emission Concentration | < | 0.0022 | $ppm_{dv}$ |
| Emission Rate | < | 0.00035 | lb/hr |

**1,2-Dichloropropane (78-87-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.68 | µg |

**Tetrachloroethene (127-18-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.69 | µg |
| Molecular Weight | | 165.82 | lb/lb-mole |
| Emission Concentration | < | 0.0114 | mg/DSCM |
| Emission Concentration | < | 7.07E-10 | lb/dscf |
| Emission Concentration | < | 0.0016 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr |

**Toluene (108-88-3)**

| | | | |
|---|---|---|---|
| Emission Mass | | 8.00 | µg |
| Molecular Weight | | 92.14 | lb/lb-mole |
| Emission Concentration | | 0.1319 | mg/DSCM |
| Emission Concentration | | 8.18E-09 | lb/dscf |
| Emission Concentration | | 0.0342 | $ppm_{dv}$ |
| Emission Rate | | 0.00509 | lb/hr |

**1,1,1-Trichloroethane (71-55-6)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.69 | µg |
| Molecular Weight | | 133.4 | lb/lb-mole |
| Emission Concentration | < | 0.0113 | mg/DSCM |
| Emission Concentration | < | 7.03E-10 | lb/dscf |
| Emission Concentration | < | 0.0020 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr |

**1,1,2-Trichloroethane (79-00-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.69 | µg |
| Molecular Weight | | 133.4 | lb/lb-mole |
| Emission Concentration | < | 0.0114 | mg/DSCM |
| Emission Concentration | < | 7.05E-10 | lb/dscf |
| Emission Concentration | < | 0.0020 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr |

**Trichloroethene (79-01-6)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.68 | µg |
| Molecular Weight | | 131.4 | lb/lb-mole |
| Emission Concentration | < | 0.0113 | mg/DSCM |
| Emission Concentration | < | 7.00E-10 | lb/dscf |
| Emission Concentration | < | 0.0021 | $ppm_{dv}$ |
| Emission Rate | < | 0.00044 | lb/hr |

**Vinyl chloride (75-01-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.55 | µg |
| Molecular Weight | | 62.498 | lb/lb-mole |
| Emission Concentration | < | 0.0091 | mg/DSCM |
| Emission Concentration | < | 5.65E-10 | lb/dscf |
| Emission Concentration | < | 0.0035 | $ppm_{dv}$ |
| Emission Rate | < | 0.00035 | lb/hr |

**Xylenes (total) (1330-20-7)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 0.76 | µg |
| Molecular Weight | | 106.16 | lb/lb-mole |
| Emission Concentration | < | 0.0125 | mg/DSCM |
| Emission Concentration | < | 7.73E-10 | lb/dscf |
| Emission Concentration | < | 0.0028 | $ppm_{dv}$ |
| Emission Rate | < | 0.00048 | lb/hr |

| | | | | | |
|---|---|---|---|---|---|
| Client: | Erie Coke | | Test Date: | Nov. 2, 2016 | |
| Project No.: | 16-146 | | Test Location: | Baghouse Exhaust | |
| Plant: | Erie, PA | | Test Run: | Run 2 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 5:13 AM | |
| Unit Operation: | 20 Ovens/Day | | Test Finish Time: | 7:10 PM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_{@}$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Barometric Pressure (Pbar) | 29.29 | in. Hg |
| Stack Static Pressure (Pg) | 0.12 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72 | inches |
| Stack Width (enter NA if circular) | NA | inches |
| O2 (taken from CEMs spreadsheet) | 20.11 | % dv |
| CO2 (taken from CEMs spreadsheet) | 0.63 | % dv |
| Product Rate (enter NA if not needed) | NA | ton/hr |
| Is the input ton/hr metric? (YES=1) | 0 | |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Flow, Moisture, Phenol | |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 72.0 | F |
| Stack Temperature (Tsavg) | 131.3 | F |
| Orifice Pressure Drop (dHavg) | 0.424 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8418 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 13.95 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.44 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.26 | % dv |
| Water Collected ($V_f$ - $V_i$) | NA | ml |
| Water Vapor Condensed (Vwc(std)) | NA | scf |
| Water Collected ($W_f$ - $W_i$) | NA | g |
| Water Vapor in Silica Gel (Vwsg(std)) | NA | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | NA | scf |
| Volume Dry Gas Metered (Vm) | NA | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | NA | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | NA | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | NA | dscm |
| Stack Absolute Pressure (Ps) | 29.30 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 590.9 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.68 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1599 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0217 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0217 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.67 | lb/lb-mole |
| Gas Velocity (Vs) | 50.72 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 86,045 | acfm |
| Standard Gas Flowrate | 75,245 | scfm |
| Dry Standard Gas Flowrate | 73,613 | dscfm |
| Actual Gas Flowrate | 2,437 | acm/min |
| Standard Gas Flowrate | 2,131 | scm/min |
| Dry Standard Gas Flowrate | 2,085 | dscm/min |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Acrylonitrile (107-13-1)** | | | | **Ethylbenzene (100-41-4)** | | | |
| Emission Mass | < | 1.37 | µg | Emission Mass | < | 1.39 | µg |
| Molecular Weight | | 53.06 | lb/lb-mole | Molecular Weight | | 106.17 | lb/lb-mole |
| Emission Concentration | < | 0.0229 | mg/DSCM | Emission Concentration | < | 0.0234 | mg/DSCM |
| Emission Concentration | < | 1.30E-09 | lb/dscf | Emission Concentration | < | 1.33E-09 | lb/dscf |
| Emission Concentration | < | 0.0094 | $ppm_{dv}$ | Emission Concentration | < | 0.0048 | $ppm_{dv}$ |
| Emission Rate | < | 0.00575 | lb/hr | Emission Rate | < | 0.00587 | lb/hr |
| **Benzene** | | | | **Iodomethane (74-88-4)** | | | |
| Emission Mass | < | 3.76 | µg | Emission Mass | < | 1.62 | µg |
| Molecular Weight | | 78.11 | lb/lb-mole | Molecular Weight | | 141.94 | lb/lb-mole |
| Emission Concentration | < | 0.0631 | mg/DSCM | Emission Concentration | < | 0.0272 | mg/DSCM |
| Emission Concentration | < | 3.58E-09 | lb/dscf | Emission Concentration | < | 1.55E-09 | lb/dscf |
| Emission Concentration | < | 0.0177 | $ppm_{dv}$ | Emission Concentration | < | 0.0042 | $ppm_{dv}$ |
| Emission Rate | < | 0.01582 | lb/hr | Emission Rate | < | 0.00683 | lb/hr |
| **Bromoform (75-25-2)** | | | | **Methylene chloride (75-09-2)** | | | |
| Emission Mass | < | 1.09 | µg | Emission Mass | < | 4.70 | µg |
| Molecular Weight | | 252.731 | lb/lb-mole | Molecular Weight | | 84.93 | lb/lb-mole |
| Emission Concentration | < | 0.0182 | mg/DSCM | Emission Concentration | < | 0.0789 | mg/DSCM |
| Emission Concentration | < | 1.04E-09 | lb/dscf | Emission Concentration | < | 4.48E-09 | lb/dscf |
| Emission Concentration | < | 0.0016 | $ppm_{dv}$ | Emission Concentration | < | 0.0203 | $ppm_{dv}$ |
| Emission Rate | < | 0.00457 | lb/hr | Emission Rate | < | 0.01980 | lb/hr |
| **Bromomethane (74-83-9)** | | | | **Styrene (100-42-5)** | | | |
| Emission Mass | < | 8.06 | µg | Emission Mass | < | 1.49 | µg |
| Molecular Weight | | 252.731 | lb/lb-mole | Molecular Weight | | 104.15 | lb/lb-mole |
| Emission Concentration | < | 0.1352 | mg/DSCM | Emission Concentration | < | 0.0250 | mg/DSCM |
| Emission Concentration | < | 7.68E-09 | lb/dscf | Emission Concentration | < | 1.42E-09 | lb/dscf |
| Emission Concentration | < | 0.0117 | $ppm_{dv}$ | Emission Concentration | < | 0.0052 | $ppm_{dv}$ |
| Emission Rate | < | 0.03391 | lb/hr | Emission Rate | < | 0.00626 | lb/hr |
| **Carbon disulfide (75-15-0)** | | | | **1,1,2,2-Tetrachloroethane (79-34-5)** | | | |
| Emission Mass | < | 1.51 | µg | Emission Mass | < | 2.69 | µg |
| Molecular Weight | | 76.139 | lb/lb-mole | Molecular Weight | | 167.848 | lb/lb-mole |
| Emission Concentration | < | 0.0253 | mg/DSCM | Emission Concentration | < | 0.0452 | mg/DSCM |
| Emission Concentration | < | 1.43E-09 | lb/dscf | Emission Concentration | < | 2.57E-09 | lb/dscf |
| Emission Concentration | < | 0.0073 | $ppm_{dv}$ | Emission Concentration | < | 0.0059 | $ppm_{dv}$ |
| Emission Rate | < | 0.00634 | lb/hr | Emission Rate | < | 0.01134 | lb/hr |

**Erie Coke** **Run 2** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP $(in. H2O)^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) | Sample Train Temp Side A |
|---|---|---|---|---|---|---|---|
| A-1 | 0.62 | 0.787 | 0.37 | 113 | 68 | 69 | 18 |
| A-1 | 0.73 | 0.854 | 0.44 | 119 | 68 | 69 | 19 |
| A-2 | 0.75 | 0.866 | 0.45 | 122 | 68 | 68 | 18 |
| A-2 | 0.67 | 0.819 | 0.40 | 120 | 68 | 68 | 18 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 | 18 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 | 18 |
| A-4 | 0.72 | 0.849 | 0.43 | 109 | 67 | 68 | 19 |
| A-4 | 0.74 | 0.860 | 0.44 | 122 | 67 | 68 | 19 |
| A-5 | 0.73 | 0.854 | 0.44 | 116 | 67 | 68 | 18 |
| A-5 | 0.72 | 0.849 | 0.43 | 115 | 67 | 67 | 18 |
| A-6 | 0.72 | 0.849 | 0.43 | 124 | 67 | 67 | 18 |
| A-6 | 0.73 | 0.854 | 0.44 | 117 | 66 | 67 | 18 |
| A-7 | 0.79 | 0.889 | 0.47 | 113 | 66 | 67 | 19 |
| A-7 | 0.80 | 0.894 | 0.48 | 121 | 66 | 66 | 19 |
| A-8 | 0.72 | 0.849 | 0.43 | 114 | 66 | 66 | 19 |
| A-8 | 0.74 | 0.860 | 0.44 | 122 | 66 | 66 | 19 |
| A-9 | 0.71 | 0.843 | 0.43 | 117 | 66 | 66 | 18 |
| A-9 | 0.72 | 0.849 | 0.43 | 133 | 66 | 66 | 18 |
| A-10 | 0.69 | 0.831 | 0.41 | 121 | 66 | 66 | 18 |
| A-10 | 0.71 | 0.843 | 0.43 | 131 | 67 | 67 | 18 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 67 | 67 | 18 |
| A-11 | 0.69 | 0.831 | 0.41 | 143 | 68 | 67 | 18 |
| A-12 | 0.73 | 0.854 | 0.44 | 127 | 70 | 69 | 19 |
| A-12 | 0.72 | 0.849 | 0.43 | 136 | 70 | 69 | 19 |
| B-1 | 0.70 | 0.837 | 0.42 | 136 | 71 | 70 | |
| B-1 | 0.66 | 0.812 | 0.40 | 151 | 71 | 71 | |
| B-2 | 0.67 | 0.819 | 0.40 | 131 | 72 | 71 | |
| B-2 | 0.65 | 0.806 | 0.39 | 155 | 73 | 71 | |
| B-3 | 0.65 | 0.806 | 0.39 | 145 | 73 | 71 | |
| B-3 | 0.71 | 0.843 | 0.45 | 164 | 74 | 73 | |
| B-4 | 0.68 | 0.825 | 0.41 | 151 | 74 | 73 | |
| B-4 | 0.67 | 0.819 | 0.40 | 147 | 75 | 74 | |
| B-5 | 0.70 | 0.837 | 0.40 | 132 | 76 | 75 | |
| B-5 | 0.70 | 0.837 | 0.40 | 136 | 76 | 75 | |
| B-6 | 0.72 | 0.849 | 0.43 | 143 | 77 | 76 | |
| B-6 | 0.75 | 0.866 | 0.45 | 144 | 77 | 76 | |
| B-7 | 0.72 | 0.849 | 0.43 | 147 | 78 | 76 | |
| B-7 | 0.76 | 0.872 | 0.46 | 129 | 79 | 78 | |
| B-8 | 0.75 | 0.866 | 0.45 | 124 | 79 | 78 | |
| B-8 | 0.75 | 0.866 | 0.45 | 135 | 80 | 79 | |
| B-9 | 0.74 | 0.860 | 0.44 | 155 | 80 | 79 | |
| B-9 | 0.73 | 0.854 | 0.44 | 142 | 80 | 80 | |
| B-10 | 0.64 | 0.800 | 0.38 | 150 | 81 | 80 | |
| B-10 | 0.67 | 0.819 | 0.40 | 135 | 81 | 80 | |
| B-11 | 0.71 | 0.843 | 0.43 | 127 | 81 | 81 | |
| B-11 | 0.70 | 0.837 | 0.40 | 138 | 81 | 81 | |
| B-12 | 0.67 | 0.819 | 0.40 | 149 | 80 | 81 | |
| B-12 | 0.67 | 0.819 | 0.40 | 123 | 80 | 80 | |
| Average | 0.7092 | 0.8418 | 0.42 | 131.3 | 72.0 | | 18.4 |

1st Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 20.034 | liters |
| Total metered | 20.034 | dry actual liters |

Leak Check Volume 0.000 dry actual liters

2nd Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 20.013 | liters |
| Total metered | 20.013 | dry actual liters |

Leak Check Volume 0.000 dry actual liters

3rd Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 20.011 | liters |
| Total metered | 20.011 | dry actual liters |

| | | |
|---|---|---|
| Sample Train Volume | 60.058 | (liters) |
| Unspiked Train Meter ID | VOST-1 | |
| Meter Correction Factor | 1.008 | |
| VOST meter Temp | 18.4 | (def C) |
| VOST meter Temp | 65.1 | (def F) |
| Corrected Volume | 59.570 | (liters, dry standard) |
| Corrected Volume | 0.060 | (dscm) |

**Carbon tetrachloride (56-23-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.36 | µg |
| Molecular Weight | | 153.82 | lb/lb-mole |
| Emission Concentration | < | 0.0228 | mg/DSCM |
| Emission Concentration | < | 1.29E-09 | lb/dscf |
| Emission Concentration | < | 0.0032 | $ppm_{dv}$ |
| Emission Rate | < | 0.00571 | lb/hr |

**Chlorobenzene (108-90-7)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 112.56 | lb/lb-mole |
| Emission Concentration | < | 0.0227 | mg/DSCM |
| Emission Concentration | < | 1.29E-09 | lb/dscf |
| Emission Concentration | < | 0.0044 | $ppm_{dv}$ |
| Emission Rate | < | 0.00569 | lb/hr |

**Chloroethane (75-00-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 2.69 | µg |
| Molecular Weight | | 64.51 | lb/lb-mole |
| Emission Concentration | < | 0.0451 | mg/DSCM |
| Emission Concentration | < | 2.56E-09 | lb/dscf |
| Emission Concentration | < | 0.0153 | $ppm_{dv}$ |
| Emission Rate | < | 0.01132 | lb/hr |

**Chloroform (67-66-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.08 | µg |
| Molecular Weight | | 119.38 | lb/lb-mole |
| Emission Concentration | < | 0.0182 | mg/DSCM |
| Emission Concentration | < | 1.03E-09 | lb/dscf |
| Emission Concentration | < | 0.0033 | $ppm_{dv}$ |
| Emission Rate | < | 0.00456 | lb/hr |

**Chloromethane (74-87-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 5.41 | µg |
| Molecular Weight | | 50.488 | lb/lb-mole |
| Emission Concentration | < | 0.0908 | mg/DSCM |
| Emission Concentration | < | 5.16E-09 | lb/dscf |
| Emission Concentration | < | 0.0394 | $ppm_{dv}$ |
| Emission Rate | < | 0.02277 | lb/hr |

**1,2-Dichloroethane (107-06-2)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 98.95 | lb/lb-mole |
| Emission Concentration | < | 0.0226 | mg/DSCM |
| Emission Concentration | < | 1.28E-09 | lb/dscf |
| Emission Concentration | < | 0.0050 | $ppm_{dv}$ |
| Emission Rate | < | 0.00567 | lb/hr |

**1,1-Dichloroethene (75-35-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.08 | µg |
| Molecular Weight | | 96.94 | lb/lb-mole |
| Emission Concentration | < | 0.0182 | mg/DSCM |
| Emission Concentration | < | 1.03E-09 | lb/dscf |
| Emission Concentration | < | 0.0041 | $ppm_{dv}$ |
| Emission Rate | < | 0.00456 | lb/hr |

**1,2-Dichloropropane (78-87-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |

**Tetrachloroethene (127-18-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.37 | µg |
| Molecular Weight | | 165.82 | lb/lb-mole |
| Emission Concentration | < | 0.0230 | mg/DSCM |
| Emission Concentration | < | 1.31E-09 | lb/dscf |
| Emission Concentration | < | 0.0030 | $ppm_{dv}$ |
| Emission Rate | < | 0.00577 | lb/hr |

**Toluene (108-88-3)**

| | | | |
|---|---|---|---|
| Emission Mass | | 22.29 | µg |
| Molecular Weight | | 92.14 | lb/lb-mole |
| Emission Concentration | | 0.3741 | mg/DSCM |
| Emission Concentration | | 2.12E-08 | lb/dscf |
| Emission Concentration | | 0.0888 | $ppm_{dv}$ |
| Emission Rate | | 0.09383 | lb/hr |

**1,1,1-Trichloroethane (71-55-6)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 133.4 | lb/lb-mole |
| Emission Concentration | < | 0.0227 | mg/DSCM |
| Emission Concentration | < | 1.29E-09 | lb/dscf |
| Emission Concentration | < | 0.0037 | $ppm_{dv}$ |
| Emission Rate | < | 0.00570 | lb/hr |

**1,1,2-Trichloroethane (79-00-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.36 | µg |
| Molecular Weight | | 133.4 | lb/lb-mole |
| Emission Concentration | < | 0.0228 | mg/DSCM |
| Emission Concentration | < | 1.29E-09 | lb/dscf |
| Emission Concentration | < | 0.0037 | $ppm_{dv}$ |
| Emission Rate | < | 0.00571 | lb/hr |

**Trichloroethene (79-01-6)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 131.4 | lb/lb-mole |
| Emission Concentration | < | 0.0227 | mg/DSCM |
| Emission Concentration | < | 1.29E-09 | lb/dscf |
| Emission Concentration | < | 0.0038 | $ppm_{dv}$ |
| Emission Rate | < | 0.00569 | lb/hr |

**Vinyl chloride (75-01-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.09 | µg |
| Molecular Weight | | 62.498 | lb/lb-mole |
| Emission Concentration | < | 0.0182 | mg/DSCM |
| Emission Concentration | < | 1.03E-09 | lb/dscf |
| Emission Concentration | < | 0.0064 | $ppm_{dv}$ |
| Emission Rate | < | 0.00457 | lb/hr |

**Xylenes (total) (1330-20-7)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.62 | µg |
| Molecular Weight | | 106.16 | lb/lb-mole |
| Emission Concentration | < | 0.0272 | mg/DSCM |
| Emission Concentration | < | 1.55E-09 | lb/dscf |
| Emission Concentration | < | 0.0056 | $ppm_{dv}$ |
| Emission Rate | < | 0.00683 | lb/hr |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 2-3, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 3 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 7:49 PM | |
| Unit Operation: | Normal | | Test Finish Time: | 10:56 AM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |

**Data Input**

| | | |
|---|---|---|
| Control Box: | 1618 | |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ |
| Meter Calibration Factor (Yd) | 1.003 | |
| Barometric Pressure (Pbar) | 29.26 | in. Hg |
| Stack Static Pressure (Pg) | 0.12 | in. $H_2O$ |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches |
| Stack Width (enter NA if circular) | NA | inches |
| O2 (taken from CEMs spreadsheet) | 20.24 | % dv |
| CO2 (taken from CEMs spreadsheet) | 0.48 | % dv |
| Product Rate (enter NA if not needed) | NA | ton/hr |
| Is the input ton/hr metric? (YES=1) | 0 | |
| Pitot Tube Coefficient (Cp) | 0.84 | |
| Sample Calculation Title | Flow, Moisture, Phenol | |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu |
| Standard Temperature | 68 | F |
| Standard Pressure | 760 | mm Hg |
| Pitot Tube Constant (Kp) | 85.49 | |

**Calculations**

| | | |
|---|---|---|
| Meter Temperature (Tm) | 72.8 | F |
| Stack Temperature (Tsavg) | 128.3 | F |
| Orifice Pressure Drop (dHavg) | 0.455 | in. $H_2O$ |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8691 | in. $H_2O$^1/2 |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu |
| Heat Input Based on $F_d$ | NA | MMBtu/hr |
| K1method 4 | 0.04706 | scf/ml |
| K2method 4 | 0.04715 | scf/g |
| K1method 5 | 17.64 | R/in. Hg |
| K4method 5 | 0.0945 | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole |
| Total Test Time | 15.12 | hours |
| # of Pushes | 48 | pushes/test |
| Avg. # of pushes per hour | 3.18 | pushes/hour |
| Minutes per Push | 2.50 | minutes/push |

**Calculations**

| | | |
|---|---|---|
| CO + N2 | 79.27 | % dv |
| Water Collected ($V_f$ - $V_i$) | NA | ml |
| Water Vapor Condensed (Vwc(std)) | NA | scf |
| Water Collected ($W_f$ - $W_i$) | NA | g |
| Water Vapor in Silica Gel (Vwsg(std)) | NA | scf |
| Vol. Water Vapor in Gas Stand.(Vw(std)) | NA | scf |
| Volume Dry Gas Metered (Vm) | NA | dacf |
| Vol. Dry Gas Metered Stand.(Vm(std)) | NA | dscf |
| Volume Dry Gas Metered (Vm($m^3$)) | NA | dacm |
| Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | NA | dscm |
| Stack Absolute Pressure (Ps) | 29.27 | in. Hg |
| Stack Absolute Temperature (Tsavg) | 587.9 | R |
| H2O Vapor Pressure @ avg Stack Temp. | 4.32 | in. Hg |
| H2O in the gas at saturation (Bws) | 0.1477 | vol. fraction |
| H2O in the gas from test data (Bws) | 0.0266 | vol. fraction |
| H2O in the gas used (lower of the 2 Bws) | 0.0266 | vol. fraction |
| Is the Gas Stream Saturated With H2O? | NO | |
| Dry Gas Molecular Weight (Md) | 28.89 | lb/lb-mole |
| Wet Gas Molecular Weight (Ms) | 28.60 | lb/lb-mole |
| Gas Velocity (Vs) | 52.32 | ft/s |
| Is the stack circular or rectangular? | CIRCULAR | |
| Area Stack (As) | 28.274 | $ft^2$ |
| Actual Gas Flowrate | 88,765 | acfm |
| Standard Gas Flowrate | 77,940 | scfm |
| Dry Standard Gas Flowrate | 75,866 | dscfm |
| Actual Gas Flowrate | 2,514 | acm/min |
| Standard Gas Flowrate | 2,207 | scm/min |
| Dry Standard Gas Flowrate | 2,148 | dscm/min |

**Acrylonitrile (107-13-1)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.36 | µg |
| Molecular Weight | | 53.06 | lb/lb-mole |
| Emission Concentration | < | 0.0227 | mg/DSCM |
| Emission Concentration | < | 1.27E-09 | lb/dscf |
| Emission Concentration | < | 0.0092 | $ppm_{dv}$ |
| Emission Rate | < | 0.0058 | lb/hr |

**Benzene**

| | | | |
|---|---|---|---|
| Emission Mass | < | 2.49 | µg |
| Molecular Weight | | 78.11 | lb/lb-mole |
| Emission Concentration | < | 0.0417 | mg/DSCM |
| Emission Concentration | < | 2.34E-09 | lb/dscf |
| Emission Concentration | < | 0.0115 | $ppm_{dv}$ |
| Emission Rate | < | 0.0106 | lb/hr |

**Bromoform (75-25-2)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.08 | µg |
| Molecular Weight | | 252.731 | lb/lb-mole |
| Emission Concentration | < | 0.0181 | mg/DSCM |
| Emission Concentration | < | 1.01E-09 | lb/dscf |
| Emission Concentration | < | 0.0015 | $ppm_{dv}$ |
| Emission Rate | < | 0.0046 | lb/hr |

**Bromomethane (74-83-9)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 8.02 | µg |
| Molecular Weight | | 252.731 | lb/lb-mole |
| Emission Concentration | < | 0.1339 | mg/DSCM |
| Emission Concentration | < | 7.51E-09 | lb/dscf |
| Emission Concentration | < | 0.0114 | $ppm_{dv}$ |
| Emission Rate | < | 0.0342 | lb/hr |

**Carbon disulfide (75-15-0)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.47 | µg |
| Molecular Weight | | 76.139 | lb/lb-mole |
| Emission Concentration | < | 0.0245 | mg/DSCM |
| Emission Concentration | < | 1.38E-09 | lb/dscf |
| Emission Concentration | < | 0.0070 | $ppm_{dv}$ |
| Emission Rate | < | 0.0063 | lb/hr |

**Ethylbenzene (100-41-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 106.17 | lb/lb-mole |
| Emission Concentration | < | 0.0225 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0046 | $ppm_{dv}$ |
| Emission Rate | < | 0.00575 | lb/hr |

**Iodomethane (74-88-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.62 | µg |
| Molecular Weight | | 141.94 | lb/lb-mole |
| Emission Concentration | < | 0.0270 | mg/DSCM |
| Emission Concentration | < | 1.51E-09 | lb/dscf |
| Emission Concentration | < | 0.0041 | $ppm_{dv}$ |
| Emission Rate | < | 0.00689 | lb/hr |

**Methylene chloride (75-09-2)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 3.12 | µg |
| Molecular Weight | | 84.93 | lb/lb-mole |
| Emission Concentration | < | 0.0521 | mg/DSCM |
| Emission Concentration | < | 2.92E-09 | lb/dscf |
| Emission Concentration | < | 0.0133 | $ppm_{dv}$ |
| Emission Rate | < | 0.01330 | lb/hr |

**Styrene (100-42-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.37 | µg |
| Molecular Weight | | 104.15 | lb/lb-mole |
| Emission Concentration | < | 0.0229 | mg/DSCM |
| Emission Concentration | < | 1.28E-09 | lb/dscf |
| Emission Concentration | < | 0.0048 | $ppm_{dv}$ |
| Emission Rate | < | 0.00585 | lb/hr |

**1,1,2,2-Tetrachloroethane (79-34-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 2.68 | µg |
| Molecular Weight | | 167.848 | lb/lb-mole |
| Emission Concentration | < | 0.0448 | mg/DSCM |
| Emission Concentration | < | 2.51E-09 | lb/dscf |
| Emission Concentration | < | 0.0058 | $ppm_{dv}$ |
| Emission Rate | < | 0.01143 | lb/hr |

**ArcelorMittal Run 3**
**Pushing Baghouse**

F or C? F=1,C=0 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) | Sample Train Temp Side A |
|---|---|---|---|---|---|---|---|
| A-1 | 0.76 | 0.872 | 0.46 | 129 | 78 | 79 | 19 |
| A-1 | 0.84 | 0.917 | 0.50 | 113 | 77 | 78 | 19 |
| A-2 | 0.78 | 0.883 | 0.47 | 123 | 76 | 77 | 19 |
| A-2 | 0.73 | 0.854 | 0.44 | 126 | 76 | 77 | 19 |
| A-3 | 0.75 | 0.866 | 0.45 | 138 | 76 | 77 | 19 |
| A-3 | 0.76 | 0.872 | 0.46 | 132 | 76 | 77 | 19 |
| A-4 | 0.80 | 0.894 | 0.48 | 152 | 75 | 76 | 19 |
| A-4 | 0.76 | 0.872 | 0.46 | 138 | 75 | 76 | 19 |
| A-5 | 0.75 | 0.866 | 0.45 | 148 | 75 | 76 | 19 |
| A-5 | 0.77 | 0.877 | 0.46 | 137 | 75 | 76 | 19 |
| A-6 | 0.72 | 0.849 | 0.43 | 128 | 75 | 76 | 19 |
| A-6 | 0.72 | 0.849 | 0.43 | 133 | 75 | 76 | 19 |
| A-7 | 0.75 | 0.866 | 0.45 | 126 | 75 | 76 | 19 |
| A-7 | 0.72 | 0.849 | 0.43 | 133 | 75 | 75 | 19 |
| A-8 | 0.77 | 0.877 | 0.46 | 127 | 74 | 74 | 19 |
| A-8 | 0.75 | 0.866 | 0.45 | 117 | 73 | 74 | 19 |
| A-9 | 0.70 | 0.837 | 0.43 | 119 | 72 | 73 | 19 |
| A-9 | 0.68 | 0.825 | 0.40 | 128 | 72 | 72 | 19 |
| A-10 | 0.65 | 0.806 | 0.39 | 119 | 71 | 72 | 19 |
| A-10 | 0.66 | 0.812 | 0.40 | 143 | 71 | 72 | 19 |
| A-11 | 0.63 | 0.794 | 0.38 | 127 | 72 | 72 | 19 |
| A-11 | 0.67 | 0.819 | 0.40 | 143 | 71 | 72 | 19 |
| A-12 | 0.65 | 0.806 | 0.39 | 123 | 71 | 72 | 19 |
| A-12 | 0.65 | 0.806 | 0.39 | 131 | 71 | 71 | 19 |
| B-1 | 0.78 | 0.883 | 0.47 | 117 | 70 | 71 | |
| B-1 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 | |
| B-2 | 0.82 | 0.906 | 0.50 | 112 | 70 | 70 | |
| B-2 | 0.82 | 0.906 | 0.50 | 130 | 70 | 71 | |
| B-3 | 0.77 | 0.877 | 0.46 | 123 | 70 | 70 | |
| B-3 | 0.84 | 0.917 | 0.50 | 125 | 70 | 70 | |
| B-4 | 0.78 | 0.883 | 0.47 | 130 | 71 | 70 | |
| B-4 | 0.82 | 0.906 | 0.50 | 140 | 71 | 71 | |
| B-5 | 0.80 | 0.894 | 0.48 | 134 | 71 | 71 | |
| B-5 | 0.75 | 0.866 | 0.45 | 132 | 71 | 71 | |
| B-6 | 0.84 | 0.917 | 0.50 | 114 | 73 | 73 | |
| B-6 | 0.82 | 0.906 | 0.50 | 119 | 73 | 73 | |
| B-7 | 0.85 | 0.922 | 0.51 | 124 | 74 | 73 | |
| B-7 | 0.82 | 0.906 | 0.49 | 118 | 73 | 73 | |
| B-8 | 0.82 | 0.906 | 0.49 | 117 | 73 | 73 | |
| B-8 | 0.75 | 0.866 | 0.45 | 126 | 72 | 72 | |
| B-9 | 0.78 | 0.883 | 0.47 | 122 | 72 | 72 | |
| B-9 | 0.76 | 0.872 | 0.46 | 138 | 71 | 72 | |
| B-10 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 | |
| B-10 | 0.78 | 0.883 | 0.47 | 119 | 70 | 71 | |
| B-11 | 0.72 | 0.849 | 0.43 | 121 | 70 | 70 | |
| B-11 | 0.71 | 0.843 | 0.43 | 140 | 70 | 70 | |
| B-12 | 0.74 | 0.860 | 0.44 | 136 | 70 | 70 | |
| B-12 | 0.72 | 0.849 | 0.43 | 120 | 70 | 70 | |
| Average | 0.7565 | 0.8691 | 0.45 | 128.3 | | 72.8 | 19.0 |

1st Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 20.002 | liters |
| Total metered | 20.002 | dry actual liters |

Leak Check Volume 0.000 dry actual liters

2nd Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 20.187 | liters |
| Total metered | 20.187 | dry actual liters |

Leak Check Volume 0.000 dry actual liters

3rd Set of Tubes

| | | |
|---|---|---|
| Initial volume | 0.000 | liters |
| Final volume | 20.334 | liters |
| Total metered | 20.334 | dry actual liters |

| | | |
|---|---|---|
| Sample Train Volume | 60.523 | (liters) |
| Unspiked Train Meter ID | VOST-1 | |
| Meter Correction Factor | 1.008 | |
| VOST meter Temp | 19.0 | (def C) |
| VOST meter Temp | 66.2 | (def F) |
| Corrected Volume | 59.842 | (liters, dry standard) |
| Corrected Volume | 0.060 | (dscm) |

**Carbon tetrachloride (56-23-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 153.82 | lb/lb-mole |
| Emission Concentration | < | 0.0225 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0032 | $ppm_{dv}$ |
| Emission Rate | < | 0.0058 | lb/hr |

**Chlorobenzene (108-90-7)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.34 | µg |
| Molecular Weight | | 112.56 | lb/lb-mole |
| Emission Concentration | < | 0.0225 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0043 | $ppm_{dv}$ |
| Emission Rate | < | 0.0057 | lb/hr |

**Chloroethane (75-00-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 2.68 | µg |
| Molecular Weight | | 64.51 | lb/lb-mole |
| Emission Concentration | < | 0.0447 | mg/DSCM |
| Emission Concentration | < | 2.51E-09 | lb/dscf |
| Emission Concentration | < | 0.0150 | $ppm_{dv}$ |
| Emission Rate | < | 0.0114 | lb/hr |

**Chloroform (67-66-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.08 | µg |
| Molecular Weight | | 119.38 | lb/lb-mole |
| Emission Concentration | < | 0.0180 | mg/DSCM |
| Emission Concentration | < | 1.01E-09 | lb/dscf |
| Emission Concentration | < | 0.0033 | $ppm_{dv}$ |
| Emission Rate | < | 0.0046 | lb/hr |

**Chloromethane (74-87-3)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 5.37 | µg |
| Molecular Weight | | 50.488 | lb/lb-mole |
| Emission Concentration | < | 0.0898 | mg/DSCM |
| Emission Concentration | < | 5.03E-09 | lb/dscf |
| Emission Concentration | < | 0.0384 | $ppm_{dv}$ |
| Emission Rate | < | 0.0229 | lb/hr |

**1,2-Dichloroethane (107-06-2)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.34 | µg |
| Molecular Weight | | 98.95 | lb/lb-mole |
| Emission Concentration | < | 0.0224 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0049 | $ppm_{dv}$ |
| Emission Rate | < | 0.0057 | lb/hr |

**1,1-Dichloroethene (75-35-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.08 | µg |
| Molecular Weight | | 96.94 | lb/lb-mole |
| Emission Concentration | < | 0.0180 | mg/DSCM |
| Emission Concentration | < | 1.01E-09 | lb/dscf |
| Emission Concentration | < | 0.0040 | $ppm_{dv}$ |
| Emission Rate | < | 0.00460 | lb/hr |

**1,2-Dichloropropane (78-87-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.34 | µg |

**Tetrachloroethene (127-18-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 165.82 | lb/lb-mole |
| Emission Concentration | < | 0.0226 | mg/DSCM |
| Emission Concentration | < | 1.27E-09 | lb/dscf |
| Emission Concentration | < | 0.0029 | $ppm_{dv}$ |
| Emission Rate | < | 0.00576 | lb/hr |

**Toluene (108-88-3)**

| | | | |
|---|---|---|---|
| Emission Mass | | 20.28 | µg |
| Molecular Weight | | 92.14 | lb/lb-mole |
| Emission Concentration | | 0.3390 | mg/DSCM |
| Emission Concentration | | 1.90E-08 | lb/dscf |
| Emission Concentration | | 0.0795 | $ppm_{dv}$ |
| Emission Rate | | 0.08652 | lb/hr |

**1,1,1-Trichloroethane (71-55-6)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 133.4 | lb/lb-mole |
| Emission Concentration | < | 0.0225 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0036 | $ppm_{dv}$ |
| Emission Rate | < | 0.00575 | lb/hr |

**1,1,2-Trichloroethane (79-00-5)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.35 | µg |
| Molecular Weight | | 133.4 | lb/lb-mole |
| Emission Concentration | < | 0.0225 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0037 | $ppm_{dv}$ |
| Emission Rate | < | 0.00576 | lb/hr |

**Trichloroethene (79-01-6)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.34 | µg |
| Molecular Weight | | 131.4 | lb/lb-mole |
| Emission Concentration | < | 0.0225 | mg/DSCM |
| Emission Concentration | < | 1.26E-09 | lb/dscf |
| Emission Concentration | < | 0.0037 | $ppm_{dv}$ |
| Emission Rate | < | 0.00573 | lb/hr |

**Vinyl chloride (75-01-4)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.08 | µg |
| Molecular Weight | | 62.498 | lb/lb-mole |
| Emission Concentration | < | 0.0180 | mg/DSCM |
| Emission Concentration | < | 1.01E-09 | lb/dscf |
| Emission Concentration | < | 0.0062 | $ppm_{dv}$ |
| Emission Rate | < | 0.00461 | lb/hr |

**Xylenes (total) (1330-20-7)**

| | | | |
|---|---|---|---|
| Emission Mass | < | 1.41 | µg |
| Molecular Weight | | 106.16 | lb/lb-mole |
| Emission Concentration | < | 0.0235 | mg/DSCM |
| Emission Concentration | < | 1.32E-09 | lb/dscf |
| Emission Concentration | < | 0.0048 | $ppm_{dv}$ |
| Emission Rate | < | 0.00600 | lb/hr |

**Method 0031 Data Sheet**
**Solid Waste 846 Method**
**Volatile Organic HAPs (VOHAPS)**

Company Name: **Arcelormittal**

Location: **Monessen, PA**

Source Name: **Coke Oven Battery**

Description of Location Sampled (include description of all control devices, quenches, air inlets, etc.): **Coke Battery PEC Stack**

Run Number: 1
Start Time: 1413
End Time: 0440
Date: 11/1/16

Crew: JV JW TM (TL)
*Circle initials of meterbox operator*

**Field Train Blank System Leak Check** Tubes 10A, 10B and 10C

Time: 1100 Initial Measurement (L/min): 0.000
Time: 1103 Final Measurement (L/min): 0.000

*Leak Check Criteria - ≤2% of the sampling rate of 0.5 LPM, vacuum 15 in. Hg* VOST-1 (Analyzer) Y=1.008

**Measurement System Leak Checks/Purge**

| Tube set 1 | Tube 1A, 1B and 1C | Tube set 2 | 2A, 2B and 2C | Tube set 3 | 3A, 3B and 3C |
|---|---|---|---|---|---|
| Pre (L/min): | 0.000 Time: 1968 | Pre (L/min): | 0.000 Time: 1857 | Pre (L/min): | 0.000 Time: 2330 |
| Purge (1 L/min): | ☑ Time: 1409 | Purge (1 L/min): | ☑ Time: 1900 | Purge (1 L/min): | ☑ Time: 2334 |
| Post (L/min): | 0.000 Time: 1818 | Post (L/min): | 0.000 Time: 2100 | Post (L/min): | 0.000 Time: 446 |

*Leak Check Criteria - ≤2% of the sampling rate of 0.5 LPM, Pre-test vacuum 15 in. Hg, post-test at highest sample vacuum*
*Initial leak check done from tip of probe. Subsequent leak checks done from 3 way valve.*

**Temperature, Pressure and Dry Gas Meter Measurements**

| | Ambient | | Time Recorded | |
|---|---|---|---|---|
| Beginning | 70 | °F | 1100 | |
| End | 59 | °F | 0440 | 11/2 |

| | Barometric | | | |
|---|---|---|---|---|
| Beginning | 29.33 | "Hg | 1100 | |
| End | 29.29 | "Hg | 440 | 11/2 |

Notes:

*Sample Recovery Notes.*
Transfer condensate into vial. Rinses can use 1 or more vials. Fill bottle to eliminate headspace. Use ONLY Type 1 high purity HPLC water for all rinses.

Place all 3 tubes in ziplocks with VOA bottle and chill.

*QA/QC:*
One Field train blank is required

One Trip blank is required per source also.

Tube set 1

| Time | Meter | L/min | Vacuum in. hg | Probe °F | Meter °C | Push Time |
|---|---|---|---|---|---|---|
| 0.0 | 0.000 | 0.5 | | | | |
| 2.5 | 1.261 | 0.5 | 2.0 | 245 | 17 | 1413 |
| 5.0 | 2.787 | 0.5 | 2.0 | 248 | 18 | 1425 |
| 7.5 | 4.142 | 0.5 | 2.0 | 250 | 19 | 1436 |
| 10.0 | 5.54 | 0.5 | 2.0 | 250 | 20 | 1450 |
| 12.5 | 6.756 | 0.5 | 2.0 | 248 | 20 | 1503 |
| 15.0 | 7.982 | 0.5 | 2.0 | 249 | 20 | 1514 |
| 17.5 | 9.116 | 0.5 | 2.0 | 248 | 20 | 1533 |
| 20.0 | 10.295 | 0.5 | 2.0 | 247 | 21 | 1547 |
| 22.5 | 11.511 | 0.5 | 2.0 | 247 | 22 | 1559 |
| 25.0 | 13.165 | 0.5 | 2.0 | 246 | 22 | 1644 |
| 27.5 | 14.022 | 0.5 | 2.0 | 248 | 23 | 1656 |
| 30.0 | 15.206 | 0.5 | 2.0 | 249 | 23 | 1711 |
| 32.5 | 17.015 | 0.5 | 2.0 | 250 | 23 | 1733 |
| 35.0 | 18.109 | 0.5 | 2.0 | 250 | 23 | 1747 |
| 37.5 | 19.259 | 0.5 | 2.0 | 250 | 23 | 1800 |
| 40.0 | 20.039 | 0.5 | 2.0 | 250 | 23 | 1813 |
| | | | | | | Push Time |

Tube set 2

| Time | Meter | L/min | Vacuum in. hg | Probe °F | Meter °C | Push Time |
|---|---|---|---|---|---|---|
| 0.0 | 0.000 | 0.5 | | | | |
| 2.5 | 1.270 | 0.5 | 2.0 | 250 | 22 | 1909 |
| 5.0 | 2.565 | 0.5 | 2.0 | 248 | 22 | 1921 |
| 7.5 | 3.814 | 0.5 | 2.0 | 249 | 22 | 1935 |
| 10.0 | 5.250 | 0.5 | 2.0 | 249 | 22 | 1949 |
| 12.5 | 6.612 | 0.5 | 2.0 | 247 | 22 | 2002 |
| 15.0 | 7.916 | 0.5 | 2.0 | 247 | 22 | 2015 |
| 17.5 | 9.059 | 0.5 | 2.0 | 258 | 22 | 2027 |
| 20.0 | 10.235 | 0.5 | 2.0 | 264 | 22 | 2040 |
| 22.5 | 11.417 | 0.5 | 2.0 | 236 | 22 | 2101 |
| 25.0 | 12.661 | 0.5 | 2.0 | 241 | 21 | 2139 |
| 27.5 | 12.789 | 0.5 | 2.0 | 237 | 21 | 2153 |
| 30.0 | 16.028 | 0.5 | 2.0 | 238 | 21 | 2203 |
| 32.5 | 16.114 | 0.5 | 2.0 | 236 | 21 | 2214 |
| 35.0 | 17.178 | 0.5 | 2.0 | 241 | 21 | 2226 |
| 37.5 | 18.302 | 0.5 | 2.0 | 232 | 21 | 2238 |
| 40.0 | 19.402 | 0.5 | 2.0 | 234 | 20 | 2250 and 2053 |
| | | | | | | Push Time |

Tube set 3

| Time | Meter | L/min | Vacuum in. hg | Probe °F | Meter °C | Push Time |
|---|---|---|---|---|---|---|
| 0.0 | 0.000 | 0.5 | | | | |
| 2.5 | 1.205 | 0.5 | 2.0 | 243 | 20 | 2337 |
| 5.0 | 2.393 | 0.5 | 2.0 | 246 | 20 | 2349 |
| 7.5 | 3.500 | 0.5 | 2.0 | 255 | 20 | 0001 |
| 10.0 | 4.590 | 0.5 | 2.0 | 256 | 19 | 0038 |
| 12.5 | 5.824 | 0.5 | 2.0 | 243 | 19 | 0051 |
| 15.0 | 7.127 | 0.5 | 2.0 | 249 | 19 | 0112 |
| 17.5 | 8.347 | 0.5 | 2.0 | 255 | 18 | 0226 |
| 20.0 | 9.781 | 0.5 | 2.0 | 259 | 17 | 0241 |
| 22.5 | 11.628 | 0.5 | 2.0 | 260 | 17 | 0255 |
| 25.0 | 12.297 | 0.5 | 2.0 | 244 | 17 | 0309 |
| 27.5 | 13.354 | 0.5 | 2.0 | 254 | 17 | 0318 |
| 30.0 | 14.507 | 0.5 | 2.0 | 257 | 17 | 0329 |
| 32.5 | 15.693 | 0.5 | 2.0 | 248 | 17 | 0340 |
| 35.0 | 16.876 | 0.5 | 2.0 | 251 | 17 | 0415 |
| 37.5 | 17.958 | 0.5 | 2.0 | 246 | 17 | 0427 |
| 40.0 | 19.178 | 0.5 | 2.0 | 253 | 17 | 0436 and 0440 |

**Method 0031 Data Sheet**
**Solid Waste 846 Method**
**Volatile Organic HAPs (VOHAPS)**

Company Name: **Arcelormittal**

Location: **Monessen, PA**

Source Name: **Coke Oven Battery**

Description of Location Sampled (include description of all control devices, quenches, air inlets, etc.): **Coke Battery PEC Stack**

Run Number: 2
Start Time: 513
End Time: 1910
Date: 11/2/16

Crew: JV JW TM TL
*Circle initials of meterbox operator*

**Field Train Blank System Leak Check**

Time: 1100 Initial Measurement (L/min): 0.000
Time: 1103 Final Measurement (L/min): 0.000

*Leak Check Criteria - ≤2% of the sampling rate of 0.5 LPM, vacuum 15 in. Hg* Vac-1 (Avog-Dry) Y=1.008

**Measurement System Leak Checks/Purge**

| Tube set 1 | Tubes 4A, 4B and 4C | | Tube set 2 | Tubes 5A, 5B and 5C | | Tube set 3 | Tubes 6A, 6B and 6C | |
|---|---|---|---|---|---|---|---|---|
| Pre (L/min): | 0.000 | Time: 509 | Pre (L/min): | 0.000 | Time: 0945 | Pre (L/min): | 0.000 | Time: 1405 |
| Purge (1 L/min): | ☑ | Time: 510 | Purge (1 L/min): | ☑ | Time: 0946 | Purge (1 L/min): | ☑ | Time: 1406 |
| Post (L/min): | 0.000 | Time: 1915 | Post (L/min): | 0.000 | Time: 0938 | Post (L/min): | 0.000 | Time: 1917 |

*Leak Check Criteria - ≤2% of the sampling rate of 0.5 LPM, Pre-test vacuum 15 in. Hg, post-test at highest sample vacuum*
*Initial leak check done from tip of probe. Subsequent leak checks done from 3 way valve.*

**Temperature, Pressure and Dry Gas Meter Measurements**

| | Ambient | | Time Recorded |
|---|---|---|---|
| Beginning | 60 | °F | 0500 |
| End | 72 | °F | 1915 |

| | Barometric | | |
|---|---|---|---|
| Beginning | 29.29 | "Hg | 0500 |
| End | 29.26 | "Hg | 1915 |

Notes:

*Sample Recovery Notes.*
Transfer condensate into vial. Rinses can use 1 or more vials. Fill bottle to eliminate headspace. Use ONLY Type 1 high purity HPLC water for all rinses.

Place all 3 tubes in ziplocks with VOA bottle and chill.

*QA/QC:*
One Field train blank is required

One Trip blank is required per source also.

Tube set 1

| Time | Meter | L/min | Vacuum in. hg | Probe F | Meter C | Push Time |
|---|---|---|---|---|---|---|
| 0.0 | | 0.5 | | | | |
| 2.5 | | 0.5 | 2.0 | 243 | 19 | 513 |
| 5.0 | | 0.5 | 2.0 | 245 | 19 | 526 |
| 7.5 | | 0.5 | 2.0 | 245 | 20 | 540 |
| 10.0 | | 0.5 | 2.0 | 247 | 20 | 552 |
| 12.5 | | 0.5 | 2.0 | 245 | 20 | 607 |
| 15.0 | | 0.5 | 2.0 | 244 | 21 | 621 |
| 17.5 | | 0.5 | 2.0 | 242 | 21 | 634 |
| 20.0 | | 0.5 | 2.0 | 243 | 21 | 646 |
| 22.5 | | 0.5 | 2.0 | 245 | 21 | 657 |
| 25.0 | | 0.5 | 2.0 | 246 | 20 | 738 |
| 27.5 | | 0.5 | 2.0 | 245 | 20 | 753 |
| 30.0 | | 0.5 | 2.0 | 246 | 20 | 806 |
| 32.5 | | 0.5 | 2.0 | 247 | 19 | 822 |
| 35.0 | | 0.5 | 2.0 | 246 | 19 | 902 |
| 37.5 | | 0.5 | 2.0 | 246 | 20 | 921 |
| 40.0 | | 0.5 | 2.0 | 245 | 20 | 933 |
| | | | | | | Push Time |

Tube set 2

| Time | Meter | L/min | Vacuum in. hg | Probe F | Meter C | Push Time |
|---|---|---|---|---|---|---|
| 0.0 | | 0.5 | | | | |
| 2.5 | | 0.5 | 2.0 | 242 | 19 | 949 |
| 5.0 | | 0.5 | 2.0 | 244 | 19 | 1000 |
| 7.5 | | 0.5 | 2.0 | 245 | 19 | 1014 |
| 10.0 | | 0.5 | 2.0 | 245 | 19 | 1026 |
| 12.5 | | 0.5 | 2.0 | 245 | 19 | 1039 |
| 15.0 | | 0.5 | 2.0 | 246 | 20 | 1051 |
| 17.5 | | 0.5 | 2.0 | 245 | 20 | 1150 |
| 20.0 | | 0.5 | 2.0 | 243 | 20 | 1202 |
| 22.5 | | 0.5 | 2.0 | 242 | 20 | 1215 |
| 25.0 | | 0.5 | 2.0 | 241 | 21 | 1231 |
| 27.5 | | 0.5 | 2.0 | 243 | 21 | 1249 |
| 30.0 | | 0.5 | 2.0 | 246 | 21 | 1255 |
| 32.5 | | 0.5 | 2.0 | 245 | 22 | 1311 |
| 35.0 | | 0.5 | 2.0 | 245 | 22 | 1324 |
| 37.5 | | 0.5 | 2.0 | 244 | 22 | 1337 |
| 40.0 | | 0.5 | 2.0 | 243 | 22 | 1354 end 1357 |
| | | | | | | Push Time |

Tube set 3

| Time | Meter | L/min | Vacuum in. hg | Probe F | Meter C | Push Time |
|---|---|---|---|---|---|---|
| 0.0 | | 0.5 | | | | |
| 2.5 | | 0.5 | 2.0 | 244 | 22 | 1410 |
| 5.0 | | 0.5 | 2.0 | 245 | 22 | 1423 |
| 7.5 | | 0.5 | 2.0 | 245 | 22 | 1435 |
| 10.0 | | 0.5 | 2.0 | 246 | 23 | 1447 |
| 12.5 | | 0.5 | 2.0 | 246 | 23 | 1457 |
| 15.0 | | 0.5 | 2.0 | 247 | 23 | 1536 |
| 17.5 | | 0.5 | 2.0 | 246 | 23 | 1549 |
| 20.0 | | 0.5 | 2.0 | 245 | 23 | 1612 |
| 22.5 | | 0.5 | 2.0 | 243 | 24 | 1629 |
| 25.0 | | 0.5 | 2.0 | 243 | 24 | 1644 |
| 27.5 | | 0.5 | 2.0 | 244 | 23 | 1805 |
| 30.0 | | 0.5 | 2.0 | 245 | 23 | 1824 |
| 32.5 | | 0.5 | 2.0 | 245 | 23 | 1835 |
| 35.0 | | 0.5 | 2.0 | 246 | 24 | 1847 |
| 37.5 | | 0.5 | 2.0 | 246 | 24 | 1858 |
| 40.0 | | 0.5 | 2.0 | 245 | 23 | 1910 end 1913 |

**Method 0031 Data Sheet**
**Solid Waste 846 Method**
**Volatile Organic HAPs (VOHAPS)**

Company Name: **Arcelormittal**

Location: **Monessen, PA**

Source Name: **Coke Oven Battery**

Description of Location Sampled (include description of all control devices, quenches, air inlets, etc.): **Coke Battery PEC Stack**

Run Number: 3
Start Time: 1949
End Time:
Date: 11/2/16

Crew: JV JW TM TL
*Circle initials of meterbox operator*

**Field Train Blank System Leak Check** Tubes 10A, 10B and 10C

Time: 1106 11/1/16 Initial Measurement (L/min): 0.000
Time: 1103 11/1/16 Final Measurement (L/min): 0.000

*Leak Check Criteria - ≤2% of the sampling rate of 0.5 LPM, vacuum 15 in. Hg*

Volt-1 (Argon/Air) 421.008

**Measurement System Leak Checks/Purge**

| Tube set 1 | 7A, 7B and 7C | | Tube set 2 | 8A, 8B and 8C | | Tube set 3 | 9A, 9B and 9C | |
|---|---|---|---|---|---|---|---|---|
| Pre (L/min): | 0.000 | Time: 1900 | Pre (L/min): | 0.000 | Time: 0004 | Pre (L/min): | 0.000 | Time: 511 |
| Purge (1 L/min): | ☑ | Time: 1904 | Purge (1 L/min): | ☑ | Time: 0009 | Purge (1 L/min): | ☑ | Time: 514 |
| Post (L/min): | 0.000 | Time: 2352 | Post (L/min): | 0.000 | Time: 498 | Post (L/min): | 0.000 | Time: 10560 |

*Leak Check Criteria - ≤2% of the sampling rate of 0.5 LPM, Pre-test vacuum 15 in. Hg, post-test at highest sample vacuum*
*Initial leak check done from tip of probe. Subsequent leak checks done from 3 way valve.*

**Temperature, Pressure and Dry Gas Meter Measurements**

| | Ambient | | Time Recorded |
|---|---|---|---|
| Beginning | 72 | °F | 733 |
| End | 67 | °F | 1056 |

| | Barometric | | |
|---|---|---|---|
| Beginning | 29.26 | "Hg | 733 |
| End | 29.15 | "Hg | 1056 |

Notes:

*Sample Recovery Notes.*
Transfer condensate into vial. Rinses can use 1 or more vials. Fill bottle to eliminate headspace. Use ONLY Type 1 high purity HPLC water for all rinses.

Place all 3 tubes in ziplocks with VOA bottle and chill.

*QA/QC:*
One Field train blank is required

One Trip blank is required per source also.

| | Time | Meter | L/min | Vacuum in. hg | Probe F | Meter C | Push Time |
|---|---|---|---|---|---|---|---|
| Tube set 1 | 0.0 | 0.000 | 0.5 | | | | |
| | 2.5 | 1.133 | 0.5 | 2.0 | 234 | 24 | 1949 |
| | 5.0 | 2.288 | 0.5 | 2.0 | 237 | 23 | 2038 |
| | 7.5 | 3.428 | 0.5 | 2.0 | 235 | 23 | 2050 |
| | 10.0 | 4.603 | 0.5 | 2.0 | 236 | 22 | 2100 |
| | 12.5 | 5.860 | 0.5 | 2.0 | 241 | 22 | 2110 |
| | 15.0 | 7.122 | 0.5 | 2.0 | 237 | 22 | 2121 |
| | 17.5 | 8.296 | 0.5 | 2.0 | 238 | 22 | 2133 |
| | 20.0 | 9.470 | 0.5 | 2.0 | 237 | 22 | 2144 |
| | 22.5 | 10.571 | 0.5 | 2.0 | 243 | 22 | 2154 |
| | 25.0 | 11.717 | 0.5 | 2.0 | 236 | 22 | 2205 |
| | 27.5 | 12.835 | 0.5 | 2.0 | 246 | 22 | 2217 |
| | 30.0 | 13.893 | 0.5 | 2.0 | 244 | 22 | 2226 |
| | 32.5 | 14.890 | 0.5 | 2.0 | 248 | 22 | 2236 |
| | 35.0 | 15.948 | 0.5 | 2.0 | 242 | 22 | 2246 |
| | 37.5 | 16.974 | 0.5 | 2.0 | 241 | 20 | 2332 |
| | 40.0 | 18.199 | 0.5 | 2.0 | 246 | 20 | 2348 |
| | | | | | | | Push Time |
| Tube set 2 | 0.0 | 0.000 | 0.5 | | | | |
| | 2.5 | 1.139 | 0.5 | 2.0 | 238 | 20 | 0005 |
| | 5.0 | 2.343 | 0.5 | 2.0 | 235 | 19 | 107 |
| | 7.5 | 3.485 | 0.5 | 2.0 | 237 | 19 | 119 |
| | 10.0 | 4.706 | 0.5 | 2.0 | 234 | 19 | 131 |
| | 12.5 | 5.927 | 0.5 | 2.0 | 239 | 19 | 144 |
| | 15.0 | 7.250 | 0.5 | 2.0 | 236 | 19 | 157 |
| | 17.5 | 8.408 | 0.5 | 2.0 | 240 | 19 | 210 |
| | 20.0 | 9.785 | 0.5 | 2.0 | 239 | 19 | 232 |
| | 22.5 | 10.968 | 0.5 | 2.0 | 244 | 18 | 251 |
| | 25.0 | 12.075 | 0.5 | 2.0 | 242 | 18 | 305 |
| | 27.5 | 13.093 | 0.5 | 2.0 | 240 | 18 | 344 |
| | 30.0 | 14.144 | 0.5 | 2.0 | 239 | 18 | 400 |
| | 32.5 | 15.161 | 0.5 | 2.0 | 246 | 18 | 413 |
| | 35.0 | 16.116 | 0.5 | 2.0 | 249 | 18 | 425 |
| | 37.5 | 17.246 | 0.5 | 2.0 | 240 | 19 | 438 |
| | 40.0 | 18.328 | 0.5 | 2.0 | 236 | 19 | 452 |
| | | | | | | | Push Time |
| Tube set 3 | 0.0 | 0.000 | 0.5 | | | | |
| | 2.5 | 1.498 | 0.5 | 2.0 | 245 | 19 | 521 |
| | 5.0 | 2.704 | 0.5 | 2.0 | 242 | 19 | 534 |
| | 7.5 | 3.839 | 0.5 | 2.0 | 242 | 21 | 701 |
| | 10.0 | 5.013 | 0.5 | 2.0 | 243 | 21 | 710 |
| | 12.5 | 6.229 | 0.5 | 2.0 | 246 | 21 | 733 |
| | 15.0 | 7.376 | 0.5 | 2.0 | 244 | 21 | 747 |
| | 17.5 | 8.522 | 0.5 | 2.0 | 246 | 21 | 800 |
| | 20.0 | 9.671 | 0.5 | 2.0 | 249 | 20 | 821 |
| | 22.5 | 10.840 | 0.5 | 2.0 | 251 | 20 | 834 |
| | 25.0 | 12.005 | 0.5 | 2.0 | 249 | 20 | 848 |
| | 27.5 | 13.105 | 0.5 | 2.0 | 247 | 19 | 932 |
| | 30.0 | 15.085 | 0.5 | 2.0 | 253 | 19 | 950 |
| | 32.5 | 17.324 | 0.5 | 2.0 | 246 | 19 | 1004 |
| | 35.0 | 18.307 | 0.5 | 2.0 | 244 | 19 | 1020 |
| | 37.5 | 19.245 | 0.5 | 2.0 | 248 | 19 | 1036 |
| | 40.0 | 20.413 | 0.5 | 2.0 | 250 | 19 | 1054 |

# Methods 3A, 15

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 1** | | | | |
| 1 | 2016/11/01 | 14:38:40 | 19.99 | 0.84 |
| 2 | 2016/11/01 | 14:39:40 | 20.33 | 0.56 |
| 3 | 2016/11/01 | 14:50:40 | 19.87 | 0.91 |
| 4 | 2016/11/01 | 14:51:40 | 19.77 | 0.98 |
| 5 | 2016/11/01 | 15:02:40 | 19.98 | 0.85 |
| 6 | 2016/11/01 | 15:03:40 | 20.13 | 0.74 |
| 7 | 2016/11/01 | 15:15:40 | 19.88 | 0.84 |
| 8 | 2016/11/01 | 15:16:40 | 19.93 | 0.81 |
| 9 | 2016/11/01 | 15:33:40 | 20.32 | 0.49 |
| 10 | 2016/11/01 | 15:34:40 | 19.89 | 0.93 |
| 11 | 2016/11/01 | 15:47:40 | 19.86 | 0.92 |
| 12 | 2016/11/01 | 15:48:40 | 20.31 | 0.57 |
| 13 | 2016/11/01 | 15:59:40 | 20.10 | 0.70 |
| 14 | 2016/11/01 | 16:00:40 | 19.80 | 0.99 |
| 15 | 2016/11/01 | 16:44:40 | 20.24 | 0.50 |
| 16 | 2016/11/01 | 16:45:40 | 19.83 | 0.87 |
| 17 | 2016/11/01 | 16:56:40 | 20.22 | 0.55 |
| 18 | 2016/11/01 | 16:57:40 | 19.81 | 0.91 |
| 19 | 2016/11/01 | 17:11:40 | 19.92 | 0.82 |
| 20 | 2016/11/01 | 17:12:40 | 20.33 | 0.54 |
| 21 | 2016/11/01 | 17:35:40 | 19.89 | 0.84 |
| 22 | 2016/11/01 | 17:36:40 | 19.76 | 0.91 |
| 23 | 2016/11/01 | 17:48:40 | 19.85 | 0.90 |
| 24 | 2016/11/01 | 17:49:40 | 20.36 | 0.50 |
| 25 | 2016/11/01 | 18:00:40 | 20.04 | 0.69 |
| 26 | 2016/11/01 | 18:01:40 | 19.79 | 0.93 |
| 27 | 2016/11/01 | 18:13:40 | 20.34 | 0.47 |
| 28 | 2016/11/01 | 18:14:40 | 19.91 | 0.88 |
| 29 | 2016/11/01 | 19:10:40 | 19.89 | 0.86 |
| 30 | 2016/11/01 | 19:11:40 | 20.43 | 0.45 |
| 31 | 2016/11/01 | 19:21:40 | 19.97 | 0.78 |
| 32 | 2016/11/01 | 19:22:40 | 19.77 | 0.97 |
| 33 | 2016/11/01 | 19:35:40 | 20.11 | 0.70 |
| 34 | 2016/11/01 | 19:36:40 | 19.93 | 0.88 |
| 35 | 2016/11/01 | 19:49:40 | 20.11 | 0.66 |
| 36 | 2016/11/01 | 19:50:40 | 19.84 | 0.91 |
| 37 | 2016/11/01 | 20:02:40 | 20.06 | 0.77 |
| 38 | 2016/11/01 | 20:03:40 | 20.35 | 0.53 |
| 39 | 2016/11/01 | 20:14:40 | 19.92 | 0.84 |
| 40 | 2016/11/01 | 20:15:40 | 19.77 | 0.96 |
| 41 | 2016/11/01 | 20:27:40 | 20.00 | 0.82 |
| 42 | 2016/11/01 | 20:28:40 | 20.17 | 0.70 |
| 43 | 2016/11/01 | 20:40:40 | 19.83 | 0.83 |
| 44 | 2016/11/01 | 20:41:40 | 19.75 | 0.88 |
| 45 | 2016/11/01 | 21:01:40 | 20.16 | 0.67 |
| 46 | 2016/11/01 | 21:02:40 | 19.90 | 0.91 |
| 47 | 2016/11/01 | 21:39:40 | 20.02 | 0.81 |
| 48 | 2016/11/01 | 21:40:40 | 20.27 | 0.61 |
| 49 | 2016/11/01 | 21:52:40 | 20.05 | 0.84 |
| 50 | 2016/11/01 | 21:53:40 | 20.33 | 0.60 |
| 51 | 2016/11/01 | 22:03:40 | 19.96 | 0.85 |
| 52 | 2016/11/01 | 22:04:40 | 20.44 | 0.46 |
| 53 | 2016/11/01 | 22:13:40 | 20.10 | 0.72 |
| 54 | 2016/11/01 | 22:14:40 | 20.08 | 0.76 |
| 55 | 2016/11/01 | 22:25:40 | 20.40 | 0.44 |
| 56 | 2016/11/01 | 22:26:40 | 20.00 | 0.82 |
| 57 | 2016/11/01 | 22:38:40 | 20.07 | 0.75 |
| 58 | 2016/11/01 | 22:39:40 | 19.88 | 0.90 |
| 59 | 2016/11/01 | 22:50:40 | 20.04 | 0.87 |
| 60 | 2016/11/01 | 22:51:40 | 20.34 | 0.60 |
| 61 | 2016/11/01 | 23:38:40 | 20.01 | 0.81 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 62 | 2016/11/01 | 23:39:40 | 20.42 | 0.50 |
| 63 | 2016/11/01 | 23:49:40 | 20.06 | 0.85 |
| 64 | 2016/11/01 | 23:50:40 | 20.37 | 0.58 |
| 65 | 2016/11/02 | 00:01:40 | 19.90 | 0.83 |
| 66 | 2016/11/02 | 00:02:40 | 19.89 | 0.85 |
| 67 | 2016/11/02 | 00:38:40 | 19.98 | 0.83 |
| 68 | 2016/11/02 | 00:39:40 | 20.45 | 0.47 |
| 69 | 2016/11/02 | 00:49:40 | 19.54 | 1.02 |
| 70 | 2016/11/02 | 00:50:40 | 19.43 | 1.12 |
| 71 | 2016/11/02 | 01:10:40 | 19.60 | 1.04 |
| 72 | 2016/11/02 | 01:11:40 | 19.71 | 1.02 |
| 73 | 2016/11/02 | 02:27:40 | 19.84 | 0.81 |
| 74 | 2016/11/02 | 02:28:40 | 20.18 | 0.64 |
| 75 | 2016/11/02 | 02:41:40 | 20.09 | 0.80 |
| 76 | 2016/11/02 | 02:42:40 | 20.25 | 0.69 |
| 77 | 2016/11/02 | 02:55:40 | 20.13 | 0.66 |
| 78 | 2016/11/02 | 02:56:40 | 19.94 | 0.85 |
| 79 | 2016/11/02 | 03:07:40 | 20.37 | 0.60 |
| 80 | 2016/11/02 | 03:08:40 | 20.59 | 0.40 |
| 81 | 2016/11/02 | 03:18:40 | 20.26 | 0.61 |
| 82 | 2016/11/02 | 03:19:40 | 20.03 | 0.80 |
| 83 | 2016/11/02 | 03:29:40 | 20.14 | 0.75 |
| 84 | 2016/11/02 | 03:30:40 | 20.46 | 0.48 |
| 85 | 2016/11/02 | 03:40:40 | 20.20 | 0.64 |
| 86 | 2016/11/02 | 03:41:40 | 20.45 | 0.48 |
| 87 | 2016/11/02 | 04:15:40 | 20.18 | 0.74 |
| 88 | 2016/11/02 | 04:16:40 | 20.47 | 0.48 |
| 89 | 2016/11/02 | 04:26:40 | 20.12 | 0.76 |
| 90 | 2016/11/02 | 04:27:40 | 20.09 | 0.81 |
| 91 | 2016/11/02 | 04:36:40 | 20.31 | 0.56 |
| 92 | 2016/11/02 | 04:37:40 | 20.50 | 0.43 |
| **RUN 1 AVERAGES** | | | **20.07** | **0.74** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 2** | | | | |
| 1 | 2016/11/02 | 05:12:40 | 19.80 | 0.92 |
| 2 | 2016/11/02 | 05:13:40 | 19.68 | 0.97 |
| 3 | 2016/11/02 | 05:25:40 | 20.14 | 0.65 |
| 4 | 2016/11/02 | 05:26:40 | 20.32 | 0.57 |
| 5 | 2016/11/02 | 05:40:40 | 19.82 | 0.92 |
| 6 | 2016/11/02 | 05:41:40 | 19.76 | 0.96 |
| 7 | 2016/11/02 | 05:52:40 | 20.24 | 0.67 |
| 8 | 2016/11/02 | 05:53:40 | 20.43 | 0.54 |
| 9 | 2016/11/02 | 06:07:40 | 20.16 | 0.70 |
| 10 | 2016/11/02 | 06:08:40 | 20.40 | 0.53 |
| 11 | 2016/11/02 | 06:22:40 | 20.19 | 0.64 |
| 12 | 2016/11/02 | 06:23:40 | 20.48 | 0.44 |
| 13 | 2016/11/02 | 06:35:40 | 20.27 | 0.67 |
| 14 | 2016/11/02 | 06:36:40 | 20.58 | 0.41 |
| 15 | 2016/11/02 | 06:46:40 | 19.59 | 1.05 |
| 16 | 2016/11/02 | 06:47:40 | 19.64 | 1.04 |
| 17 | 2016/11/02 | 06:57:40 | 20.19 | 0.73 |
| 18 | 2016/11/02 | 06:58:40 | 20.45 | 0.52 |
| 19 | 2016/11/02 | 07:39:40 | 20.11 | 0.69 |
| 20 | 2016/11/02 | 07:40:40 | 20.52 | 0.40 |
| 21 | 2016/11/02 | 07:53:40 | 20.22 | 0.77 |
| 22 | 2016/11/02 | 07:54:40 | 20.51 | 0.49 |
| 23 | 2016/11/02 | 08:05:40 | 20.17 | 0.76 |
| 24 | 2016/11/02 | 08:06:40 | 19.96 | 0.93 |
| 25 | 2016/11/02 | 08:21:40 | 20.17 | 0.79 |
| 26 | 2016/11/02 | 08:22:40 | 20.48 | 0.51 |
| 27 | 2016/11/02 | 09:02:50 | 20.03 | 0.68 |
| 28 | 2016/11/02 | 09:03:50 | 20.04 | 0.77 |
| 29 | 2016/11/02 | 09:20:50 | 19.76 | 1.12 |
| 30 | 2016/11/02 | 09:21:50 | 20.61 | 0.39 |
| 31 | 2016/11/02 | 09:33:50 | 20.01 | 0.87 |
| 32 | 2016/11/02 | 09:34:50 | 20.04 | 0.82 |
| 33 | 2016/11/02 | 09:49:50 | 19.94 | 0.89 |
| 34 | 2016/11/02 | 09:50:50 | 20.63 | 0.37 |
| 35 | 2016/11/02 | 10:00:50 | 20.34 | 0.43 |
| 36 | 2016/11/02 | 10:01:50 | 20.05 | 0.74 |
| 37 | 2016/11/02 | 10:15:50 | 20.27 | 0.70 |
| 38 | 2016/11/02 | 10:16:50 | 20.74 | 0.28 |
| 39 | 2016/11/02 | 10:26:50 | 19.79 | 1.06 |
| 40 | 2016/11/02 | 10:27:50 | 19.96 | 0.89 |
| 41 | 2016/11/02 | 10:39:50 | 19.91 | 1.01 |
| 42 | 2016/11/02 | 10:40:50 | 20.63 | 0.37 |
| 43 | 2016/11/02 | 10:51:50 | 19.95 | 0.87 |
| 44 | 2016/11/02 | 10:52:50 | 19.96 | 0.85 |
| 45 | 2016/11/02 | 11:49:50 | 20.41 | 0.48 |
| 46 | 2016/11/02 | 11:50:50 | 20.11 | 0.77 |
| 47 | 2016/11/02 | 12:02:50 | 20.24 | 0.62 |
| 48 | 2016/11/02 | 12:03:50 | 20.08 | 0.81 |
| 49 | 2016/11/02 | 12:16:50 | 20.05 | 0.85 |
| 50 | 2016/11/02 | 12:17:50 | 20.64 | 0.36 |
| 51 | 2016/11/02 | 12:31:50 | 20.08 | 0.86 |
| 52 | 2016/11/02 | 12:32:50 | 20.04 | 0.86 |
| 53 | 2016/11/02 | 13:37:50 | 19.81 | 1.10 |
| 54 | 2016/11/02 | 13:38:50 | 20.13 | 0.82 |
| 55 | 2016/11/02 | 13:54:50 | 19.08 | 1.53 |
| 56 | 2016/11/02 | 13:55:50 | 20.17 | 0.68 |
| 57 | 2016/11/02 | 14:09:50 | 19.88 | 0.96 |
| 58 | 2016/11/02 | 14:10:50 | 20.02 | 0.86 |
| 59 | 2016/11/02 | 14:23:50 | 19.93 | 0.94 |
| 60 | 2016/11/02 | 14:24:50 | 20.56 | 0.39 |
| 61 | 2016/11/02 | 14:35:50 | 19.83 | 1.02 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 62 | 2016/11/02 | 14:36:50 | 20.29 | 0.65 |
| 63 | 2016/11/02 | 14:47:50 | 19.85 | 0.99 |
| 64 | 2016/11/02 | 14:48:50 | 20.58 | 0.35 |
| 65 | 2016/11/02 | 14:57:50 | 19.81 | 0.99 |
| 66 | 2016/11/02 | 14:58:50 | 20.25 | 0.65 |
| 67 | 2016/11/02 | 15:36:50 | 19.89 | 1.01 |
| 68 | 2016/11/02 | 15:37:50 | 20.46 | 0.50 |
| 69 | 2016/11/02 | 15:49:50 | 19.86 | 0.98 |
| 70 | 2016/11/02 | 15:50:50 | 20.25 | 0.68 |
| 71 | 2016/11/02 | 16:11:50 | 20.63 | 0.29 |
| 72 | 2016/11/02 | 16:12:50 | 20.24 | 0.71 |
| 73 | 2016/11/02 | 16:27:50 | 20.28 | 0.49 |
| 74 | 2016/11/02 | 16:28:50 | 19.96 | 0.78 |
| 75 | 2016/11/02 | 16:44:50 | 19.72 | 0.99 |
| 76 | 2016/11/02 | 16:45:50 | 20.43 | 0.49 |
| 77 | 2016/11/02 | 17:04:50 | 19.93 | 0.82 |
| 78 | 2016/11/02 | 17:05:50 | 20.47 | 0.43 |
| 79 | 2016/11/02 | 17:24:50 | 19.92 | 0.88 |
| 80 | 2016/11/02 | 17:25:50 | 20.60 | 0.32 |
| 81 | 2016/11/02 | 18:33:50 | 19.28 | 1.02 |
| 82 | 2016/11/02 | 18:34:50 | 19.55 | 0.96 |
| 83 | 2016/11/02 | 18:46:50 | 20.17 | 0.67 |
| 84 | 2016/11/02 | 18:47:50 | 20.67 | 0.26 |
| 85 | 2016/11/02 | 18:58:50 | 20.00 | 0.76 |
| 86 | 2016/11/02 | 18:59:50 | 20.47 | 0.44 |
| 87 | 2016/11/02 | 19:10:50 | 19.85 | 0.97 |
| 88 | 2016/11/02 | 19:11:50 | 20.45 | 0.49 |
| **RUN 2 AVERAGES** | | | **20.14** | **0.73** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| **RUN 3** | | | | |
| 1 | 2016/11/02 | 19:49:50 | 19.99 | 0.79 |
| 2 | 2016/11/02 | 19:50:50 | 20.15 | 0.70 |
| 3 | 2016/11/02 | 20:37:50 | 19.93 | 0.91 |
| 4 | 2016/11/02 | 20:38:50 | 20.58 | 0.36 |
| 5 | 2016/11/02 | 20:49:50 | 20.11 | 0.75 |
| 6 | 2016/11/02 | 20:50:50 | 20.63 | 0.32 |
| 7 | 2016/11/02 | 20:59:50 | 20.31 | 0.53 |
| 8 | 2016/11/02 | 21:00:50 | 20.46 | 0.49 |
| 9 | 2016/11/02 | 21:10:50 | 19.79 | 0.87 |
| 10 | 2016/11/02 | 21:11:50 | 19.98 | 0.81 |
| 11 | 2016/11/02 | 21:21:50 | 20.61 | 0.28 |
| 12 | 2016/11/02 | 21:22:50 | 20.12 | 0.69 |
| 13 | 2016/11/02 | 21:32:50 | 19.04 | 1.50 |
| 14 | 2016/11/02 | 21:33:50 | 19.76 | 0.90 |
| 15 | 2016/11/02 | 21:43:50 | 19.78 | 0.99 |
| 16 | 2016/11/02 | 21:44:50 | 20.55 | 0.37 |
| 17 | 2016/11/02 | 21:53:50 | 19.96 | 0.74 |
| 18 | 2016/11/02 | 21:54:50 | 20.45 | 0.44 |
| 19 | 2016/11/02 | 22:04:50 | 19.87 | 0.96 |
| 20 | 2016/11/02 | 22:05:50 | 20.56 | 0.37 |
| 21 | 2016/11/02 | 22:06:50 | 20.80 | 0.16 |
| 22 | 2016/11/02 | 22:16:50 | 20.28 | 0.60 |
| 23 | 2016/11/02 | 22:17:50 | 20.71 | 0.24 |
| 24 | 2016/11/02 | 22:25:50 | 19.74 | 1.00 |
| 25 | 2016/11/02 | 22:26:50 | 20.44 | 0.48 |
| 26 | 2016/11/02 | 22:35:50 | 19.91 | 0.86 |
| 27 | 2016/11/02 | 22:36:50 | 20.47 | 0.44 |
| 28 | 2016/11/02 | 22:44:50 | 19.92 | 0.71 |
| 29 | 2016/11/02 | 22:45:50 | 19.99 | 0.76 |
| 30 | 2016/11/02 | 22:46:50 | 20.66 | 0.25 |
| 31 | 2016/11/02 | 23:32:50 | 20.52 | 0.34 |
| 32 | 2016/11/02 | 23:33:50 | 20.03 | 0.73 |
| 33 | 2016/11/02 | 23:48:50 | 20.04 | 0.80 |
| 34 | 2016/11/02 | 23:49:50 | 20.61 | 0.31 |
| 35 | 2016/11/03 | 00:15:50 | 19.86 | 0.97 |
| 36 | 2016/11/03 | 00:16:50 | 20.53 | 0.38 |
| 37 | 2016/11/03 | 01:06:50 | 19.78 | 0.76 |
| 38 | 2016/11/03 | 01:07:50 | 19.89 | 0.78 |
| 39 | 2016/11/03 | 01:18:50 | 19.82 | 0.97 |
| 40 | 2016/11/03 | 01:19:50 | 20.47 | 0.46 |
| 41 | 2016/11/03 | 01:31:50 | 19.83 | 0.78 |
| 42 | 2016/11/03 | 01:32:50 | 20.29 | 0.54 |
| 43 | 2016/11/03 | 01:42:50 | 20.34 | 0.46 |
| 44 | 2016/11/03 | 01:43:50 | 20.49 | 0.43 |
| 45 | 2016/11/03 | 01:57:50 | 19.22 | 1.22 |
| 46 | 2016/11/03 | 01:58:50 | 19.77 | 0.84 |
| 47 | 2016/11/03 | 02:15:50 | 19.78 | 1.02 |
| 48 | 2016/11/03 | 02:16:50 | 20.48 | 0.43 |
| 49 | 2016/11/03 | 02:33:50 | 19.71 | 0.96 |
| 50 | 2016/11/03 | 02:34:50 | 19.92 | 0.81 |
| 51 | 2016/11/03 | 02:51:50 | 19.92 | 0.88 |
| 52 | 2016/11/03 | 02:52:50 | 20.53 | 0.37 |
| 53 | 2016/11/03 | 03:05:50 | 19.81 | 0.87 |
| 54 | 2016/11/03 | 03:06:50 | 20.05 | 0.68 |
| 55 | 2016/11/03 | 03:49:50 | 19.97 | 0.68 |
| 56 | 2016/11/03 | 03:50:50 | 20.04 | 0.74 |
| 57 | 2016/11/03 | 04:01:50 | 20.03 | 0.73 |
| 58 | 2016/11/03 | 04:02:50 | 20.01 | 0.76 |
| 59 | 2016/11/03 | 04:13:50 | 19.80 | 0.91 |
| 60 | 2016/11/03 | 04:14:50 | 20.48 | 0.37 |
| 61 | 2016/11/03 | 04:26:50 | 20.00 | 0.73 |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) |
|---|---|---|---|---|
| 62 | 2016/11/03 | 04:27:50 | 20.09 | 0.71 |
| 63 | 2016/11/03 | 04:38:50 | 19.97 | 0.78 |
| 64 | 2016/11/03 | 04:39:50 | 20.56 | 0.30 |
| 65 | 2016/11/03 | 04:52:50 | 19.84 | 0.91 |
| 66 | 2016/11/03 | 04:53:50 | 19.95 | 0.78 |
| 67 | 2016/11/03 | 05:21:50 | 19.36 | 1.12 |
| 68 | 2016/11/03 | 05:22:50 | 19.77 | 0.82 |
| 69 | 2016/11/03 | 05:33:50 | 19.78 | 0.97 |
| 70 | 2016/11/03 | 05:34:50 | 20.45 | 0.41 |
| 71 | 2016/11/03 | 07:01:50 | 20.06 | 0.72 |
| 72 | 2016/11/03 | 07:02:50 | 20.54 | 0.32 |
| 73 | 2016/11/03 | 07:11:50 | 19.89 | 0.90 |
| 74 | 2016/11/03 | 07:12:50 | 20.48 | 0.38 |
| 75 | 2016/11/03 | 07:32:50 | 20.56 | 0.28 |
| 76 | 2016/11/03 | 07:33:50 | 20.09 | 0.70 |
| 77 | 2016/11/03 | 07:47:50 | 19.86 | 0.97 |
| 78 | 2016/11/03 | 07:48:50 | 20.50 | 0.40 |
| 79 | 2016/11/03 | 08:02:50 | 19.91 | 0.88 |
| 80 | 2016/11/03 | 08:03:50 | 20.42 | 0.47 |
| 81 | 2016/11/03 | 08:21:50 | 19.82 | 1.01 |
| 82 | 2016/11/03 | 08:22:50 | 20.49 | 0.41 |
| 83 | 2016/11/03 | 08:34:50 | 20.18 | 0.55 |
| 84 | 2016/11/03 | 08:35:50 | 19.93 | 0.80 |
| 85 | 2016/11/03 | 08:48:50 | 19.43 | 1.06 |
| 86 | 2016/11/03 | 08:49:50 | 19.78 | 0.84 |
| 87 | 2016/11/03 | 09:32:50 | 20.12 | 0.64 |
| 88 | 2016/11/03 | 09:33:50 | 20.44 | 0.45 |
| 89 | 2016/11/03 | 09:51:50 | 20.01 | 0.76 |
| 90 | 2016/11/03 | 09:52:50 | 20.01 | 0.76 |
| 91 | 2016/11/03 | 10:04:50 | 19.79 | 0.93 |
| 92 | 2016/11/03 | 10:05:50 | 20.54 | 0.33 |
| 93 | 2016/11/03 | 10:20:50 | 19.64 | 1.04 |
| 94 | 2016/11/03 | 10:21:50 | 19.82 | 0.87 |
| 95 | 2016/11/03 | 10:36:50 | 20.44 | 0.38 |
| 96 | 2016/11/03 | 10:37:50 | 20.08 | 0.78 |
| **RUN 3 AVERAGES** | | | **20.11** | **0.68** |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1-2, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 1 |
| **Unit** | Pushing Baghouse | **Start Time** | 14:13 |
| **Operation** | Normal | **End Time** | 15:13 |
| **Tester(s)** | BC, JW, TL, CS | | |

| Cal. | LOW | | MID | | HIGH | | | | If Using M205, denote Mass Flow Controller | | | M205 Dilution System Information | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tank ID | | | | | | |
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Conc. Units | LOW | MID | HIGH | Dilution Cylinder ID | Cylinder Concentration | Response Time (up) | Response Time (down) |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | 45 | 45 | 60 | 60 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B | 50 | 50 | 70 | 70 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | | | |
| THC LIMITS | | 25 % to 35 % | | 45 % to 55 % | | 80 % to 90 % | | | | | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values: System Cal. Response | Initial Values: System Cal. Bias (% of Span) | Final Values: System Cal. Response | Final Values: System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | Zero | | 0.01 | 0.11 | 0.50 | 0.07 | 0.30 | -0.20 | 20.03 | 0.09 | | | |
| | Mid | 10.01 | 10.07 | 10.04 | -0.15 | 10.05 | -0.10 | 0.05 | 20.03 | 10.045 | 20.07 | 20.09 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.15 | 0.45 | 0.12 | 0.30 | -0.15 | 19.79 | 0.135 | | | |
| | Mid | 10.15 | 10.04 | 10.01 | -0.15 | 10.01 | -0.15 | 0.00 | 19.79 | 10.01 | 0.74 | 0.63 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1-2, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 2 |
| **Unit** | Pushing Baghouse | **Start Time** | 5:13 |
| **Operation** | Normal | **End Time** | 6:13 |
| **Tester(s)** | BC, JW, TL, CS | | |

| Cal. | LOW | | MID | | HIGH | | | | If Using M205, denote Mass Flow Controller | | | M205 Dilution System Information | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tank ID | | | Dilution | Cylinder |
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Conc. Units | LOW | MID | HIGH | Cylinder ID | Concentration |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | 45 | 45 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B | 50 | 50 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |
| THC LIMITS | | 25 % to 35 % | | 45 % to 55 % | | 80 % to 90 % | | | | | | | |

| | | | | Initial Values | | Final Values | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
| O2 | Zero | | 0.01 | 0.07 | 0.30 | 0.09 | 0.40 | 0.10 | 20.03 | 0.08 | | | |
| | Mid | 10.01 | 10.07 | 10.05 | -0.10 | 10.08 | 0.05 | 0.15 | 20.03 | 10.07 | 20.14 | 20.11 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.12 | 0.30 | 0.10 | 0.20 | -0.10 | 19.79 | 0.11 | | | |
| | Mid | 10.15 | 10.04 | 10.01 | -0.15 | 10.03 | -0.05 | 0.10 | 19.79 | 10.02 | 0.73 | 0.63 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1-2, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 3 |
| **Unit** | Pushing Baghouse | **Start Time** | 19:49 |
| **Operation** | Normal | **End Time** | 20:49 |
| **Tester(s)** | BC, JW, TL, CS | | |

| Cal. | LOW | | MID | | HIGH | | | | If Using M205, denote Mass Flow Controller | | | M205 Dilution System Information | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tank ID | | | Dilution | Cylinder |
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Conc. Units | LOW | MID | HIGH | Cylinder ID | Concentration |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | 45 | 45 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210754 | XC034406B | 50 | 50 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |
| THC LIMITS | | 25 % to 35 % | | 45 % to 55 % | | 80 % to 90 % | | | | | | | |

| | Upscale: Enter "Low" "Mid" or "High" | | | Initial Values | | Final Values | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
| O2 | Zero | | 0.01 | 0.09 | 0.40 | 0.09 | 0.40 | 0.00 | 20.03 | 0.09 | | | |
| | Mid | 10.01 | 10.07 | 10.08 | 0.05 | 10.09 | 0.10 | 0.05 | 20.03 | 10.09 | 20.11 | 20.05 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.10 | 0.20 | 0.11 | 0.25 | 0.05 | 19.79 | 0.11 | | | |
| | Mid | 10.15 | 10.04 | 10.03 | -0.05 | 10.06 | 0.10 | 0.15 | 19.79 | 10.05 | 0.68 | 0.59 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.1 | 0.30 | | 20.03 | 20.2 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.0 | -0.56 | | 19.79 | 19.6 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 1-2, 2016 | |
| Project No.: | 16-167 | | 0 | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 1 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 2:13 PM | |
| Unit Operation: | Normal | | Test Finish Time: | 4:40 AM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |
| **Data Input** | | | **Calculations** | | |
| Control Box: | 1618 | | CO + N2 | 79.28 | % dv |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ | Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Meter Calibration Factor (Yd) | 1.003 | | Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Barometric Pressure (Pbar) | 29.33 | in. Hg | Water Collected ($W_f$ - $W_i$) | 27.2 | g |
| Stack Static Pressure (Pg) | 0.11 | in. $H_2O$ | Water Vapor in Silica Gel (Vwsg(std)) | 1.282 | scf |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches | Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.282 | scf |
| Stack Width (enter NA if circular) | 0.0 | inches | Volume Dry Gas Metered (Vm) | 46.103 | dacf |
| O2 | 20.09 | % dv | Vol. Dry Gas Metered Stand.(Vm(std)) | 44.901 | dscf |
| CO2 | 0.63 | % dv | Volume Dry Gas Metered ($Vm(m^3)$) | 1.305 | dacm |
| Product Rate (enter NA if not needed) | NA | ton/hr | Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.271 | dscm |
| Is the input ton/hr metric? (YES=1) | 0 | | Stack Absolute Pressure (Ps) | 29.34 | in. Hg |
| Pitot Tube Coefficient (Cp) | 0.84 | | Stack Absolute Temperature (Tsavg) | 591.5 | R |
| Sample Calculation Title | Flow, Moisture, CEMS | | H2O Vapor Pressure @ avg Stack Temp. | 4.76 | in. Hg |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu | H2O in the gas at saturation (Bws) | 0.1623 | vol. fraction |
| Standard Temperature | 68 | F | H2O in the gas from test data (Bws) | 0.0278 | vol. fraction |
| Standard Pressure | 760 | mm Hg | H2O in the gas used (lower of the 2 Bws) | 0.0278 | vol. fraction |
| Pitot Tube Constant (Kp) | 85.49 | | Is the Gas Stream Saturated With H2O? | NO | |
| **Calculations** | | | Dry Gas Molecular Weight (Md) | 28.90 | lb/lb-mole |
| Meter Temperature (Tm) | 73.4 | F | Wet Gas Molecular Weight (Ms) | 28.60 | lb/lb-mole |
| Stack Temperature (Tsavg) | 131.9 | F | Gas Velocity (Vs) | 51.89 | ft/s |
| Orifice Pressure Drop (dHavg) | 0.442 | in. $H_2O$ | Is the stack circular or rectangular? | CIRCULAR | |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8603 | in. $H_2O$^1/2 | Area Stack (As) | 28.274 | $ft^2$ |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu | Actual Gas Flowrate | 88,026 | acfm |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu | Standard Gas Flowrate | 77,002 | scfm |
| Heat Input Based on $F_d$ | NA | MMBtu/hr | Dry Standard Gas Flowrate | 74,863 | dscfm |
| K1method 4 | 0.04706 | scf/ml | Actual Gas Flowrate | 2,493 | acm/min |
| K2method 4 | 0.04715 | scf/g | Standard Gas Flowrate | 2,180 | scm/min |
| K1method 5 | 17.64 | R/in. Hg | Dry Standard Gas Flowrate | 2,120 | dscm/min |
| K4method 5 | 0.0945 | | | | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole | | | |
| Total Test Time | 14.45 | hours | **Carbon Dioxide (CO2)** | | |
| # of Pushes | 48 | pushes/test | MW | 44 | lb/lb-mole |
| Avg. # of pushes per hour | 3.32 | pushes/hour | Concentration | 6,267.5 | $ppm_{dv}$ |
| Minutes per Push | 2.50 | minutes/push | Emission | 201,836.0 | g/hr |
| | | | Emission | 445.0 | lb/hr |
| **Hydrogen Sulfide** | | | Emission | 0.22 | tons/hr |
| MW | 34.1 | lb/lb-mole | | | |
| Concentration | < 0.50 | $ppm_{wv}$ | | | |
| Concentration | < 0.51 | $ppm_{dv}$ | | | |
| Emission | < 0.0283 | lb/hr | | | |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.71 | 0.843 | 0.43 | 122 | 71 | 69 |
| A-1 | 0.72 | 0.849 | 0.44 | 148 | 72 | 70 |
| A-2 | 0.72 | 0.849 | 0.44 | 132 | 72 | 71 |
| A-2 | 0.75 | 0.866 | 0.45 | 152 | 73 | 72 |
| A-3 | 0.76 | 0.872 | 0.46 | 138 | 73 | 72 |
| A-3 | 0.74 | 0.860 | 0.44 | 158 | 74 | 73 |
| A-4 | 0.74 | 0.860 | 0.44 | 144 | 74 | 73 |
| A-4 | 0.78 | 0.883 | 0.47 | 132 | 75 | 74 |
| A-5 | 0.78 | 0.883 | 0.47 | 135 | 75 | 75 |
| A-5 | 0.82 | 0.906 | 0.49 | 145 | 77 | 76 |
| A-6 | 0.81 | 0.900 | 0.49 | 139 | 77 | 76 |
| A-6 | 0.77 | 0.877 | 0.46 | 147 | 77 | 76 |
| A-7 | 0.65 | 0.806 | 0.39 | 158 | 77 | 77 |
| A-7 | 0.65 | 0.806 | 0.39 | 139 | 77 | 77 |
| A-8 | 0.68 | 0.825 | 0.41 | 144 | 77 | 77 |
| A-8 | 0.69 | 0.831 | 0.41 | 138 | 78 | 77 |
| A-9 | 0.70 | 0.837 | 0.42 | 125 | 77 | 77 |
| A-9 | 0.75 | 0.866 | 0.45 | 137 | 77 | 77 |
| A-10 | 0.70 | 0.837 | 0.42 | 124 | 76 | 77 |
| A-10 | 0.68 | 0.825 | 0.41 | 135 | 76 | 77 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 76 | 76 |
| A-11 | 0.68 | 0.825 | 0.41 | 153 | 76 | 76 |
| A-12 | 0.70 | 0.837 | 0.42 | 138 | 76 | 76 |
| A-12 | 0.68 | 0.825 | 0.41 | 170 | 76 | 76 |
| B-1 | 0.91 | 0.954 | 0.43 | 129 | 74 | 76 |
| B-1 | 0.72 | 0.849 | 0.43 | 110 | 75 | 75 |
| B-2 | 0.75 | 0.866 | 0.45 | 117 | 74 | 75 |
| B-2 | 0.69 | 0.831 | 0.41 | 125 | 74 | 75 |
| B-3 | 0.72 | 0.849 | 0.43 | 122 | 74 | 75 |
| B-3 | 0.73 | 0.854 | 0.44 | 124 | 74 | 74 |
| B-4 | 0.71 | 0.843 | 0.43 | 119 | 74 | 74 |
| B-4 | 0.68 | 0.825 | 0.40 | 121 | 73 | 74 |
| B-5 | 0.80 | 0.894 | 0.48 | 108 | 73 | 73 |
| B-5 | 0.74 | 0.860 | 0.44 | 119 | 72 | 73 |
| B-6 | 0.74 | 0.860 | 0.44 | 138 | 72 | 73 |
| B-6 | 0.80 | 0.894 | 0.48 | 113 | 71 | 72 |
| B-7 | 0.74 | 0.860 | 0.44 | 145 | 71 | 72 |
| B-7 | 0.79 | 0.889 | 0.46 | 134 | 71 | 72 |
| B-8 | 0.82 | 0.906 | 0.50 | 123 | 70 | 70 |
| B-8 | 0.82 | 0.906 | 0.50 | 124 | 69 | 70 |
| B-9 | 0.78 | 0.883 | 0.47 | 131 | 69 | 70 |
| B-9 | 0.76 | 0.872 | 0.46 | 118 | 69 | 70 |
| B-10 | 0.74 | 0.860 | 0.44 | 127 | 69 | 70 |
| B-10 | 0.74 | 0.860 | 0.44 | 121 | 69 | 70 |
| B-11 | 0.77 | 0.877 | 0.46 | 138 | 69 | 70 |
| B-11 | 0.75 | 0.866 | 0.45 | 104 | 69 | 69 |
| B-12 | 0.77 | 0.877 | 0.46 | 126 | 69 | 69 |
| B-12 | 0.76 | 0.872 | 0.46 | 116 | 68 | 69 |
| **Average** | 0.7410 | 0.8603 | 0.44 | 131.9 | | 73.4 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 51.423 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 97.526 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 46.103 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 755.1 | 738.0 | 17.1 | | | 0.0 |
| 2 | 636.9 | 634.9 | 2.0 | | | 0.0 |
| 3 | 615.8 | 615.6 | 0.2 | | | 0.0 |
| 4 | 789.1 | 781.2 | 7.9 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2796.9 | 2769.7 | 27.2 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - Vi) |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 2, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 2 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 5:13 AM | |
| Unit Operation: | Normal | | Test Finish Time: | 7:10 PM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |
| **Data Input** | | | **Calculations** | | |
| Control Box: | 1618 | | CO + N2 | 79.26 | % dv |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ | Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Meter Calibration Factor (Yd) | 1.003 | | Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Barometric Pressure (Pbar) | 29.07 | in. Hg | Water Collected ($W_f$ - $W_i$) | 20.6 | g |
| Stack Static Pressure (Pg) | -1.20 | in. $H_2O$ | Water Vapor in Silica Gel (Vwsg(std)) | 0.971 | scf |
| Stack Diameter (Ds) (L if rectangular) | 72 | inches | Vol. Water Vapor in Gas Stand.(Vw(std)) | 0.971 | scf |
| Stack Width (enter NA if circular) | 0 | inches | Volume Dry Gas Metered (Vm) | 44.942 | dacf |
| O2 | 20.11 | % dv | Vol. Dry Gas Metered Stand.(Vm(std)) | 43.500 | dscf |
| CO2 | 0.63 | % dv | Volume Dry Gas Metered ($Vm(m^3)$) | 1.273 | dacm |
| Product Rate (enter NA if not needed) | NA | ton/hr | Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.232 | dscm |
| Is the input ton/hr metric? (YES=1) | 0 | | Stack Absolute Pressure (Ps) | 28.98 | in. Hg |
| Pitot Tube Coefficient (Cp) | 0.84 | | Stack Absolute Temperature (Tsavg) | 590.9 | R |
| Sample Calculation Title | Flow, Moisture, CEMS | | H2O Vapor Pressure @ avg Stack Temp. | 4.68 | in. Hg |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu | H2O in the gas at saturation (Bws) | 0.1616 | vol. fraction |
| Standard Temperature | 68 | F | H2O in the gas from test data (Bws) | 0.0218 | vol. fraction |
| Standard Pressure | 760 | mm Hg | H2O in the gas used (lower of the 2 Bws) | 0.0218 | vol. fraction |
| Pitot Tube Constant (Kp) | 85.49 | | Is the Gas Stream Saturated With H2O? | NO | |
| **Calculations** | | | Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Meter Temperature (Tm) | 72.0 | F | Wet Gas Molecular Weight (Ms) | 28.67 | lb/lb-mole |
| Stack Temperature (Tsavg) | 131.3 | F | Gas Velocity (Vs) | 51.00 | ft/s |
| Orifice Pressure Drop (dHavg) | 0.424 | in. $H_2O$ | Is the stack circular or rectangular? | CIRCULAR | |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8418 | in. $H_2O$^1/2 | Area Stack (As) | 28.274 | $ft^2$ |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu | Actual Gas Flowrate | 86,517 | acfm |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu | Standard Gas Flowrate | 74,839 | scfm |
| Heat Input Based on $F_d$ | NA | MMBtu/hr | Dry Standard Gas Flowrate | 73,204 | dscfm |
| K1method 4 | 0.04706 | scf/ml | Actual Gas Flowrate | 2,450 | acm/min |
| K2method 4 | 0.04715 | scf/g | Standard Gas Flowrate | 2,119 | scm/min |
| K1method 5 | 17.64 | R/in. Hg | Dry Standard Gas Flowrate | 2,073 | dscm/min |
| K4method 5 | 0.0945 | | | | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole | | | |
| Total Test Time | 13.95 | hours | **Carbon Dioxide (CO2)** | | |
| # of Pushes | 48 | pushes/test | MW | 44 | lb/lb-mole |
| Avg. # of pushes per hour | 3.44 | pushes/hour | Concentration | 6,307.5 | $ppm_{dv}$ |
| Minutes per Push | 2.50 | minutes/push | Emission | 205,740.9 | g/hr |
| | | | Emission | 453.6 | lb/hr |
| **Hydrogen Sulfide** | | | Emission | 0.23 | tons/hr |
| MW | 34.1 | lb/lb-mole | | | |
| Concentration | < 0.50 | $ppm_{wv}$ | | | |
| Concentration | < 0.51 | $ppm_{dv}$ | | | |
| Emission | < 0.0285 | lb/hr | | | |

**ArcelorMittal** **Run 2** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.62 | 0.787 | 0.37 | 113 | 68 | 69 |
| A-1 | 0.73 | 0.854 | 0.44 | 119 | 68 | 69 |
| A-2 | 0.75 | 0.866 | 0.45 | 122 | 68 | 68 |
| A-2 | 0.67 | 0.819 | 0.40 | 120 | 68 | 68 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 |
| A-4 | 0.72 | 0.849 | 0.43 | 109 | 67 | 68 |
| A-4 | 0.74 | 0.860 | 0.44 | 122 | 67 | 68 |
| A-5 | 0.73 | 0.854 | 0.44 | 116 | 67 | 68 |
| A-5 | 0.72 | 0.849 | 0.43 | 115 | 67 | 67 |
| A-6 | 0.72 | 0.849 | 0.43 | 124 | 67 | 67 |
| A-6 | 0.73 | 0.854 | 0.44 | 117 | 66 | 67 |
| A-7 | 0.79 | 0.889 | 0.47 | 113 | 66 | 67 |
| A-7 | 0.80 | 0.894 | 0.48 | 121 | 66 | 66 |
| A-8 | 0.72 | 0.849 | 0.43 | 114 | 66 | 66 |
| A-8 | 0.74 | 0.860 | 0.44 | 122 | 66 | 66 |
| A-9 | 0.71 | 0.843 | 0.43 | 117 | 66 | 66 |
| A-9 | 0.72 | 0.849 | 0.43 | 133 | 66 | 66 |
| A-10 | 0.69 | 0.831 | 0.41 | 121 | 66 | 66 |
| A-10 | 0.71 | 0.843 | 0.43 | 131 | 67 | 67 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 67 | 67 |
| A-11 | 0.69 | 0.831 | 0.41 | 143 | 68 | 67 |
| A-12 | 0.73 | 0.854 | 0.44 | 127 | 70 | 69 |
| A-12 | 0.72 | 0.849 | 0.43 | 136 | 70 | 69 |
| B-1 | 0.70 | 0.837 | 0.42 | 136 | 71 | 70 |
| B-1 | 0.66 | 0.812 | 0.40 | 151 | 71 | 71 |
| B-2 | 0.67 | 0.819 | 0.40 | 131 | 72 | 71 |
| B-2 | 0.65 | 0.806 | 0.39 | 155 | 73 | 71 |
| B-3 | 0.65 | 0.806 | 0.39 | 145 | 73 | 71 |
| B-3 | 0.71 | 0.843 | 0.45 | 164 | 74 | 73 |
| B-4 | 0.68 | 0.825 | 0.41 | 151 | 74 | 73 |
| B-4 | 0.67 | 0.819 | 0.40 | 147 | 75 | 74 |
| B-5 | 0.70 | 0.837 | 0.40 | 132 | 76 | 75 |
| B-5 | 0.70 | 0.837 | 0.40 | 136 | 76 | 75 |
| B-6 | 0.72 | 0.849 | 0.43 | 143 | 77 | 76 |
| B-6 | 0.75 | 0.866 | 0.45 | 144 | 77 | 76 |
| B-7 | 0.72 | 0.849 | 0.43 | 147 | 78 | 76 |
| B-7 | 0.76 | 0.872 | 0.46 | 129 | 79 | 78 |
| B-8 | 0.75 | 0.866 | 0.45 | 124 | 79 | 78 |
| B-8 | 0.75 | 0.866 | 0.45 | 135 | 80 | 79 |
| B-9 | 0.74 | 0.860 | 0.44 | 155 | 80 | 79 |
| B-9 | 0.73 | 0.854 | 0.44 | 142 | 80 | 80 |
| B-10 | 0.64 | 0.800 | 0.38 | 150 | 81 | 80 |
| B-10 | 0.67 | 0.819 | 0.40 | 135 | 81 | 80 |
| B-11 | 0.71 | 0.843 | 0.43 | 127 | 81 | 81 |
| B-11 | 0.70 | 0.837 | 0.40 | 138 | 81 | 81 |
| B-12 | 0.67 | 0.819 | 0.40 | 149 | 80 | 81 |
| B-12 | 0.67 | 0.819 | 0.40 | 123 | 80 | 80 |
| **Average** | 0.7092 | 0.8418 | 0.42 | 131.3 | | 72.0 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 97.700 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 142.642 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 44.942 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 711.1 | 706.8 | 4.3 | | | 0.0 |
| 2 | 711.8 | 706.8 | 5.0 | | | 0.0 |
| 3 | 605.1 | 603.1 | 2.0 | | | 0.0 |
| 4 | 757.8 | 748.5 | 9.3 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2785.8 | 2765.2 | 20.6 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - Vi) |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 2-3, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 3 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 7:49 PM | |
| Unit Operation: | Normal | | Test Finish Time: | 10:56 AM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |
| **Data Input** | | | **Calculations** | | |
| Control Box: | 1618 | | CO + N2 | 79.37 | % dv |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ | Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Meter Calibration Factor (Yd) | 1.003 | | Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Barometric Pressure (Pbar) | 29.26 | in. Hg | Water Collected ($W_f$ - $W_i$) | 27.9 | g |
| Stack Static Pressure (Pg) | 0.12 | in. $H_2O$ | Water Vapor in Silica Gel (Vwsg(std)) | 1.315 | scf |
| Stack Diameter (Ds) (L if rectangular) | 72 | inches | Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.315 | scf |
| Stack Width (enter NA if circular) | 0 | inches | Volume Dry Gas Metered (Vm) | 49.470 | dacf |
| O2 | 20.05 | % dv | Vol. Dry Gas Metered Stand.(Vm(std)) | 48.124 | dscf |
| CO2 | 0.59 | % dv | Volume Dry Gas Metered ($Vm(m^3)$) | 1.401 | dacm |
| Product Rate (enter NA if not needed) | NA | ton/hr | Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.363 | dscm |
| Is the input ton/hr metric? (YES=1) | 0 | | Stack Absolute Pressure (Ps) | 29.27 | in. Hg |
| Pitot Tube Coefficient (Cp) | 0.84 | | Stack Absolute Temperature (Tsavg) | 587.9 | R |
| Sample Calculation Title | Flow, Moisture, CEMS | | H2O Vapor Pressure @ avg Stack Temp. | 4.32 | in. Hg |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu | H2O in the gas at saturation (Bws) | 0.1477 | vol. fraction |
| Standard Temperature | 68 | F | H2O in the gas from test data (Bws) | 0.0266 | vol. fraction |
| Standard Pressure | 760 | mm Hg | H2O in the gas used (lower of the 2 Bws) | 0.0266 | vol. fraction |
| Pitot Tube Constant (Kp) | 85.49 | | Is the Gas Stream Saturated With H2O? | NO | |
| **Calculations** | | | Dry Gas Molecular Weight (Md) | 28.90 | lb/lb-mole |
| Meter Temperature (Tm) | 72.8 | F | Wet Gas Molecular Weight (Ms) | 28.61 | lb/lb-mole |
| Stack Temperature (Tsavg) | 128.3 | F | Gas Velocity (Vs) | 52.32 | ft/s |
| Orifice Pressure Drop (dHavg) | 0.455 | in. $H_2O$ | Is the stack circular or rectangular? | CIRCULAR | |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8691 | in. $H_2O$^1/2 | Area Stack (As) | 28.274 | $ft^2$ |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu | Actual Gas Flowrate | 88,752 | acfm |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu | Standard Gas Flowrate | 77,928 | scfm |
| Heat Input Based on $F_d$ | NA | MMBtu/hr | Dry Standard Gas Flowrate | 75,854 | dscfm |
| K1method 4 | 0.04706 | scf/ml | Actual Gas Flowrate | 2,513 | acm/min |
| K2method 4 | 0.04715 | scf/g | Standard Gas Flowrate | 2,207 | scm/min |
| K1method 5 | 17.64 | R/in. Hg | Dry Standard Gas Flowrate | 2,148 | dscm/min |
| K4method 5 | 0.0945 | | | | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole | | | |
| Total Test Time | 15.12 | hours | **Carbon Dioxide (CO2)** | | |
| # of Pushes | 48 | pushes/test | MW | 44 | lb/lb-mole |
| Avg. # of pushes per hour | 3.18 | pushes/hour | Concentration | 5,882.5 | $ppm_{dv}$ |
| Minutes per Push | 2.50 | minutes/push | Emission | 183,479.4 | g/hr |
| | | | Emission | 404.5 | lb/hr |
| **Hydrogen Sulfide** | | | Emission | 0.20 | tons/hr |
| MW | 34.1 | lb/lb-mole | | | |
| Concentration | < 0.50 | $ppm_{wv}$ | | | |
| Concentration | < 0.51 | $ppm_{dv}$ | | | |
| Emission | < 0.0274 | lb/hr | | | |

**ArcelorMittal** **Run 3** **F or C?**
**Pushing Baghouse** **F=1,C=0 1**

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In (F or C) | Meter Temp Out (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.76 | 0.872 | 0.46 | 129 | 78 | 79 |
| A-1 | 0.84 | 0.917 | 0.50 | 113 | 77 | 78 |
| A-2 | 0.78 | 0.883 | 0.47 | 123 | 76 | 77 |
| A-2 | 0.73 | 0.854 | 0.44 | 126 | 76 | 77 |
| A-3 | 0.75 | 0.866 | 0.45 | 138 | 76 | 77 |
| A-3 | 0.76 | 0.872 | 0.46 | 132 | 76 | 77 |
| A-4 | 0.80 | 0.894 | 0.48 | 152 | 75 | 76 |
| A-4 | 0.76 | 0.872 | 0.46 | 138 | 75 | 76 |
| A-5 | 0.75 | 0.866 | 0.45 | 148 | 75 | 76 |
| A-5 | 0.77 | 0.877 | 0.46 | 137 | 75 | 76 |
| A-6 | 0.72 | 0.849 | 0.43 | 128 | 75 | 76 |
| A-6 | 0.72 | 0.849 | 0.43 | 133 | 75 | 76 |
| A-7 | 0.75 | 0.866 | 0.45 | 126 | 75 | 76 |
| A-7 | 0.72 | 0.849 | 0.43 | 133 | 75 | 75 |
| A-8 | 0.77 | 0.877 | 0.46 | 127 | 74 | 74 |
| A-8 | 0.75 | 0.866 | 0.45 | 117 | 73 | 74 |
| A-9 | 0.70 | 0.837 | 0.43 | 119 | 72 | 73 |
| A-9 | 0.68 | 0.825 | 0.40 | 128 | 72 | 72 |
| A-10 | 0.65 | 0.806 | 0.39 | 119 | 71 | 72 |
| A-10 | 0.66 | 0.812 | 0.40 | 143 | 71 | 72 |
| A-11 | 0.63 | 0.794 | 0.38 | 127 | 72 | 72 |
| A-11 | 0.67 | 0.819 | 0.40 | 143 | 71 | 72 |
| A-12 | 0.65 | 0.806 | 0.39 | 123 | 71 | 72 |
| A-12 | 0.65 | 0.806 | 0.39 | 131 | 71 | 71 |
| B-1 | 0.78 | 0.883 | 0.47 | 117 | 70 | 71 |
| B-1 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 |
| B-2 | 0.82 | 0.906 | 0.50 | 112 | 70 | 70 |
| B-2 | 0.82 | 0.906 | 0.50 | 130 | 70 | 71 |
| B-3 | 0.77 | 0.877 | 0.46 | 123 | 70 | 70 |
| B-3 | 0.84 | 0.917 | 0.50 | 125 | 70 | 70 |
| B-4 | 0.78 | 0.883 | 0.47 | 130 | 71 | 70 |
| B-4 | 0.82 | 0.906 | 0.50 | 140 | 71 | 71 |
| B-5 | 0.80 | 0.894 | 0.48 | 134 | 71 | 71 |
| B-5 | 0.75 | 0.866 | 0.45 | 132 | 71 | 71 |
| B-6 | 0.84 | 0.917 | 0.50 | 114 | 73 | 73 |
| B-6 | 0.82 | 0.906 | 0.50 | 119 | 73 | 73 |
| B-7 | 0.85 | 0.922 | 0.51 | 124 | 74 | 73 |
| B-7 | 0.82 | 0.906 | 0.49 | 118 | 73 | 73 |
| B-8 | 0.82 | 0.906 | 0.49 | 117 | 73 | 73 |
| B-8 | 0.75 | 0.866 | 0.45 | 126 | 72 | 72 |
| B-9 | 0.78 | 0.883 | 0.47 | 122 | 72 | 72 |
| B-9 | 0.76 | 0.872 | 0.46 | 138 | 71 | 72 |
| B-10 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 |
| B-10 | 0.78 | 0.883 | 0.47 | 119 | 70 | 71 |
| B-11 | 0.72 | 0.849 | 0.43 | 121 | 70 | 70 |
| B-11 | 0.71 | 0.843 | 0.43 | 140 | 70 | 70 |
| B-12 | 0.74 | 0.860 | 0.44 | 136 | 70 | 70 |
| B-12 | 0.72 | 0.849 | 0.43 | 120 | 70 | 70 |
| Average | 0.76 | 0.869 | 0.45 | 128.3 | | 72.8 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 142.800 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 192.270 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 49.470 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 726.3 | 708.7 | 17.6 | | | 0.0 |
| 2 | 709.6 | 707.7 | 1.9 | | | 0.0 |
| 3 | 605.6 | 605.4 | 0.2 | | | 0.0 |
| 4 | 759.4 | 751.2 | 8.2 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| Total | 2800.9 | 2773.0 | 27.9 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - Vi) |

# Method 320

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) | HCN (PPMwv) | HF (PPMwv) |
|---|---|---|---|---|---|---|
| **RUN 1** | | | | | | |
| 1 | 2016/11/01 | 14:38:40 | 19.99 | 0.84 | 0.90 | 0.06 |
| 2 | 2016/11/01 | 14:39:40 | 20.33 | 0.56 | 0.98 | 0.06 |
| 3 | 2016/11/01 | 14:50:40 | 19.87 | 0.91 | 1.09 | 0.06 |
| 4 | 2016/11/01 | 14:51:40 | 19.77 | 0.98 | 0.71 | 0.06 |
| 5 | 2016/11/01 | 15:02:40 | 19.98 | 0.85 | 1.02 | 0.06 |
| 6 | 2016/11/01 | 15:03:40 | 20.13 | 0.74 | 1.11 | 0.06 |
| 7 | 2016/11/01 | 15:15:40 | 19.88 | 0.84 | 1.03 | 0.06 |
| 8 | 2016/11/01 | 15:16:40 | 19.93 | 0.81 | 1.04 | 0.06 |
| 9 | 2016/11/01 | 15:33:40 | 20.32 | 0.49 | 1.36 | 0.06 |
| 10 | 2016/11/01 | 15:34:40 | 19.89 | 0.93 | 0.90 | 0.06 |
| 11 | 2016/11/01 | 15:47:40 | 19.86 | 0.92 | 1.26 | 0.06 |
| 12 | 2016/11/01 | 15:48:40 | 20.31 | 0.57 | 0.90 | 0.06 |
| 13 | 2016/11/01 | 15:59:40 | 20.10 | 0.70 | 1.07 | 0.06 |
| 14 | 2016/11/01 | 16:00:40 | 19.80 | 0.99 | 1.16 | 0.06 |
| 15 | 2016/11/01 | 16:44:40 | 20.24 | 0.50 | 0.96 | 0.06 |
| 16 | 2016/11/01 | 16:45:40 | 19.83 | 0.87 | 0.94 | 0.06 |
| 17 | 2016/11/01 | 16:56:40 | 20.22 | 0.55 | 1.09 | 0.06 |
| 18 | 2016/11/01 | 16:57:40 | 19.81 | 0.91 | 1.01 | 0.06 |
| 19 | 2016/11/01 | 17:11:40 | 19.92 | 0.82 | 0.70 | 0.06 |
| 20 | 2016/11/01 | 17:12:40 | 20.33 | 0.54 | 0.89 | 0.06 |
| 21 | 2016/11/01 | 17:35:40 | 19.89 | 0.84 | 1.08 | 0.06 |
| 22 | 2016/11/01 | 17:36:40 | 19.76 | 0.91 | 0.85 | 0.06 |
| 23 | 2016/11/01 | 17:48:40 | 19.85 | 0.90 | 1.04 | 0.06 |
| 24 | 2016/11/01 | 17:49:40 | 20.36 | 0.50 | 1.36 | 0.06 |
| 25 | 2016/11/01 | 18:00:40 | 20.04 | 0.69 | 1.01 | 0.06 |
| 26 | 2016/11/01 | 18:01:40 | 19.79 | 0.93 | 1.09 | 0.06 |
| 27 | 2016/11/01 | 18:13:40 | 20.34 | 0.47 | 1.79 | 0.06 |
| 28 | 2016/11/01 | 18:14:40 | 19.91 | 0.88 | 0.97 | 0.06 |
| 29 | 2016/11/01 | 19:10:40 | 19.89 | 0.86 | 1.65 | 0.06 |
| 30 | 2016/11/01 | 19:11:40 | 20.43 | 0.45 | 0.92 | 0.06 |
| 31 | 2016/11/01 | 19:21:40 | 19.97 | 0.78 | 1.05 | 0.06 |
| 32 | 2016/11/01 | 19:22:40 | 19.77 | 0.97 | 0.97 | 0.06 |
| 33 | 2016/11/01 | 19:35:40 | 20.11 | 0.70 | 2.29 | 0.06 |
| 34 | 2016/11/01 | 19:36:40 | 19.93 | 0.88 | 0.84 | 0.06 |
| 35 | 2016/11/01 | 19:49:40 | 20.11 | 0.66 | 1.61 | 0.06 |
| 36 | 2016/11/01 | 19:50:40 | 19.84 | 0.91 | 0.95 | 0.06 |
| 37 | 2016/11/01 | 20:02:40 | 20.06 | 0.77 | 1.60 | 0.06 |
| 38 | 2016/11/01 | 20:03:40 | 20.35 | 0.53 | 0.88 | 0.06 |
| 39 | 2016/11/01 | 20:14:40 | 19.92 | 0.84 | 0.83 | 0.06 |
| 40 | 2016/11/01 | 20:15:40 | 19.77 | 0.96 | 1.07 | 0.06 |
| 41 | 2016/11/01 | 20:27:40 | 20.00 | 0.82 | 1.26 | 0.06 |
| 42 | 2016/11/01 | 20:28:40 | 20.17 | 0.70 | 1.17 | 0.06 |
| 43 | 2016/11/01 | 20:40:40 | 19.83 | 0.83 | 1.40 | 0.06 |
| 44 | 2016/11/01 | 20:41:40 | 19.75 | 0.88 | 0.83 | 0.06 |
| 45 | 2016/11/01 | 21:01:40 | 20.16 | 0.67 | 1.61 | 0.06 |
| 46 | 2016/11/01 | 21:02:40 | 19.90 | 0.91 | 1.07 | 0.06 |
| 47 | 2016/11/01 | 21:39:40 | 20.02 | 0.81 | 1.03 | 0.06 |
| 48 | 2016/11/01 | 21:40:40 | 20.27 | 0.61 | 1.54 | 0.06 |
| 49 | 2016/11/01 | 21:52:40 | 20.05 | 0.84 | 1.01 | 0.06 |
| 50 | 2016/11/01 | 21:53:40 | 20.33 | 0.60 | 1.02 | 0.06 |
| 51 | 2016/11/01 | 22:03:40 | 19.96 | 0.85 | 1.05 | 0.06 |
| 52 | 2016/11/01 | 22:04:40 | 20.44 | 0.46 | 1.03 | 0.06 |
| 53 | 2016/11/01 | 22:13:40 | 20.10 | 0.72 | 1.01 | 0.06 |
| 54 | 2016/11/01 | 22:14:40 | 20.08 | 0.76 | 1.10 | 0.06 |
| 55 | 2016/11/01 | 22:25:40 | 20.40 | 0.44 | 1.29 | 0.06 |
| 56 | 2016/11/01 | 22:26:40 | 20.00 | 0.82 | 0.89 | 0.06 |
| 57 | 2016/11/01 | 22:38:40 | 20.07 | 0.75 | 1.56 | 0.06 |
| 58 | 2016/11/01 | 22:39:40 | 19.88 | 0.90 | 1.46 | 0.06 |
| 59 | 2016/11/01 | 22:50:40 | 20.04 | 0.87 | 0.94 | 0.06 |
| 60 | 2016/11/01 | 22:51:40 | 20.34 | 0.60 | 0.84 | 0.06 |
| **RUN 1 AVERAGES** | | | **20.0** | **0.8** | **1.12** | **0.06** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) | HCN (PPMwv) | HF (PPMwv) |
|---|---|---|---|---|---|---|
| **RUN 2** | | | | | | |
| 1 | 2016/11/02 | 08:05:40 | 20.17 | 0.76 | 1.12 | 0.06 |
| 2 | 2016/11/02 | 08:06:40 | 19.96 | 0.93 | 1.00 | 0.06 |
| 3 | 2016/11/02 | 08:21:40 | 20.17 | 0.79 | 1.27 | 0.05 |
| 4 | 2016/11/02 | 08:22:40 | 20.48 | 0.51 | 0.71 | 0.05 |
| 5 | 2016/11/02 | 09:02:50 | 20.03 | 0.68 | 1.49 | 0.05 |
| 6 | 2016/11/02 | 09:03:50 | 20.04 | 0.77 | 0.94 | 0.06 |
| 7 | 2016/11/02 | 09:20:50 | 19.76 | 1.12 | 0.85 | 0.06 |
| 8 | 2016/11/02 | 09:21:50 | 20.61 | 0.39 | 1.44 | 0.05 |
| 9 | 2016/11/02 | 09:33:50 | 20.01 | 0.87 | 0.91 | 0.06 |
| 10 | 2016/11/02 | 09:34:50 | 20.04 | 0.82 | 0.93 | 0.05 |
| 11 | 2016/11/02 | 09:49:50 | 19.94 | 0.89 | 0.97 | 0.05 |
| 12 | 2016/11/02 | 09:50:50 | 20.63 | 0.37 | 0.92 | 0.06 |
| 13 | 2016/11/02 | 10:00:50 | 20.34 | 0.43 | 0.88 | 0.06 |
| 14 | 2016/11/02 | 10:01:50 | 20.05 | 0.74 | 1.06 | 0.05 |
| 15 | 2016/11/02 | 10:15:50 | 20.27 | 0.70 | 1.16 | 0.06 |
| 16 | 2016/11/02 | 10:16:50 | 20.74 | 0.28 | 0.81 | 0.06 |
| 17 | 2016/11/02 | 10:26:50 | 19.79 | 1.06 | 1.52 | 0.06 |
| 18 | 2016/11/02 | 10:27:50 | 19.96 | 0.89 | 0.71 | 0.05 |
| 19 | 2016/11/02 | 10:39:50 | 19.91 | 1.01 | 1.08 | 0.06 |
| 20 | 2016/11/02 | 10:40:50 | 20.63 | 0.37 | 1.33 | 0.05 |
| 21 | 2016/11/02 | 10:51:50 | 19.95 | 0.87 | 1.33 | 0.06 |
| 22 | 2016/11/02 | 10:52:50 | 19.96 | 0.85 | 1.33 | 0.05 |
| 23 | 2016/11/02 | 11:49:50 | 20.41 | 0.48 | 0.89 | 0.06 |
| 24 | 2016/11/02 | 11:50:50 | 20.11 | 0.77 | 0.79 | 0.05 |
| 25 | 2016/11/02 | 12:02:50 | 20.24 | 0.62 | 1.36 | 0.06 |
| 26 | 2016/11/02 | 12:03:50 | 20.08 | 0.81 | 1.15 | 0.06 |
| 27 | 2016/11/02 | 12:16:50 | 20.05 | 0.85 | 1.21 | 0.06 |
| 28 | 2016/11/02 | 12:17:50 | 20.64 | 0.36 | 0.87 | 0.06 |
| 29 | 2016/11/02 | 12:31:50 | 20.08 | 0.86 | 1.23 | 0.06 |
| 30 | 2016/11/02 | 12:32:50 | 20.04 | 0.86 | 0.97 | 0.06 |
| 31 | 2016/11/02 | 13:37:50 | 19.81 | 1.10 | 1.49 | 0.06 |
| 32 | 2016/11/02 | 13:38:50 | 20.13 | 0.82 | 0.94 | 0.06 |
| 33 | 2016/11/02 | 13:54:50 | 19.08 | 1.53 | 1.15 | 0.06 |
| 34 | 2016/11/02 | 13:55:50 | 20.17 | 0.68 | 0.74 | 0.06 |
| 35 | 2016/11/02 | 14:09:50 | 19.88 | 0.96 | 1.28 | 0.06 |
| 36 | 2016/11/02 | 14:10:50 | 20.02 | 0.86 | 1.16 | 0.06 |
| 37 | 2016/11/02 | 14:23:50 | 19.93 | 0.94 | 0.94 | 0.06 |
| 38 | 2016/11/02 | 14:24:50 | 20.56 | 0.39 | 1.31 | 0.06 |
| 39 | 2016/11/02 | 14:35:50 | 19.83 | 1.02 | 2.11 | 0.06 |
| 40 | 2016/11/02 | 14:36:50 | 20.29 | 0.65 | 0.92 | 0.06 |
| 41 | 2016/11/02 | 14:47:50 | 19.85 | 0.99 | 0.58 | 0.07 |
| 42 | 2016/11/02 | 14:48:50 | 20.58 | 0.35 | 0.24 | 0.07 |
| 43 | 2016/11/02 | 14:57:50 | 19.81 | 0.99 | 0.87 | 0.08 |
| 44 | 2016/11/02 | 14:58:50 | 20.25 | 0.65 | 0.92 | 0.07 |
| 45 | 2016/11/02 | 15:36:50 | 19.89 | 1.01 | 0.77 | 0.08 |
| 46 | 2016/11/02 | 15:37:50 | 20.46 | 0.50 | 1.25 | 0.08 |
| 47 | 2016/11/02 | 15:49:50 | 19.86 | 0.98 | 1.28 | 0.08 |
| 48 | 2016/11/02 | 15:50:50 | 20.25 | 0.68 | 1.06 | 0.08 |
| 49 | 2016/11/02 | 16:11:50 | 20.63 | 0.29 | 0.77 | 0.08 |
| 50 | 2016/11/02 | 16:12:50 | 20.24 | 0.71 | 0.65 | 0.07 |
| 51 | 2016/11/02 | 16:27:50 | 20.28 | 0.49 | 0.94 | 0.09 |
| 52 | 2016/11/02 | 16:28:50 | 19.96 | 0.78 | 0.99 | 0.07 |
| 53 | 2016/11/02 | 16:44:50 | 19.72 | 0.99 | 0.85 | 0.08 |
| 54 | 2016/11/02 | 16:45:50 | 20.43 | 0.49 | 1.12 | 0.07 |
| 55 | 2016/11/02 | 17:04:50 | 19.93 | 0.82 | 1.41 | 0.08 |
| 56 | 2016/11/02 | 17:05:50 | 20.47 | 0.43 | 1.02 | 0.06 |
| 57 | 2016/11/02 | 17:24:50 | 19.92 | 0.88 | 1.18 | 0.08 |
| 58 | 2016/11/02 | 17:25:50 | 20.60 | 0.32 | 0.95 | 0.07 |
| 59 | 2016/11/02 | 18:33:50 | 19.28 | 1.02 | 1.61 | 0.08 |
| 60 | 2016/11/02 | 18:34:50 | 19.55 | 0.96 | 0.83 | 0.08 |
| **RUN 2 AVERAGES** | | | **20.11** | **0.75** | **1.06** | **0.06** |

| Montrose 1 Minute Average Data Sheet | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Baghouse Exhaust |

| MINUTE | DATE | TIME | O2 (DV %) | CO2 (DV %) | HCN (PPMwv) | HF (PPMwv) |
|---|---|---|---|---|---|---|
| **RUN 3** | | | | | | |
| 1 | 2016/11/02 | 19:49:50 | 19.99 | 0.79 | 1.29 | 0.07 |
| 2 | 2016/11/02 | 19:50:50 | 20.15 | 0.70 | 0.92 | 0.08 |
| 3 | 2016/11/02 | 20:37:50 | 19.93 | 0.91 | 0.73 | 0.06 |
| 4 | 2016/11/02 | 20:38:50 | 20.58 | 0.36 | 0.96 | 0.07 |
| 5 | 2016/11/02 | 20:49:50 | 20.11 | 0.75 | 0.77 | 0.07 |
| 6 | 2016/11/02 | 20:50:50 | 20.63 | 0.32 | 0.86 | 0.08 |
| 7 | 2016/11/02 | 20:59:50 | 20.31 | 0.53 | 1.13 | 0.07 |
| 8 | 2016/11/02 | 21:00:50 | 20.46 | 0.49 | 0.95 | 0.08 |
| 9 | 2016/11/02 | 21:10:50 | 19.79 | 0.87 | 0.24 | 0.08 |
| 10 | 2016/11/02 | 21:11:50 | 19.98 | 0.81 | 0.65 | 0.07 |
| 11 | 2016/11/02 | 21:21:50 | 20.61 | 0.28 | 0.97 | 0.07 |
| 12 | 2016/11/02 | 21:22:50 | 20.12 | 0.69 | 1.51 | 0.07 |
| 13 | 2016/11/02 | 21:32:50 | 19.04 | 1.50 | 0.80 | 0.07 |
| 14 | 2016/11/02 | 21:33:50 | 19.76 | 0.90 | 0.78 | 0.08 |
| 15 | 2016/11/02 | 21:43:50 | 19.78 | 0.99 | 1.24 | 0.06 |
| 16 | 2016/11/02 | 21:44:50 | 20.55 | 0.37 | 1.76 | 0.07 |
| 17 | 2016/11/02 | 21:53:50 | 19.96 | 0.74 | 0.85 | 0.07 |
| 18 | 2016/11/02 | 21:54:50 | 20.45 | 0.44 | 1.02 | 0.09 |
| 19 | 2016/11/02 | 22:04:50 | 19.87 | 0.96 | 0.96 | 0.07 |
| 20 | 2016/11/02 | 22:05:50 | 20.56 | 0.37 | 0.97 | 0.07 |
| 21 | 2016/11/02 | 22:06:50 | 20.80 | 0.16 | 1.28 | 0.06 |
| 22 | 2016/11/02 | 22:16:50 | 20.28 | 0.60 | 1.31 | 0.08 |
| 23 | 2016/11/02 | 22:17:50 | 20.71 | 0.24 | 0.89 | 0.07 |
| 24 | 2016/11/02 | 22:25:50 | 19.74 | 1.00 | 0.63 | 0.08 |
| 25 | 2016/11/02 | 22:26:50 | 20.44 | 0.48 | 0.87 | 0.08 |
| 26 | 2016/11/02 | 22:35:50 | 19.91 | 0.86 | 0.61 | 0.07 |
| 27 | 2016/11/02 | 22:36:50 | 20.47 | 0.44 | 0.45 | 0.06 |
| 28 | 2016/11/02 | 22:44:50 | 19.92 | 0.71 | 0.43 | 0.08 |
| 29 | 2016/11/02 | 22:45:50 | 19.99 | 0.76 | 1.03 | 0.08 |
| 30 | 2016/11/02 | 22:46:50 | 20.66 | 0.25 | 1.11 | 0.08 |
| 31 | 2016/11/02 | 23:32:50 | 20.52 | 0.34 | 0.89 | 0.07 |
| 32 | 2016/11/02 | 23:33:50 | 20.03 | 0.73 | 0.98 | 0.08 |
| 33 | 2016/11/02 | 23:48:50 | 20.04 | 0.80 | 1.07 | 0.07 |
| 34 | 2016/11/02 | 23:49:50 | 20.61 | 0.31 | 0.81 | 0.08 |
| 35 | 2016/11/03 | 00:15:50 | 19.86 | 0.97 | 0.87 | 0.06 |
| 36 | 2016/11/03 | 00:16:50 | 20.53 | 0.38 | 1.39 | 0.07 |
| 37 | 2016/11/03 | 01:06:50 | 19.78 | 0.76 | 1.03 | 0.07 |
| 38 | 2016/11/03 | 01:07:50 | 19.89 | 0.78 | 1.29 | 0.08 |
| 39 | 2016/11/03 | 01:18:50 | 19.82 | 0.97 | 1.27 | 0.07 |
| 40 | 2016/11/03 | 01:19:50 | 20.47 | 0.46 | 1.06 | 0.08 |
| 41 | 2016/11/03 | 01:31:50 | 19.83 | 0.78 | 0.67 | 0.07 |
| 42 | 2016/11/03 | 01:32:50 | 20.29 | 0.54 | 1.13 | 0.07 |
| 43 | 2016/11/03 | 01:42:50 | 20.34 | 0.46 | 1.00 | 0.07 |
| 44 | 2016/11/03 | 01:43:50 | 20.49 | 0.43 | 0.50 | 0.08 |
| 45 | 2016/11/03 | 01:57:50 | 19.22 | 1.22 | 1.38 | 0.08 |
| 46 | 2016/11/03 | 01:58:50 | 19.77 | 0.84 | 1.01 | 0.07 |
| 47 | 2016/11/03 | 02:15:50 | 19.78 | 1.02 | 0.69 | 0.06 |
| 48 | 2016/11/03 | 02:16:50 | 20.48 | 0.43 | 0.94 | 0.08 |
| 49 | 2016/11/03 | 02:33:50 | 19.71 | 0.96 | 1.49 | 0.07 |
| 50 | 2016/11/03 | 02:34:50 | 19.92 | 0.81 | 1.37 | 0.06 |
| 51 | 2016/11/03 | 02:51:50 | 19.92 | 0.88 | 1.15 | 0.07 |
| 52 | 2016/11/03 | 02:52:50 | 20.53 | 0.37 | 1.02 | 0.07 |
| 53 | 2016/11/03 | 03:05:50 | 19.81 | 0.87 | 0.86 | 0.08 |
| 54 | 2016/11/03 | 03:06:50 | 20.05 | 0.68 | 1.24 | 0.08 |
| 55 | 2016/11/03 | 03:49:50 | 19.97 | 0.68 | 1.05 | 0.07 |
| 56 | 2016/11/03 | 03:50:50 | 20.04 | 0.74 | 1.26 | 0.08 |
| 57 | 2016/11/03 | 04:01:50 | 20.03 | 0.73 | 0.74 | 0.07 |
| 58 | 2016/11/03 | 04:02:50 | 20.01 | 0.76 | 0.51 | 0.07 |
| 59 | 2016/11/03 | 04:13:50 | 19.80 | 0.91 | 1.03 | 0.06 |
| 60 | 2016/11/03 | 04:14:50 | 20.48 | 0.37 | 0.94 | 0.07 |
| **RUN 3 AVERAGES** | | | **20.13** | **0.67** | **0.98** | **0.07** |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 1 |
| **Unit** | Pushing Baghouse | **Start Time** | 14:38 |
| **Operation** | Normal | **End Time** | 22:51 |
| **Tester(s)** | BC, JW, TM, CB | | |

| Cal. | LOW | | MID | | HIGH | | | | If Using M205, denote Mass Flow Controller | | | M205 Dilution System Information | | 200' HSL to Trailer | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tank ID | | | Dilution | Cylinder | Response Time (sec) | |
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Conc. Units | LOW | MID | HIGH | Cylinder ID | Concentration | Up | Down |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | NA | NA | 45 | 45 |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210574 | XC034406B | NA | NA | 50 | 50 |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | | | |

| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | Initial Values: System Cal. Response | Initial Values: System Cal. Bias (% of Span) | Final Values: System Cal. Response | Final Values: System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | Zero | | 0.01 | 0.11 | 0.50 | 0.07 | 0.30 | -0.20 | 20.03 | 0.09 | | | |
| | Mid | 10.01 | 10.07 | 10.04 | -0.15 | 10.05 | -0.10 | 0.05 | 20.03 | 10.045 | 20.04 | 20.06 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.15 | 0.45 | 0.12 | 0.30 | -0.15 | 19.79 | 0.135 | | | |
| | Mid | 10.15 | 10.04 | 10.01 | -0.15 | 10.01 | -0.15 | 0.00 | 19.79 | 10.01 | 0.76 | 0.64 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 2 |
| **Unit** | Pushing Baghouse | **Start Time** | 8:05 |
| **Operation** | Normal | **End Time** | 18:34 |
| **Tester(s)** | BC, JW, TM, CB | | |

| Cal. | LOW | | MID | | HIGH | | | | If Using M205, denote Mass Flow Controller | | | M205 Dilution System Information | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tank ID | | | | |
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Conc. Units | LOW | MID | HIGH | Dilution Cylinder ID | Cylinder Concentration |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | NA | NA |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210574 | XC034406B | NA | NA |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |

| | | | | Initial Values | | Final Values | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
| O2 | Zero | | 0.01 | 0.07 | 0.30 | 0.09 | 0.40 | 0.10 | 20.03 | 0.08 | | | |
| | Mid | 10.01 | 10.07 | 10.05 | -0.10 | 10.08 | 0.05 | 0.15 | 20.03 | 10.07 | 20.11 | 20.08 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.12 | 0.30 | 0.10 | 0.20 | -0.10 | 19.79 | 0.11 | | | |
| | Mid | 10.15 | 10.04 | 10.01 | -0.15 | 10.03 | -0.05 | 0.10 | 19.79 | 10.02 | 0.75 | 0.66 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.18 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.62 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

**Montrose CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 7E**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Date** | Nov. 1, 2016 |
| **Project No** | 16-167 | **Location** | Baghouse Exhaust |
| **Plant** | Monessen, PA | **Run** | Run 3 |
| **Unit** | Pushing Baghouse | **Start Time** | 19:49 |
| **Operation** | Normal | **End Time** | 4:15 |
| **Tester(s)** | BC, JW, TM, CB | | |

| Cal. | LOW | | MID | | HIGH | | | | If Using M205, denote Mass Flow Controller | | | M205 Dilution System Information | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Tank ID | | | | |
| Gas | Conc. | (% of Span) | Conc. | (% of Span) | Conc. | (% of Span) | Span | Conc. Units | LOW | MID | HIGH | Dilution Cylinder ID | Cylinder Concentration |
| O2 | N/A | N/A | 10.01 | 50.0 | 20.03 | 100.0 | 20.03 | d. vol. % | N/A | CC210754 | XC034406B | NA | NA |
| CO2 | N/A | N/A | 10.15 | 51.3 | 19.79 | 100.0 | 19.79 | d. vol. % | N/A | CC210574 | XC034406B | NA | NA |
| LIMITS | | | | 40 % to 60 % | | 100% | | | | | | | |

| | | | | Initial Values | | Final Values | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas | Upscale: Enter "Low" "Mid" or "High" below "Zero" | Actual Upscale Conc. | Analyzer Cal. Response | System Cal. Response | System Cal. Bias (% of Span) | System Cal. Response | System Cal. Bias (% of Span) | Drift (% of Span) | Span | Average of Initial and Final System Responses | Average Indicated Gas Conc. | Corrected Gas Conc. | Conc. Units |
| O2 | Zero | | 0.01 | 0.09 | 0.40 | 0.09 | 0.40 | 0.00 | 20.03 | 0.09 | | | |
| | Mid | 10.01 | 10.07 | 10.08 | 0.05 | 10.09 | 0.10 | 0.05 | 20.03 | 10.09 | 20.13 | 20.07 | d. vol. % |
| CO2 | Zero | | 0.06 | 0.10 | 0.20 | 0.11 | 0.25 | 0.05 | 19.79 | 0.11 | | | |
| | Mid | 10.15 | 10.04 | 10.03 | -0.05 | 10.06 | 0.10 | 0.15 | 19.79 | 10.05 | 0.67 | 0.58 | d. vol. % |
| LIMITS | | | | | +/- 5 % | | +/- 5 % | +/- 3 % | | | | | |

| Gas | ZERO Analyzer Response (System for THC) | ZERO Analyzer Cal. Error (% of Span) | LOW Actual Conc. | LOW Analyzer Response (System for THC) | LOW Analyzer Cal. Error (% of Span) | LOW System Cal. Error (% of Actual) | MID Actual Conc. | MID Analyzer Response (System for THC) | MID Analyzer Cal. Error (% of Span) | MID System Cal. Error (% of Actual) | HIGH Actual Conc. | HIGH Analyzer Response (System for THC) | HIGH Analyzer Cal. Error (% of Span) | HIGH System Calibration Error (% of Actual) | Span | Conc. Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O2 | 0.01 | 0.05 | | | | | 10.01 | 10.07 | 0.30 | | 20.03 | 20.2 | 0.75 | | 20.03 | d. vol. % |
| CO2 | 0.06 | 0.30 | | | | | 10.15 | 10.04 | -0.56 | | 19.79 | 19.6 | -0.86 | | 19.79 | d. vol. % |
| LIMITS | | +/- 2 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | | +/- 2 % | +/- 5 % | | |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 1, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 1 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 2:38 PM | |
| Unit Operation: | Normal | | Test Finish Time: | 10:51 PM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |
| **Data Input** | | | **Calculations** | | |
| Control Box: | 1618 | | CO + N2 | 79.30 | % dv |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ | Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Meter Calibration Factor (Yd) | 1.003 | | Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Barometric Pressure (Pbar) | 29.33 | in. Hg | Water Collected ($W_f$ - $W_i$) | 27.2 | g |
| Stack Static Pressure (Pg) | 0.11 | in. $H_2O$ | Water Vapor in Silica Gel (Vwsg(std)) | 1.282 | scf |
| Stack Diameter (Ds) (L if rectangular) | 72.0 | inches | Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.282 | scf |
| Stack Width (enter NA if circular) | 0.0 | inches | Volume Dry Gas Metered (Vm) | 46.103 | dacf |
| O2 | 20.06 | % dv | Vol. Dry Gas Metered Stand.(Vm(std)) | 44.901 | dscf |
| CO2 | 0.64 | % dv | Volume Dry Gas Metered ($Vm(m^3)$) | 1.305 | dacm |
| Product Rate (enter NA if not needed) | NA | ton/hr | Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.271 | dscm |
| Is the input ton/hr metric? (YES=1) | 0 | | Stack Absolute Pressure (Ps) | 29.34 | in. Hg |
| Pitot Tube Coefficient (Cp) | 0.84 | | Stack Absolute Temperature (Tsavg) | 591.5 | R |
| Sample Calculation Title | Flow, Moisture, M320 | | H2O Vapor Pressure @ avg Stack Temp. | 4.76 | in. Hg |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu | H2O in the gas at saturation (Bws) | 0.1623 | vol. fraction |
| Standard Temperature | 68 | F | H2O in the gas from (Bws) | 0.0278 | vol. fraction |
| Standard Pressure | 760 | mm Hg | H2O in the gas used (lower of the 2 Bws) | 0.0278 | vol. fraction |
| Pitot Tube Constant (Kp) | 85.49 | | Is the Gas Stream Saturated With H2O? | NO | |
| **Calculations** | | | Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Meter Temperature (Tm) | 73.4 | F | Wet Gas Molecular Weight (Ms) | 28.60 | lb/lb-mole |
| Stack Temperature (Tsavg) | 131.9 | F | Gas Velocity (Vs) | 51.89 | ft/s |
| Orifice Pressure Drop (dHavg) | 0.442 | in. $H_2O$ | Is the stack circular or rectangular? | CIRCULAR | |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8603 | in. $H_2O$^1/2 | Area Stack (As) | 28.274 | $ft^2$ |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu | Actual Gas Flowrate | 88,024 | acfm |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu | Standard Gas Flowrate | 77,000 | scfm |
| Heat Input Based on $F_d$ | NA | MMBtu/hr | Dry Standard Gas Flowrate | 74,862 | dscfm |
| K1method 4 | 0.04706 | scf/ml | Actual Gas Flowrate | 2,493 | acm/min |
| K2method 4 | 0.04715 | scf/g | Standard Gas Flowrate | 2,180 | scm/min |
| K1method 5 | 17.64 | R/in. Hg | Dry Standard Gas Flowrate | 2,120 | dscm/min |
| K4method 5 | 0.0945 | | | | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole | | | |
| Total Test Time | 14.45 | hours | | | |
| # of Pushes | 48 | pushes/test | | | |
| Avg. # of pushes per hour | 3.32 | pushes/hour | | | |
| Minutes per Push | 2.50 | minutes/push | | | |
| **HF** | | | | | |
| MW | 20.01 | lb/lb-mole | | | |
| Concentration | 0.06 | $ppm_{wv}$ | | | |
| Concentration | 0.06 | $ppm_{dv}$ | | | |
| Concentration | 0.0000000 | lb/dscf | | | |
| Concentration | 0.06 | mg/dscm | | | |
| Emission | 0.0021 | lb/hr | | | |
| **HCN** | | | | | |
| MW | 27.0253 | lb/lb-mole | | | |
| Concentration | 1.12 | $ppm_{wv}$ | | | |
| Concentration | 1.15 | $ppm_{dv}$ | | | |
| Concentration | 0.0000000 | lb/dscf | | | |
| Concentration | 1.39 | mg/dscm | | | |
| Emission | 0.050 | lb/hr | | | |

**ArcelorMittal** **Run 1** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.71 | 0.843 | 0.43 | 122 | 71 | 69 |
| A-1 | 0.72 | 0.849 | 0.44 | 148 | 72 | 70 |
| A-2 | 0.72 | 0.849 | 0.44 | 132 | 72 | 71 |
| A-2 | 0.75 | 0.866 | 0.45 | 152 | 73 | 72 |
| A-3 | 0.76 | 0.872 | 0.46 | 138 | 73 | 72 |
| A-3 | 0.74 | 0.860 | 0.44 | 158 | 74 | 73 |
| A-4 | 0.74 | 0.860 | 0.44 | 144 | 74 | 73 |
| A-4 | 0.78 | 0.883 | 0.47 | 132 | 75 | 74 |
| A-5 | 0.78 | 0.883 | 0.47 | 135 | 75 | 75 |
| A-5 | 0.82 | 0.906 | 0.49 | 145 | 77 | 76 |
| A-6 | 0.81 | 0.900 | 0.49 | 139 | 77 | 76 |
| A-6 | 0.77 | 0.877 | 0.46 | 147 | 77 | 76 |
| A-7 | 0.65 | 0.806 | 0.39 | 158 | 77 | 77 |
| A-7 | 0.65 | 0.806 | 0.39 | 139 | 77 | 77 |
| A-8 | 0.68 | 0.825 | 0.41 | 144 | 77 | 77 |
| A-8 | 0.69 | 0.831 | 0.41 | 138 | 78 | 77 |
| A-9 | 0.70 | 0.837 | 0.42 | 125 | 77 | 77 |
| A-9 | 0.75 | 0.866 | 0.45 | 137 | 77 | 77 |
| A-10 | 0.70 | 0.837 | 0.42 | 124 | 76 | 77 |
| A-10 | 0.68 | 0.825 | 0.41 | 135 | 76 | 77 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 76 | 76 |
| A-11 | 0.68 | 0.825 | 0.41 | 153 | 76 | 76 |
| A-12 | 0.70 | 0.837 | 0.42 | 138 | 76 | 76 |
| A-12 | 0.68 | 0.825 | 0.41 | 170 | 76 | 76 |
| B-1 | 0.91 | 0.954 | 0.43 | 129 | 74 | 76 |
| B-1 | 0.72 | 0.849 | 0.43 | 110 | 75 | 75 |
| B-2 | 0.75 | 0.866 | 0.45 | 117 | 74 | 75 |
| B-2 | 0.69 | 0.831 | 0.41 | 125 | 74 | 75 |
| B-3 | 0.72 | 0.849 | 0.43 | 122 | 74 | 75 |
| B-3 | 0.73 | 0.854 | 0.44 | 124 | 74 | 74 |
| B-4 | 0.71 | 0.843 | 0.43 | 119 | 74 | 74 |
| B-4 | 0.68 | 0.825 | 0.40 | 121 | 73 | 74 |
| B-5 | 0.80 | 0.894 | 0.48 | 108 | 73 | 73 |
| B-5 | 0.74 | 0.860 | 0.44 | 119 | 72 | 73 |
| B-6 | 0.74 | 0.860 | 0.44 | 138 | 72 | 73 |
| B-6 | 0.80 | 0.894 | 0.48 | 113 | 71 | 72 |
| B-7 | 0.74 | 0.860 | 0.44 | 145 | 71 | 72 |
| B-7 | 0.79 | 0.889 | 0.46 | 134 | 71 | 72 |
| B-8 | 0.82 | 0.906 | 0.50 | 123 | 70 | 70 |
| B-8 | 0.82 | 0.906 | 0.50 | 124 | 69 | 70 |
| B-9 | 0.78 | 0.883 | 0.47 | 131 | 69 | 70 |
| B-9 | 0.76 | 0.872 | 0.46 | 118 | 69 | 70 |
| B-10 | 0.74 | 0.860 | 0.44 | 127 | 69 | 70 |
| B-10 | 0.74 | 0.860 | 0.44 | 121 | 69 | 70 |
| B-11 | 0.77 | 0.877 | 0.46 | 138 | 69 | 70 |
| B-11 | 0.75 | 0.866 | 0.45 | 104 | 69 | 69 |
| B-12 | 0.77 | 0.877 | 0.46 | 126 | 69 | 69 |
| B-12 | 0.76 | 0.872 | 0.46 | 116 | 68 | 69 |
| **Average** | 0.74 | 0.860 | 0.44 | 131.9 | | 73.4 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 51.423 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 97.526 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 46.103 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 755.1 | 738.0 | 17.1 | | | 0.0 |
| 2 | 636.9 | 634.9 | 2.0 | | | 0.0 |
| 3 | 615.8 | 615.6 | 0.2 | | | 0.0 |
| 4 | 789.1 | 781.2 | 7.9 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2796.9 | 2769.7 | 27.2 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - $V_i$) |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | November 2, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 2 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 8:05 AM | |
| Unit Operation: | Normal | | Test Finish Time: | 6:34 PM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |
| **Data Input** | | | **Calculations** | | |
| Control Box: | 1618 | | CO + N2 | 79.26 | % dv |
| Meter $DH_@$ (0.75 scfm) | 1.971 | in. $H_2O$ | Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Meter Calibration Factor (Yd) | 1.003 | | Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Barometric Pressure (Pbar) | 29.11 | in. Hg | Water Collected ($W_f$ - $W_i$) | 20.6 | g |
| Stack Static Pressure (Pg) | -1.30 | in. $H_2O$ | Water Vapor in Silica Gel (Vwsg(std)) | 0.971 | scf |
| Stack Diameter (Ds) (L if rectangular) | 72 | inches | Vol. Water Vapor in Gas Stand.(Vw(std)) | 0.971 | scf |
| Stack Width (enter NA if circular) | 0 | inches | Volume Dry Gas Metered (Vm) | 44.942 | dacf |
| O2 | 20.08 | % dv | Vol. Dry Gas Metered Stand.(Vm(std)) | 43.559 | dscf |
| CO2 | 0.66 | % dv | Volume Dry Gas Metered ($Vm(m^3)$) | 1.273 | dacm |
| Product Rate (enter NA if not needed) | NA | ton/hr | Vol. Dry Gas Metered Stand.($Vm(std)m^3$) | 1.233 | dscm |
| Is the input ton/hr metric? (YES=1) | 0 | | Stack Absolute Pressure (Ps) | 29.01 | in. Hg |
| Pitot Tube Coefficient (Cp) | 0.84 | | Stack Absolute Temperature (Tsavg) | 590.9 | R |
| Sample Calculation Title | Flow, Moisture, CEMS | | H2O Vapor Pressure @ avg Stack Temp. | 4.68 | in. Hg |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu | H2O in the gas at saturation (Bws) | 0.1615 | vol. fraction |
| Standard Temperature | 68 | F | H2O in the gas from test data (Bws) | 0.0218 | vol. fraction |
| Standard Pressure | 760 | mm Hg | H2O in the gas used (lower of the 2 Bws) | 0.0218 | vol. fraction |
| Pitot Tube Constant (Kp) | 85.49 | | Is the Gas Stream Saturated With H2O? | NO | |
| **Calculations** | | | Dry Gas Molecular Weight (Md) | 28.91 | lb/lb-mole |
| Meter Temperature (Tm) | 72.0 | F | Wet Gas Molecular Weight (Ms) | 28.67 | lb/lb-mole |
| Stack Temperature (Tsavg) | 131.3 | F | Gas Velocity (Vs) | 50.97 | ft/s |
| Orifice Pressure Drop (dHavg) | 0.424 | in. $H_2O$ | Is the stack circular or rectangular? | CIRCULAR | |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8418 | in. $H_2O$^1/2 | Area Stack (As) | 28.274 | $ft^2$ |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu | Actual Gas Flowrate | 86,463 | acfm |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu | Standard Gas Flowrate | 74,876 | scfm |
| Heat Input Based on $F_d$ | NA | MMBtu/hr | Dry Standard Gas Flowrate | 73,243 | dscfm |
| K1method 4 | 0.04706 | scf/ml | Actual Gas Flowrate | 2,448 | acm/min |
| K2method 4 | 0.04715 | scf/g | Standard Gas Flowrate | 2,120 | scm/min |
| K1method 5 | 17.64 | R/in. Hg | Dry Standard Gas Flowrate | 2,074 | dscm/min |
| K4method 5 | 0.0945 | | | | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole | | | |
| Total Test Time | 13.95 | hours | | | |
| # of Pushes | 48 | pushes/test | | | |
| Avg. # of pushes per hour | 3.44 | pushes/hour | | | |
| Minutes per Push | 2.50 | minutes/push | | | |
| **HF** | | | | | |
| MW | 20.01 | lb/lb-mole | | | |
| Concentration | 0.06 | $ppm_{wv}$ | | | |
| Concentration | 0.07 | $ppm_{dv}$ | | | |
| Concentration | 0.0000000 | lb/dscf | | | |
| Concentration | 0.06 | mg/dscm | | | |
| Emission | 0.0022 | lb/hr | | | |
| **HCN** | | | | | |
| MW | 27.03 | lb/lb-mole | | | |
| Concentration | 1.06 | $ppm_{wv}$ | | | |
| Concentration | 1.08 | $ppm_{dv}$ | | | |
| Concentration | 0.0000000 | lb/dscf | | | |
| Concentration | 1.31 | mg/dscm | | | |
| Emission | 0.048 | lb/hr | | | |

**ArcelorMittal** **Run 2** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In (F or C) | Meter Temp Out (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.62 | 0.787 | 0.37 | 113 | 68 | 69 |
| A-1 | 0.73 | 0.854 | 0.44 | 119 | 68 | 69 |
| A-2 | 0.75 | 0.866 | 0.45 | 122 | 68 | 68 |
| A-2 | 0.67 | 0.819 | 0.40 | 120 | 68 | 68 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 |
| A-3 | 0.72 | 0.849 | 0.43 | 116 | 68 | 68 |
| A-4 | 0.72 | 0.849 | 0.43 | 109 | 67 | 68 |
| A-4 | 0.74 | 0.860 | 0.44 | 122 | 67 | 68 |
| A-5 | 0.73 | 0.854 | 0.44 | 116 | 67 | 68 |
| A-5 | 0.72 | 0.849 | 0.43 | 115 | 67 | 67 |
| A-6 | 0.72 | 0.849 | 0.43 | 124 | 67 | 67 |
| A-6 | 0.73 | 0.854 | 0.44 | 117 | 66 | 67 |
| A-7 | 0.79 | 0.889 | 0.47 | 113 | 66 | 67 |
| A-7 | 0.80 | 0.894 | 0.48 | 121 | 66 | 66 |
| A-8 | 0.72 | 0.849 | 0.43 | 114 | 66 | 66 |
| A-8 | 0.74 | 0.860 | 0.44 | 122 | 66 | 66 |
| A-9 | 0.71 | 0.843 | 0.43 | 117 | 66 | 66 |
| A-9 | 0.72 | 0.849 | 0.43 | 133 | 66 | 66 |
| A-10 | 0.69 | 0.831 | 0.41 | 121 | 66 | 66 |
| A-10 | 0.71 | 0.843 | 0.43 | 131 | 67 | 67 |
| A-11 | 0.68 | 0.825 | 0.41 | 124 | 67 | 67 |
| A-11 | 0.69 | 0.831 | 0.41 | 143 | 68 | 67 |
| A-12 | 0.73 | 0.854 | 0.44 | 127 | 70 | 69 |
| A-12 | 0.72 | 0.849 | 0.43 | 136 | 70 | 69 |
| B-1 | 0.70 | 0.837 | 0.42 | 136 | 71 | 70 |
| B-1 | 0.66 | 0.812 | 0.40 | 151 | 71 | 71 |
| B-2 | 0.67 | 0.819 | 0.40 | 131 | 72 | 71 |
| B-2 | 0.65 | 0.806 | 0.39 | 155 | 73 | 71 |
| B-3 | 0.65 | 0.806 | 0.39 | 145 | 73 | 71 |
| B-3 | 0.71 | 0.843 | 0.45 | 164 | 74 | 73 |
| B-4 | 0.68 | 0.825 | 0.41 | 151 | 74 | 73 |
| B-4 | 0.67 | 0.819 | 0.40 | 147 | 75 | 74 |
| B-5 | 0.70 | 0.837 | 0.40 | 132 | 76 | 75 |
| B-5 | 0.70 | 0.837 | 0.40 | 136 | 76 | 75 |
| B-6 | 0.72 | 0.849 | 0.43 | 143 | 77 | 76 |
| B-6 | 0.75 | 0.866 | 0.45 | 144 | 77 | 76 |
| B-7 | 0.72 | 0.849 | 0.43 | 147 | 78 | 76 |
| B-7 | 0.76 | 0.872 | 0.46 | 129 | 79 | 78 |
| B-8 | 0.75 | 0.866 | 0.45 | 124 | 79 | 78 |
| B-8 | 0.75 | 0.866 | 0.45 | 135 | 80 | 79 |
| B-9 | 0.74 | 0.860 | 0.44 | 155 | 80 | 79 |
| B-9 | 0.73 | 0.854 | 0.44 | 142 | 80 | 80 |
| B-10 | 0.64 | 0.800 | 0.38 | 150 | 81 | 80 |
| B-10 | 0.67 | 0.819 | 0.40 | 135 | 81 | 80 |
| B-11 | 0.71 | 0.843 | 0.43 | 127 | 81 | 81 |
| B-11 | 0.70 | 0.837 | 0.40 | 138 | 81 | 81 |
| B-12 | 0.67 | 0.819 | 0.40 | 149 | 80 | 81 |
| B-12 | 0.67 | 0.819 | 0.40 | 123 | 80 | 80 |
| **Average** | 0.71 | 0.842 | 0.42 | 131.3 | | 72.0 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 97.700 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 142.642 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 44.942 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 711.1 | 706.8 | 4.3 | | | 0.0 |
| 2 | 711.8 | 706.8 | 5.0 | | | 0.0 |
| 3 | 605.1 | 603.1 | 2.0 | | | 0.0 |
| 4 | 757.8 | 748.5 | 9.3 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2785.8 | 2765.2 | 20.6 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - $V_i$) |

| | | | | | |
|---|---|---|---|---|---|
| Client: | ArcelorMittal | | Test Date: | Nov. 2-3, 2016 | |
| Project No.: | 16-167 | | Test Location: | Baghouse Exhaust | |
| Plant: | Monessen, PA | | Test Run: | Run 3 | |
| Unit: | Pushing Baghouse | | Test Start Time: | 7:49 PM | |
| Unit Operation: | Normal | | Test Finish Time: | 4:15 AM | |
| Blue is data input. | Red is a calculation. | Pink is a reference to a cell on another sheet. | | Green is a reference to a cell on this sheet. | |
| **Data Input** | | | **Calculations** | | |
| Control Box: | 1618 | | CO + N2 | 79.36 | % dv |
| Meter $DH@$ (0.75 scfm) | 1.971 | in. $H_2O$ | Water Collected ($V_f$ - $V_i$) | 0.0 | ml |
| Meter Calibration Factor (Yd) | 1.003 | | Water Vapor Condensed (Vwc(std)) | 0.000 | scf |
| Barometric Pressure (Pbar) | 29.11 | in. Hg | Water Collected ($W_f$ - $W_i$) | 27.9 | g |
| Stack Static Pressure (Pg) | -1.30 | in. $H_2O$ | Water Vapor in Silica Gel (Vwsg(std)) | 1.315 | scf |
| Stack Diameter (Ds) (L if rectangular) | 72 | inches | Vol. Water Vapor in Gas Stand.(Vw(std)) | 1.315 | scf |
| Stack Width (enter NA if circular) | 0 | inches | Volume Dry Gas Metered (Vm) | 49.470 | dacf |
| O2 | 20.07 | % dv | Vol. Dry Gas Metered Stand.(Vm(std)) | 47.878 | dscf |
| CO2 | 0.58 | % dv | Volume Dry Gas Metered (Vm($m^3$)) | 1.401 | dacm |
| Product Rate (enter NA if not needed) | NA | ton/hr | Vol. Dry Gas Metered Stand.(Vm(std)$m^3$) | 1.356 | dscm |
| Is the input ton/hr metric? (YES=1) | 0 | | Stack Absolute Pressure (Ps) | 29.01 | in. Hg |
| Pitot Tube Coefficient (Cp) | 0.84 | | Stack Absolute Temperature (Tsavg) | 587.9 | R |
| Sample Calculation Title | Flow, Moisture, CEMS | | H2O Vapor Pressure @ avg Stack Temp. | 4.32 | in. Hg |
| $F_d$ @ 68 F and 760 mm Hg (NA if NA) | NA | dscf/MMBtu | H2O in the gas at saturation (Bws) | 0.1490 | vol. fraction |
| Standard Temperature | 68 | F | H2O in the gas from test data (Bws) | 0.0267 | vol. fraction |
| Standard Pressure | 760 | mm Hg | H2O in the gas used (lower of the 2 Bws) | 0.0267 | vol. fraction |
| Pitot Tube Constant (Kp) | 85.49 | | Is the Gas Stream Saturated With H2O? | NO | |
| **Calculations** | | | Dry Gas Molecular Weight (Md) | 28.90 | lb/lb-mole |
| Meter Temperature (Tm) | 72.8 | F | Wet Gas Molecular Weight (Ms) | 28.60 | lb/lb-mole |
| Stack Temperature (Tsavg) | 128.3 | F | Gas Velocity (Vs) | 52.55 | ft/s |
| Orifice Pressure Drop (dHavg) | 0.455 | in. $H_2O$ | Is the stack circular or rectangular? | CIRCULAR | |
| GasVelocity Head $(dP)^{1/2}$avg | 0.8691 | in. $H_2O$^1/2 | Area Stack (As) | 28.274 | $ft^2$ |
| $F_d$ @ Standard Conditions | NA | dscf/MMBtu | Actual Gas Flowrate | 89,144 | acfm |
| $F_d$ @ Stan. Cond. & Actual O2 | NA | dscf/MMBtu | Standard Gas Flowrate | 77,591 | scfm |
| Heat Input Based on $F_d$ | NA | MMBtu/hr | Dry Standard Gas Flowrate | 75,517 | dscfm |
| K1method 4 | 0.04706 | scf/ml | Actual Gas Flowrate | 2,524 | acm/min |
| K2method 4 | 0.04715 | scf/g | Standard Gas Flowrate | 2,197 | scm/min |
| K1method 5 | 17.64 | R/in. Hg | Dry Standard Gas Flowrate | 2,138 | dscm/min |
| K4method 5 | 0.0945 | | | | |
| Standard lb-mole volume | 385.3 | $ft^3$/lb-mole | | | |
| Total Test Time | 15.12 | hours | | | |
| # of Pushes | 48 | pushes/test | | | |
| Avg. # of pushes per hour | 3.18 | pushes/hour | | | |
| Minutes per Push | 2.50 | minutes/push | | | |
| **HF** | | | | | |
| MW | 20.01 | lb/lb-mole | | | |
| Concentration | 0.072 | $ppm_{wv}$ | | | |
| Concentration | 0.074 | $ppm_{dv}$ | | | |
| Concentration | 0.0000000 | lb/dscf | | | |
| Concentration | 0.07 | mg/dscm | | | |
| Emission | 0.0023 | lb/hr | | | |
| **HCN** | | | | | |
| MW | 27.03 | lb/lb-mole | | | |
| Concentration | 0.98 | $ppm_{wv}$ | | | |
| Concentration | 1.00 | $ppm_{dv}$ | | | |
| Concentration | 0.0000000 | lb/dscf | | | |
| Concentration | 1.21 | mg/dscm | | | |
| Emission | 0.042 | lb/hr | | | |

**ArcelorMittal** **Run 3** **F or C?**
**Pushing Baghouse** **F=1,C=0** 1

| Point | Pitot DP (dP) (in. H2O) | SQRT dP (in. H2O)$^{1/2}$ | Orifice DP (dH) (in. H2O) | Stack Temp (F) | Meter Temp In/Out (F or C) | (F or C) |
|---|---|---|---|---|---|---|
| A-1 | 0.76 | 0.872 | 0.46 | 129 | 78 | 79 |
| A-1 | 0.84 | 0.917 | 0.50 | 113 | 77 | 78 |
| A-2 | 0.78 | 0.883 | 0.47 | 123 | 76 | 77 |
| A-2 | 0.73 | 0.854 | 0.44 | 126 | 76 | 77 |
| A-3 | 0.75 | 0.866 | 0.45 | 138 | 76 | 77 |
| A-3 | 0.76 | 0.872 | 0.46 | 132 | 76 | 77 |
| A-4 | 0.80 | 0.894 | 0.48 | 152 | 75 | 76 |
| A-4 | 0.76 | 0.872 | 0.46 | 138 | 75 | 76 |
| A-5 | 0.75 | 0.866 | 0.45 | 148 | 75 | 76 |
| A-5 | 0.77 | 0.877 | 0.46 | 137 | 75 | 76 |
| A-6 | 0.72 | 0.849 | 0.43 | 128 | 75 | 76 |
| A-6 | 0.72 | 0.849 | 0.43 | 133 | 75 | 76 |
| A-7 | 0.75 | 0.866 | 0.45 | 126 | 75 | 76 |
| A-7 | 0.72 | 0.849 | 0.43 | 133 | 75 | 75 |
| A-8 | 0.77 | 0.877 | 0.46 | 127 | 74 | 74 |
| A-8 | 0.75 | 0.866 | 0.45 | 117 | 73 | 74 |
| A-9 | 0.70 | 0.837 | 0.43 | 119 | 72 | 73 |
| A-9 | 0.68 | 0.825 | 0.40 | 128 | 72 | 72 |
| A-10 | 0.65 | 0.806 | 0.39 | 119 | 71 | 72 |
| A-10 | 0.66 | 0.812 | 0.40 | 143 | 71 | 72 |
| A-11 | 0.63 | 0.794 | 0.38 | 127 | 72 | 72 |
| A-11 | 0.67 | 0.819 | 0.40 | 143 | 71 | 72 |
| A-12 | 0.65 | 0.806 | 0.39 | 123 | 71 | 72 |
| A-12 | 0.65 | 0.806 | 0.39 | 131 | 71 | 71 |
| B-1 | 0.78 | 0.883 | 0.47 | 117 | 70 | 71 |
| B-1 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 |
| B-2 | 0.82 | 0.906 | 0.50 | 112 | 70 | 70 |
| B-2 | 0.82 | 0.906 | 0.50 | 130 | 70 | 71 |
| B-3 | 0.77 | 0.877 | 0.46 | 123 | 70 | 70 |
| B-3 | 0.84 | 0.917 | 0.50 | 125 | 70 | 70 |
| B-4 | 0.78 | 0.883 | 0.47 | 130 | 71 | 70 |
| B-4 | 0.82 | 0.906 | 0.50 | 140 | 71 | 71 |
| B-5 | 0.80 | 0.894 | 0.48 | 134 | 71 | 71 |
| B-5 | 0.75 | 0.866 | 0.45 | 132 | 71 | 71 |
| B-6 | 0.84 | 0.917 | 0.50 | 114 | 73 | 73 |
| B-6 | 0.82 | 0.906 | 0.50 | 119 | 73 | 73 |
| B-7 | 0.85 | 0.922 | 0.51 | 124 | 74 | 73 |
| B-7 | 0.82 | 0.906 | 0.49 | 118 | 73 | 73 |
| B-8 | 0.82 | 0.906 | 0.49 | 117 | 73 | 73 |
| B-8 | 0.75 | 0.866 | 0.45 | 126 | 72 | 72 |
| B-9 | 0.78 | 0.883 | 0.47 | 122 | 72 | 72 |
| B-9 | 0.76 | 0.872 | 0.46 | 138 | 71 | 72 |
| B-10 | 0.80 | 0.894 | 0.48 | 133 | 70 | 71 |
| B-10 | 0.78 | 0.883 | 0.47 | 119 | 70 | 71 |
| B-11 | 0.72 | 0.849 | 0.43 | 121 | 70 | 70 |
| B-11 | 0.71 | 0.843 | 0.43 | 140 | 70 | 70 |
| B-12 | 0.74 | 0.860 | 0.44 | 136 | 70 | 70 |
| B-12 | 0.72 | 0.849 | 0.43 | 120 | 70 | 70 |
| **Average** | 0.76 | 0.869 | 0.45 | 128.3 | | 72.8 |

| | | | | | |
|---|---|---|---|---|---|
| Initial volume | 142.800 | $ft^3$ | Initial volume | 0.000 | liters |
| Final volume | 192.270 | $ft^3$ | Final volume | 0.000 | liters |
| Total metered | 49.470 | dacf | Total metered | 0.000 | dry actual liters |

| Impinger | Final grams | Initial grams | Gram Gain | Final ml | Initial ml | ml Gain |
|---|---|---|---|---|---|---|
| 1 | 726.3 | 708.7 | 17.6 | | | 0.0 |
| 2 | 709.6 | 707.7 | 1.9 | | | 0.0 |
| 3 | 605.6 | 605.4 | 0.2 | | | 0.0 |
| 4 | 759.4 | 751.2 | 8.2 | | | 0.0 |
| 5 | | | 0.0 | | | 0.0 |
| 6 | | | 0.0 | | | 0.0 |
| 7 | | | 0.0 | | | 0.0 |
| 8 | | | 0.0 | | | 0.0 |
| 9 | | | 0.0 | | | 0.0 |
| 10 | | | 0.0 | | | 0.0 |
| **Total** | 2800.9 | 2773.0 | 27.9 | 0.0 | 0.0 | 0.0 |
| | $W_f$ | $W_i$ | ($W_f$ - $W_i$) | $V_f$ | $V_i$ | ($V_f$ - $V_i$) |

# REPORT - APPENDIX C

## Laboratory Data

# Methods 5/29

Maxxam
A Bureau Veritas Group Company

Your Project #: 106377/ (16-167)
Your C.O.C. #: 23261,22710

**Attention:John Wilson**

Montrose Air Quality Services, LLC
ACCI Pittsburg, PA
1050 William Pitt Way
Pittsburgh, PA
USA 15238

**Report Date: 2016/11/25**
Report #: R4260538
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B6O2329**
**Received: 2016/11/07, 18:30**

Sample Matrix: Stack Sampling Train
# Samples Received: 21

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | 6 | 2016/11/18 | 2016/11/21 | BRL SOP-00104 | EPA M29/M0060 m |
| Mercury 2B in HNO3/H2O2 Imp. | 6 | 2016/11/18 | 2016/11/21 | BRL SOP-00104 | EPA M29/M0060 m |
| Mercury 3B in KMnO4/H2SO4 Imp. | 6 | 2016/11/16 | 2016/11/17 | BRL SOP-00104 | EPA M29/M0060 m |
| Mercury 1B in Filter + Rinse (M29) | 6 | 2016/11/16 | 2016/11/17 | BRL SOP-00104 | EPA 29 m |
| Mercury 1B in Filter + Rinse (M29) | 6 | 2016/11/23 | 2016/11/21 | BRL SOP-00104 | EPA 29 m |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | 6 | 2016/11/14 | 2016/11/14 | BRL SOP-00103 / BRL SOP-00102 | EPA M29/CARB 436 m |
| Metals F.H. in Filter + Rinses (6020A) | 6 | 2016/11/16 | 2016/11/23 | BRL SOP-00103/ BRL SOP-00102 | EPA M29/CARB 436 m |
| Metals F.H. in Filter + Rinses (6020A) | 6 | 2016/11/18 | 2016/11/23 | BRL SOP-00103/ BRL SOP-00102 | EPA M29/CARB 436 m |
| Particulates/Acetone Rinse (M5/315/M201) | 6 | 2016/11/09 | 2016/11/15 | BRL SOP-00109 | EPA 5/315 m |
| Particulates/Acetone Rinse (M5/315/M201) | 3 | 2016/11/11 | 2016/11/15 | BRL SOP-00109 | EPA 5/315 m |
| Particulates B. H. Water Imp. (M315) | 3 | 2016/11/14 | 2016/11/18 | BRL SOP-00109 | EPA 315 |
| Particulates/Filter (M5/315/NJATM1/M201) | 6 | N/A | 2016/11/11 | BRL SOP-00109 | EPA 5/315/NJATM1 m |
| Particulates/Filter (M5/315/NJATM1/M201) | 3 | N/A | 2016/11/14 | BRL SOP-00109 | EPA 5/315/NJATM1 m |
| Final Volume of Acetone Probe Rinse | 6 | N/A | 2016/11/11 | BRL SOP-00109 | |
| Final Volume of Acetone Probe Rinse | 3 | N/A | 2016/11/21 | BRL SOP-00109 | |

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Your Project #: 106377/ (16-167)
Your C.O.C. #: 23261,22710

**Attention:John Wilson**

Montrose Air Quality Services, LLC
ACCI Pittsburg, PA
1050 William Pitt Way
Pittsburgh, PA
USA 15238

**Report Date: 2016/11/25**
Report #: R4260538
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B6O2329**
**Received: 2016/11/07, 18:30**

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Clayton Johnson
Project Manager - Air Toxics, Source Evaluation
25 Nov 2016 15:27:26

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M29 METALS (FRONT & BACK SEPARATE)

| **Maxxam ID** | | DKG394 | DKG395 | DKG396 | | | DKG474 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | 2016/10/25 | 2016/10/25 | | | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | 23261,22710 | | | |
| | **UNITS** | **M5/29 PEC-R1** | **M5/29 PEC-R2** | **M5/29 PEC-R3** | **RDL** | **MDL** | **M5/29 QUENCH-R1** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | | | | |
| Front Half Antimony (Sb) | ug | <0.80 | <0.80 | <0.80 | 0.80 | 0.080 | <2.0 | 2.0 | 0.20 | 4750416 |
| Front Half Arsenic (As) | ug | <0.80 | <0.80 | <0.80 | 0.80 | 0.080 | 18.6 | 2.0 | 0.20 | 4750416 |
| Front Half Beryllium (Be) | ug | <0.20 | <0.20 | 0.78 | 0.20 | 0.040 | <0.50 | 0.50 | 0.10 | 4750416 |
| Front Half Cadmium (Cd) | ug | <0.20 | <0.20 | <0.20 | 0.20 | 0.040 | <0.50 | 0.50 | 0.10 | 4750416 |
| Front Half Chromium (Cr) | ug | 35.2 | 43.0 | 37.6 | 0.60 | 0.10 | 15.2 | 1.5 | 0.25 | 4750416 |
| Front Half Cobalt (Co) | ug | 0.93 | 0.55 | 0.52 | 0.20 | 0.020 | 0.93 | 0.50 | 0.050 | 4750416 |
| Front Half Lead (Pb) | ug | 0.86 | 0.70 | 0.74 | 0.40 | 0.040 | 10.7 | 1.0 | 0.10 | 4750416 |
| Front Half Manganese (Mn) | ug | 16.1 | 20.6 | 27.4 | 1.5 | 0.10 | 126 | 3.8 | 0.25 | 4750416 |
| Front Half Nickel (Ni) | ug | 21.4 | 19.6 | 19.5 | 1.0 | 0.20 | 11.6 | 2.5 | 0.50 | 4750416 |
| Front Half Selenium (Se) | ug | <2.0 | <2.0 | <2.0 | 2.0 | 0.50 | <5.0 | 5.0 | 1.3 | 4750416 |
| Back Half Antimony (Sb) | ug | <0.40 | <0.40 | <0.40 | 0.40 | 0.080 | <0.40 | 0.40 | 0.080 | 4746765 |
| Back Half Arsenic (As) | ug | <0.40 | <0.40 | <0.40 | 0.40 | 0.080 | 0.99 | 0.40 | 0.080 | 4746765 |
| Back Half Beryllium (Be) | ug | <0.10 | <0.10 | <0.10 | 0.10 | 0.10 | <0.10 | 0.10 | 0.10 | 4746765 |
| Back Half Cadmium (Cd) | ug | <0.10 | <0.10 | <0.10 | 0.10 | 0.060 | <0.10 | 0.10 | 0.060 | 4746765 |
| Back Half Chromium (Cr) | ug | 4.65 | 3.70 | 3.97 | 0.30 | 0.14 | 131 | 0.30 | 0.14 | 4746765 |
| Back Half Cobalt (Co) | ug | 0.31 | <0.10 | 0.10 | 0.10 | 0.020 | 2.17 | 0.10 | 0.020 | 4746765 |
| Back Half Lead (Pb) | ug | 0.64 | 0.56 | 0.69 | 0.20 | 0.080 | 1.83 | 0.20 | 0.080 | 4746765 |
| Back Half Manganese (Mn) | ug | 17.9 | 11.2 | 37.8 | 0.50 | 0.12 | 106 | 0.50 | 0.12 | 4746765 |
| Back Half Nickel (Ni) | ug | 8.76 | 2.84 | 2.29 | 0.50 | 0.12 | 67.6 | 0.50 | 0.12 | 4746765 |
| Back Half Selenium (Se) | ug | 1.3 | 2.9 | 2.0 | 1.0 | 0.40 | 5.9 | 1.0 | 0.40 | 4746765 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M29 METALS (FRONT & BACK SEPARATE)

| **Maxxam ID** | | DKG476 | DKG477 | | | |
|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 QUENCH-R2** | **M5/29 QUENCH-R3** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | |
| Front Half Antimony (Sb) | ug | <2.0 | 2.1 | 2.0 | 0.20 | 4750416 |
| Front Half Arsenic (As) | ug | 26.6 | 27.0 | 2.0 | 0.20 | 4750416 |
| Front Half Beryllium (Be) | ug | <0.50 | <0.50 | 0.50 | 0.10 | 4750416 |
| Front Half Cadmium (Cd) | ug | <0.50 | <0.50 | 0.50 | 0.10 | 4750416 |
| Front Half Chromium (Cr) | ug | 3.4 | 39.0 | 1.5 | 0.25 | 4750416 |
| Front Half Cobalt (Co) | ug | 0.53 | 1.46 | 0.50 | 0.050 | 4750416 |
| Front Half Lead (Pb) | ug | 8.6 | 8.9 | 1.0 | 0.10 | 4750416 |
| Front Half Manganese (Mn) | ug | 6.7 | 47.5 | 3.8 | 0.25 | 4750416 |
| Front Half Nickel (Ni) | ug | 4.1 | 32.2 | 2.5 | 0.50 | 4750416 |
| Front Half Selenium (Se) | ug | <5.0 | <5.0 | 5.0 | 1.3 | 4750416 |
| Back Half Antimony (Sb) | ug | <0.40 | <0.40 | 0.40 | 0.080 | 4746765 |
| Back Half Arsenic (As) | ug | 9.29 | 4.27 | 0.40 | 0.080 | 4746765 |
| Back Half Beryllium (Be) | ug | <0.10 | <0.10 | 0.10 | 0.10 | 4746765 |
| Back Half Cadmium (Cd) | ug | <0.10 | <0.10 | 0.10 | 0.060 | 4746765 |
| Back Half Chromium (Cr) | ug | 2.51 | 6.44 | 0.30 | 0.14 | 4746765 |
| Back Half Cobalt (Co) | ug | 0.30 | 0.21 | 0.10 | 0.020 | 4746765 |
| Back Half Lead (Pb) | ug | 0.77 | 0.84 | 0.20 | 0.080 | 4746765 |
| Back Half Manganese (Mn) | ug | 13.2 | 132 | 0.50 | 0.12 | 4746765 |
| Back Half Nickel (Ni) | ug | 2.56 | 12.1 | 0.50 | 0.12 | 4746765 |
| Back Half Selenium (Se) | ug | 3.5 | 3.1 | 1.0 | 0.40 | 4746765 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M29 METALS (FRONT & BACK SEPARATE)

| **Maxxam ID** | | DMT409 | DMT416 | DMT417 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | 2016/10/25 | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 FH- RINSE- PEC-R1** | **M5/29 FH- RINSE- PEC-R2** | **M5/29 FH- RINSE- PEC-R3** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | |
| Front Half Antimony (Sb) | ug | <0.80 | <0.80 | <0.80 | 0.80 | 0.080 | 4762094 |
| Front Half Arsenic (As) | ug | <0.80 | <0.80 | 1.14 | 0.80 | 0.080 | 4762094 |
| Front Half Beryllium (Be) | ug | <0.20 | <0.20 | <0.20 | 0.20 | 0.040 | 4762094 |
| Front Half Cadmium (Cd) | ug | <0.20 | <0.20 | <0.20 | 0.20 | 0.040 | 4762094 |
| Front Half Chromium (Cr) | ug | 9.41 | 13.5 | 2.56 | 0.60 | 0.10 | 4762094 |
| Front Half Cobalt (Co) | ug | 0.34 | 0.22 | <0.20 | 0.20 | 0.020 | 4762094 |
| Front Half Lead (Pb) | ug | 0.59 | 0.59 | <0.40 | 0.40 | 0.040 | 4762094 |
| Front Half Manganese (Mn) | ug | 6.0 | 3.5 | 2.1 | 1.5 | 0.10 | 4762094 |
| Front Half Nickel (Ni) | ug | 12.4 | 11.2 | 3.5 | 1.0 | 0.20 | 4762094 |
| Front Half Selenium (Se) | ug | <2.0 | <2.0 | <2.0 | 2.0 | 0.50 | 4762094 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

| **Maxxam ID** | | DMT418 | DMT419 | DMT420 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | 2016/10/25 | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 FH- RINSE-QUENCH- R1** | **M5/29 FH- RINSE-QUENCH- R2** | **M5/29 FH- RINSE-QUENCH- R3** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | |
| Front Half Antimony (Sb) | ug | <0.80 | <0.80 | <0.80 | 0.80 | 0.080 | 4762094 |
| Front Half Arsenic (As) | ug | 11.4 | 7.88 | 3.39 | 0.80 | 0.080 | 4762094 |
| Front Half Beryllium (Be) | ug | <0.20 | 0.21 | <0.20 | 0.20 | 0.040 | 4762094 |
| Front Half Cadmium (Cd) | ug | 0.47 | <0.20 | <0.20 | 0.20 | 0.040 | 4762094 |
| Front Half Chromium (Cr) | ug | 6.55 | 8.71 | 2.29 | 0.60 | 0.10 | 4762094 |
| Front Half Cobalt (Co) | ug | 0.63 | 0.58 | <0.20 | 0.20 | 0.020 | 4762094 |
| Front Half Lead (Pb) | ug | 2.71 | 1.42 | 1.00 | 0.40 | 0.040 | 4762094 |
| Front Half Manganese (Mn) | ug | 2.7 | 7.7 | 9.1 | 1.5 | 0.10 | 4762094 |
| Front Half Nickel (Ni) | ug | 9.7 | 10.6 | 4.2 | 1.0 | 0.20 | 4762094 |
| Front Half Selenium (Se) | ug | <2.0 | <2.0 | <2.0 | 2.0 | 0.50 | 4762094 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M29 MERCURY (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG394 | | | DKG395 | | | DKG396 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | | | 2016/10/25 | | | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | | | 23261,22710 | | | 23261,22710 | | | |
| | **UNITS** | **M5/29 PEC-R1** | **RDL** | **MDL** | **M5/29 PEC-R2** | **RDL** | **MDL** | **M5/29 PEC-R3** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | | | | | |
| 1B Mercury (Hg) | ug | <0.15 | 0.15 | 0.15 | <0.015 | 0.015 | 0.015 | <0.015 | 0.015 | 0.015 | 4750430 |
| 2B Mercury (Hg) | ug | 0.19 | 0.16 | 0.032 | 0.19 | 0.17 | 0.034 | 0.16 | 0.16 | 0.032 | 4754312 |
| 3B Mercury (Hg) | ug | <0.023 | 0.023 | 0.0046 | 0.069 | 0.025 | 0.005 | <0.025 | 0.025 | 0.005 | 4750856 |
| 3C Mercury (Hg) | ug | 1.78 | 0.013 | 0.0026 | 1.01 | 0.013 | 0.0026 | 1.25 | 0.013 | 0.0026 | 4754482 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

| **Maxxam ID** | | DKG474 | | | DKG476 | | | |
|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | | | 23261,22710 | | | |
| | **UNITS** | **M5/29 QUENCH-R1** | **RDL** | **MDL** | **M5/29 QUENCH-R2** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | | |
| 1B Mercury (Hg) | ug | 0.039 | 0.015 | 0.015 | <0.015 | 0.015 | 0.015 | 4750430 |
| 2B Mercury (Hg) | ug | <0.26 | 0.26 | 0.052 | <0.36 | 0.36 | 0.072 | 4754312 |
| 3B Mercury (Hg) | ug | <0.025 | 0.025 | 0.005 | <0.023 | 0.023 | 0.0046 | 4750856 |
| 3C Mercury (Hg) | ug | 0.062 | 0.013 | 0.0026 | 0.050 | 0.013 | 0.0026 | 4754482 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

| **Maxxam ID** | | DKG477 | | DMT409 | DMT416 | | | |
|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | 2016/10/25 | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 QUENCH-R3** | **QC Batch** | **M5/29 FH- RINSE- PEC-R1** | **M5/29 FH- RINSE- PEC-R2** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | | |
| 1B Mercury (Hg) | ug | <0.015 | 4750430 | <0.015 | <0.015 | 0.015 | 0.015 | 4762091 |
| 2B Mercury (Hg) | ug | <0.35 | 4754312 | | | 0.35 | 0.07 | |
| 3B Mercury (Hg) | ug | <0.023 | 4750856 | | | 0.023 | 0.0046 | |
| 3C Mercury (Hg) | ug | 0.043 | 4754482 | | | 0.013 | 0.0026 | |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M29 MERCURY (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DMT417 | DMT418 | DMT419 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | 2016/10/25 | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 FH- RINSE- PEC-R3** | **M5/29 FH- RINSE-QUENCH- R1** | **M5/29 FH- RINSE-QUENCH- R2** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | | | |
| 1B Mercury (Hg) | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4762091 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

| **Maxxam ID** | | DMT420 | | | |
|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | | | |
| | **UNITS** | **M5/29 FH- RINSE-QUENCH- R3** | **RDL** | **MDL** | **QC Batch** |
| **Metals** | | | | | |
| 1B Mercury (Hg) | ug | <0.015 | 0.015 | 0.015 | 4762091 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M5 PARTICULATE MATTER (PM)

| **Maxxam ID** | | DKG394 | DKG395 | DKG396 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/25 | 2016/10/25 | 2016/10/25 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 PEC-R1** | **M5/29 PEC-R2** | **M5/29 PEC-R3** | **RDL** | **MDL** | **QC Batch** |
| Acetone Rinse Particulate Weight in Acetone Rinse | mg | 5.3 | 2.7 | 2.8 | 0.5 | 0.1 | 4740547 |
| Front Half Particulate Weight on Filter | mg | 2.60 | 2.70 | 1.60 | 0.30 | 0.060 | 4742831 |
| Acetone Rinse Volume | ml | 100 | 93 | 120 | 1 | 1 | 4740548 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

| **Maxxam ID** | | DKG474 | DKG476 | DKG477 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M5/29 QUENCH-R1** | **M5/29 QUENCH-R2** | **M5/29 QUENCH-R3** | **RDL** | **MDL** | **QC Batch** |
| Acetone Rinse Particulate Weight in Acetone Rinse | mg | 136 | 18.3 | 309 | 0.5 | 0.1 | 4740547 |
| Front Half Particulate Weight on Filter | mg | 116 | 22.6 | 205 | 0.30 | 0.060 | 4742831 |
| Acetone Rinse Volume | ml | 91 | 85 | 110 | 1 | 1 | 4740548 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

| **Maxxam ID** | | DKG382 | DKG383 | DKG384 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M315 - FILT R1** | **M315 - FILT R3** | **M315 - FILT R4** | **RDL** | **MDL** | **QC Batch** |
| Front Half DCM Extractable Material | mg | 8.20 | 9.50 | 8.10 | 0.50 | N/A | 4744594 |
| Front Half Particulate Weight on Filter | mg | 19.9 | 33.5 | 25.5 | 0.30 | 0.060 | 4744594 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

| **Maxxam ID** | | DKG386 | DKG387 | | | |
|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M315 - R1 ACE/TOL 2W/T** | **M315 - R3 ACE/TOL 2W/T** | **RDL** | **MDL** | **QC Batch** |
| Acetone Rinse DCM Extractable Material | mg | 8.3 | 10.4 | 0.5 | N/A | 4744595 |
| Acetone Rinse Particulate Weight in Acetone Rinse | mg | 114 | 80.3 | 0.5 | 0.1 | 4744595 |
| Acetone Rinse Volume | ml | 48 | 58 | 1 | 1 | 4757313 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

| **Maxxam ID** | | DKG388 | DKG390 | | | |
|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M315 - R4 ACE/TOL 2W/T** | **M315 - R1 BH IMP 3W/S** | **RDL** | **MDL** | **QC Batch** |
| Acetone Rinse DCM Extractable Material | mg | 8.6 | | 0.5 | N/A | 4744595 |
| Back Half DCM Extractable Material | mg | | 2.6 | 0.5 | N/A | 4746782 |
| Back Half DCM Extractable Material in Rinse | mg | | 6.5 | 0.5 | N/A | 4746782 |
| Acetone Rinse Particulate Weight in Acetone Rinse | mg | 7.7 | | 0.5 | 0.1 | 4744595 |
| Acetone Rinse Volume | ml | 41 | | 1 | 1 | 4757313 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

| **Maxxam ID** | | DKG391 | DKG392 | | | |
|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23261,22710 | 23261,22710 | | | |
| | **UNITS** | **M315 - R3 BH IMP 3W/S** | **M315 - R4 BH IMP 3W/S** | **RDL** | **MDL** | **QC Batch** |
| Back Half DCM Extractable Material | mg | 2.1 | 2.1 | 0.5 | N/A | 4746782 |
| Back Half DCM Extractable Material in Rinse | mg | 5.0 | 3.4 | 0.5 | N/A | 4746782 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## TEST SUMMARY

**Maxxam ID:** DKG382 **Collected:** 2016/10/26
**Sample ID:** M315 - FILT R1 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4744594 | N/A | 2016/11/14 | Brenda Moore |

**Maxxam ID:** DKG383 **Collected:** 2016/10/26
**Sample ID:** M315 - FILT R3 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4744594 | N/A | 2016/11/14 | Brenda Moore |

**Maxxam ID:** DKG384 **Collected:** 2016/10/26
**Sample ID:** M315 - FILT R4 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4744594 | N/A | 2016/11/14 | Brenda Moore |

**Maxxam ID:** DKG386 **Collected:** 2016/10/26
**Sample ID:** M315 - R1 ACE/TOL 2W/T **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4744595 | 2016/11/11 | 2016/11/15 | Farag Farag |
| Final Volume of Acetone Probe Rinse | | 4757313 | N/A | 2016/11/21 | Brenda Moore |

**Maxxam ID:** DKG387 **Collected:** 2016/10/26
**Sample ID:** M315 - R3 ACE/TOL 2W/T **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4744595 | 2016/11/11 | 2016/11/15 | Farag Farag |
| Final Volume of Acetone Probe Rinse | | 4757313 | N/A | 2016/11/21 | Brenda Moore |

**Maxxam ID:** DKG388 **Collected:** 2016/10/26
**Sample ID:** M315 - R4 ACE/TOL 2W/T **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4744595 | 2016/11/11 | 2016/11/15 | Farag Farag |
| Final Volume of Acetone Probe Rinse | | 4757313 | N/A | 2016/11/21 | Brenda Moore |

**Maxxam ID:** DKG390 **Collected:** 2016/10/26
**Sample ID:** M315 - R1 BH IMP 3W/S **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates B. H. Water Imp. (M315) | BAL | 4746782 | 2016/11/14 | 2016/11/18 | Farag Farag |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

# TEST SUMMARY

**Maxxam ID:** DKG391 **Collected:** 2016/10/26
**Sample ID:** M315 - R3 BH IMP 3W/S **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates B. H. Water Imp. (M315) | BAL | 4746782 | 2016/11/14 | 2016/11/18 | Farag Farag |

**Maxxam ID:** DKG392 **Collected:** 2016/10/26
**Sample ID:** M315 - R4 BH IMP 3W/S **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Particulates B. H. Water Imp. (M315) | BAL | 4746782 | 2016/11/14 | 2016/11/18 | Farag Farag |

**Maxxam ID:** DKG394 **Collected:** 2016/10/25
**Sample ID:** M5/29 PEC- R1 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4740547 | 2016/11/09 | 2016/11/15 | Farag Farag |
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4742831 | N/A | 2016/11/11 | Brenda Moore |
| Final Volume of Acetone Probe Rinse | | 4740548 | N/A | 2016/11/11 | Farag Farag |

**Maxxam ID:** DKG394 Dup **Collected:** 2016/10/25
**Sample ID:** M5/29 PEC- R1 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |

**Maxxam ID:** DKG395 **Collected:** 2016/10/25
**Sample ID:** M5/29 PEC- R2 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4740547 | 2016/11/09 | 2016/11/15 | Farag Farag |
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4742831 | N/A | 2016/11/11 | Brenda Moore |
| Final Volume of Acetone Probe Rinse | | 4740548 | N/A | 2016/11/11 | Farag Farag |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## TEST SUMMARY

**Maxxam ID:** DKG395 Dup
**Sample ID:** M5/29 PEC- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/17 | 2016/11/21 | Ron Morrison |

**Maxxam ID:** DKG396
**Sample ID:** M5/29 PEC- R3
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4740547 | 2016/11/09 | 2016/11/15 | Farag Farag |
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4742831 | N/A | 2016/11/11 | Brenda Moore |
| Final Volume of Acetone Probe Rinse | | 4740548 | N/A | 2016/11/11 | Farag Farag |

**Maxxam ID:** DKG396 Dup
**Sample ID:** M5/29 PEC- R3
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |

**Maxxam ID:** DKG474
**Sample ID:** M5/29 QUENCH- R1
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/26
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4740547 | 2016/11/09 | 2016/11/15 | Farag Farag |
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4742831 | N/A | 2016/11/11 | Brenda Moore |
| Final Volume of Acetone Probe Rinse | | 4740548 | N/A | 2016/11/11 | Farag Farag |

**Maxxam ID:** DKG474 Dup
**Sample ID:** M5/29 QUENCH- R1
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/26
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## TEST SUMMARY

**Maxxam ID:** DKG476
**Sample ID:** M5/29 QUENCH- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/26
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4740547 | 2016/11/09 | 2016/11/15 | Farag Farag |
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4742831 | N/A | 2016/11/11 | Brenda Moore |
| Final Volume of Acetone Probe Rinse | | 4740548 | N/A | 2016/11/11 | Farag Farag |

**Maxxam ID:** DKG477
**Sample ID:** M5/29 QUENCH- R3
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/26
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 3C in HCl Rinse | CV/AA | 4754482 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 2B in HNO3/H2O2 Imp. | CV/AA | 4754312 | 2016/11/18 | 2016/11/21 | Ron Morrison |
| Mercury 3B in KMnO4/H2SO4 Imp. | CV/AA | 4750856 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4750430 | 2016/11/16 | 2016/11/17 | Ron Morrison |
| Metals B.H. in H2O2/HNO3 Imp.(6020A) | ICP1/MS | 4746765 | 2016/11/14 | 2016/11/14 | Nan Raykha |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4750416 | 2016/11/16 | 2016/11/23 | Nan Raykha |
| Particulates/Acetone Rinse (M5/315/M201) | BAL | 4740547 | 2016/11/09 | 2016/11/15 | Farag Farag |
| Particulates/Filter (M5/315/NJATM1/M201) | BAL | 4742831 | N/A | 2016/11/11 | Brenda Moore |
| Final Volume of Acetone Probe Rinse | | 4740548 | N/A | 2016/11/11 | Farag Farag |

**Maxxam ID:** DMT409
**Sample ID:** M5/29 FH- RINSE- PEC- R1
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |

**Maxxam ID:** DMT409 Dup
**Sample ID:** M5/29 FH- RINSE- PEC- R1
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |

**Maxxam ID:** DMT416
**Sample ID:** M5/29 FH- RINSE- PEC- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## TEST SUMMARY

**Maxxam ID:** DMT416 Dup
**Sample ID:** M5/29 FH- RINSE- PEC- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |

**Maxxam ID:** DMT417
**Sample ID:** M5/29 FH- RINSE- PEC- R3
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |

**Maxxam ID:** DMT418
**Sample ID:** M5/29 FH- RINSE- QUENCH- R1
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |

**Maxxam ID:** DMT419
**Sample ID:** M5/29 FH- RINSE- QUENCH- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |

**Maxxam ID:** DMT420
**Sample ID:** M5/29 FH- RINSE- QUENCH- R3
**Matrix:** Stack Sampling Train

**Collected:** 2016/10/25
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury 1B in Filter + Rinse (M29) | CV/AA | 4762091 | 2016/11/23 | 2016/11/21 | Ron Morrison |
| Metals F.H. in Filter + Rinses (6020A) | ICP1/MS | 4762094 | 2016/11/18 | 2016/11/23 | Nan Raykha |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## GENERAL COMMENTS

Sample DKG382 [M315 - FILT R1] : LPC Loose particulate material in the petri dish

Sample DKG383 [M315 - FILT R3] : LPC Loose particulate material in the petri dish

Sample DKG384 [M315 - FILT R4] : LPC Loose particulate material in the petri dish

Sample DKG474 [M5/29 QUENCH- R1] : LPC Loose particulate material in the petri dish
WS4746765: The Hg cut for this sample was analyzed on 2016-11-15 to confirm data (Cr data obtained =125 ug, Mn = 104 ug))

Sample DKG476 [M5/29 QUENCH- R2] : LPC Loose particulate material in the petri dish

Sample DKG477 [M5/29 QUENCH- R3] : LPC Loose particulate material in the petri dish

**EPA M29 METALS (FRONT & BACK SEPARATE)**

Metals F.H. in Filter + Rinses (6020A): Extra dilution was required for some samples due to the matrix.
Post digestion duplicate and spike were done on sample DKG394.
Metals B.H. in H2O2/HNO3 Imp.(6020A): Extra 2x dilution was required for all samples due to the matrix.
Post digestion duplicate and spike were done on sample DKG394.
Metals F.H. in Filter + Rinses (6020A): Post digestion duplicate and spike were done on sample DMT409.
CCV recovery for Se range from 99.5% to 89.8%, data for Se may be slightly biased low

**EPA M29 MERCURY (STACK SAMPLING TRAIN)**

Mercury 1B in Filter + Rinse (M29): Due to lab error this front half fraction contains nitric rinses from the backhalf impinger.

Mercury 1B in Filter + Rinse (M29): Due to lab error this FH fraction contains nitric rinse only from the front half.

**Results relate only to the items tested.**



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4740547 | FF | Method Blank | Acetone Rinse Particulate Weight in Acetone | 2016/11/15 | <0.5 | | mg | |
| 4744595 | FF | Method Blank | Acetone Rinse DCM Extractable Material | 2016/11/15 | 7.60 | | mg | |
| | | | Acetone Rinse Particulate Weight in Acetone | 2016/11/15 | <0.5 | | mg | |
| 4746765 | N_R | Matrix Spike(DKG394) | Back Half Antimony (Sb) | 2016/11/14 | | 98 | % | 70 - 130 |
| | | | Back Half Arsenic (As) | 2016/11/14 | | 96 | % | 70 - 130 |
| | | | Back Half Beryllium (Be) | 2016/11/14 | | 98 | % | 70 - 130 |
| | | | Back Half Cadmium (Cd) | 2016/11/14 | | 97 | % | 70 - 130 |
| | | | Back Half Chromium (Cr) | 2016/11/14 | | 94 | % | 70 - 130 |
| | | | Back Half Cobalt (Co) | 2016/11/14 | | 97 | % | 70 - 130 |
| | | | Back Half Lead (Pb) | 2016/11/14 | | 101 | % | 70 - 130 |
| | | | Back Half Manganese (Mn) | 2016/11/14 | | 96 | % | 70 - 130 |
| | | | Back Half Nickel (Ni) | 2016/11/14 | | 95 | % | 70 - 130 |
| | | | Back Half Selenium (Se) | 2016/11/14 | | 97 | % | 70 - 130 |
| 4746765 | N_R | MS/MSD RPD | Back Half Antimony (Sb) | 2016/11/14 | 2.1 | | % | 20 |
| | | | Back Half Arsenic (As) | 2016/11/14 | 1.0 | | % | 20 |
| | | | Back Half Beryllium (Be) | 2016/11/14 | 0 | | % | 20 |
| | | | Back Half Cadmium (Cd) | 2016/11/14 | 1.0 | | % | 20 |
| | | | Back Half Chromium (Cr) | 2016/11/14 | 2.1 | | % | 20 |
| | | | Back Half Cobalt (Co) | 2016/11/14 | 2.0 | | % | 20 |
| | | | Back Half Lead (Pb) | 2016/11/14 | 0 | | % | 20 |
| | | | Back Half Manganese (Mn) | 2016/11/14 | 3.1 | | % | 20 |
| | | | Back Half Nickel (Ni) | 2016/11/14 | 1.0 | | % | 20 |
| | | | Back Half Selenium (Se) | 2016/11/14 | 1.0 | | % | 20 |
| 4746765 | N_R | Spiked Blank | Back Half Antimony (Sb) | 2016/11/14 | | 108 | % | 85 - 115 |
| | | | Back Half Arsenic (As) | 2016/11/14 | | 101 | % | 85 - 115 |
| | | | Back Half Beryllium (Be) | 2016/11/14 | | 105 | % | 85 - 115 |
| | | | Back Half Cadmium (Cd) | 2016/11/14 | | 104 | % | 85 - 115 |
| | | | Back Half Chromium (Cr) | 2016/11/14 | | 105 | % | 85 - 115 |
| | | | Back Half Cobalt (Co) | 2016/11/14 | | 104 | % | 85 - 115 |
| | | | Back Half Lead (Pb) | 2016/11/14 | | 103 | % | 85 - 115 |
| | | | Back Half Manganese (Mn) | 2016/11/14 | | 109 | % | 85 - 115 |
| | | | Back Half Nickel (Ni) | 2016/11/14 | | 104 | % | 85 - 115 |
| | | | Back Half Selenium (Se) | 2016/11/14 | | 97 | % | 85 - 115 |
| 4746765 | N_R | RPD | Back Half Antimony (Sb) | 2016/11/14 | 1.5 | | % | 20 |
| | | | Back Half Arsenic (As) | 2016/11/14 | 0.80 | | % | 20 |
| | | | Back Half Beryllium (Be) | 2016/11/14 | 0.40 | | % | 20 |
| | | | Back Half Cadmium (Cd) | 2016/11/14 | 0.39 | | % | 20 |
| | | | Back Half Chromium (Cr) | 2016/11/14 | 0.13 | | % | 20 |
| | | | Back Half Cobalt (Co) | 2016/11/14 | 1.1 | | % | 20 |
| | | | Back Half Lead (Pb) | 2016/11/14 | 1.2 | | % | 20 |
| | | | Back Half Manganese (Mn) | 2016/11/14 | 0.75 | | % | 20 |
| | | | Back Half Nickel (Ni) | 2016/11/14 | 1.5 | | % | 20 |
| | | | Back Half Selenium (Se) | 2016/11/14 | 1.2 | | % | 20 |
| 4746765 | N_R | Method Blank | Back Half Antimony (Sb) | 2016/11/14 | <0.20 | | ug | |
| | | | Back Half Arsenic (As) | 2016/11/14 | <0.20 | | ug | |
| | | | Back Half Beryllium (Be) | 2016/11/14 | <0.050 | | ug | |
| | | | Back Half Cadmium (Cd) | 2016/11/14 | <0.050 | | ug | |
| | | | Back Half Chromium (Cr) | 2016/11/14 | <0.15 | | ug | |
| | | | Back Half Cobalt (Co) | 2016/11/14 | <0.050 | | ug | |
| | | | Back Half Lead (Pb) | 2016/11/14 | <0.10 | | ug | |
| | | | Back Half Manganese (Mn) | 2016/11/14 | <0.25 | | ug | |
| | | | Back Half Nickel (Ni) | 2016/11/14 | <0.25 | | ug | |
| | | | Back Half Selenium (Se) | 2016/11/14 | <0.50 | | ug | |
| 4746765 | N_R | RPD - Sample/Sample Dup | Back Half Antimony (Sb) | 2016/11/14 | NC | | % | 20 |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Back Half Arsenic (As) | 2016/11/14 | NC | | % | 20 |
| | | | Back Half Beryllium (Be) | 2016/11/14 | NC | | % | 20 |
| | | | Back Half Cadmium (Cd) | 2016/11/14 | NC | | % | 20 |
| | | | Back Half Chromium (Cr) | 2016/11/14 | 2.0 | | % | 20 |
| | | | Back Half Cobalt (Co) | 2016/11/14 | NC | | % | 20 |
| | | | Back Half Lead (Pb) | 2016/11/14 | NC | | % | 20 |
| | | | Back Half Manganese (Mn) | 2016/11/14 | 1.4 | | % | 20 |
| | | | Back Half Nickel (Ni) | 2016/11/14 | 0.69 | | % | 20 |
| | | | Back Half Selenium (Se) | 2016/11/14 | NC | | % | 20 |
| 4746782 | FF | Method Blank | Back Half DCM Extractable Material | 2016/11/18 | 0.6, RDL=0.5 | | mg | |
| | | | Back Half DCM Extractable Material in Rinse | 2016/11/18 | <0.5 | | mg | |
| 4750416 | N_R | Matrix Spike(DKG394) | Front Half Antimony (Sb) | 2016/11/23 | | 103 | % | 70 - 130 |
| | | | Front Half Arsenic (As) | 2016/11/23 | | 98 | % | 70 - 130 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | | 99 | % | 70 - 130 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | | 102 | % | 70 - 130 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | | 108 | % | 70 - 130 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | | 103 | % | 70 - 130 |
| | | | Front Half Lead (Pb) | 2016/11/23 | | 103 | % | 70 - 130 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | | 105 | % | 70 - 130 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | | 100 | % | 70 - 130 |
| | | | Front Half Selenium (Se) | 2016/11/23 | | 100 | % | 70 - 130 |
| 4750416 | N_R | MS/MSD RPD | Front Half Antimony (Sb) | 2016/11/23 | 2.0 | | % | 20 |
| | | | Front Half Arsenic (As) | 2016/11/23 | 2.0 | | % | 20 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | 6.3 | | % | 20 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | 3.0 | | % | 20 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | 2.7 | | % | 20 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | 0.98 | | % | 20 |
| | | | Front Half Lead (Pb) | 2016/11/23 | 2.9 | | % | 20 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | 3.7 | | % | 20 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | 3.0 | | % | 20 |
| | | | Front Half Selenium (Se) | 2016/11/23 | 2.0 | | % | 20 |
| 4750416 | N_R | Spiked Blank | Front Half Antimony (Sb) | 2016/11/23 | | 99 | % | 85 - 115 |
| | | | Front Half Arsenic (As) | 2016/11/23 | | 99 | % | 85 - 115 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | | 93 | % | 85 - 115 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | | 99 | % | 85 - 115 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | | 102 | % | 85 - 115 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | | 101 | % | 85 - 115 |
| | | | Front Half Lead (Pb) | 2016/11/23 | | 102 | % | 85 - 115 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | | 101 | % | 85 - 115 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | | 100 | % | 85 - 115 |
| | | | Front Half Selenium (Se) | 2016/11/23 | | 98 | % | 85 - 115 |
| 4750416 | N_R | RPD | Front Half Antimony (Sb) | 2016/11/23 | 0.31 | | % | 20 |
| | | | Front Half Arsenic (As) | 2016/11/23 | 3.4 | | % | 20 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | 4.7 | | % | 20 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | 4.1 | | % | 20 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | 1.4 | | % | 20 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | 1.2 | | % | 20 |
| | | | Front Half Lead (Pb) | 2016/11/23 | 0.41 | | % | 20 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | 0.72 | | % | 20 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | 1.2 | | % | 20 |
| | | | Front Half Selenium (Se) | 2016/11/23 | 0.68 | | % | 20 |
| 4750416 | N_R | Method Blank | Front Half Antimony (Sb) | 2016/11/23 | <0.80 | | ug | |
| | | | Front Half Arsenic (As) | 2016/11/23 | <0.80 | | ug | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Front Half Beryllium (Be) | 2016/11/23 | <0.20 | | ug | |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | <0.20 | | ug | |
| | | | Front Half Chromium (Cr) | 2016/11/23 | <0.60 | | ug | |
| | | | Front Half Cobalt (Co) | 2016/11/23 | <0.20 | | ug | |
| | | | Front Half Lead (Pb) | 2016/11/23 | <0.40 | | ug | |
| | | | Front Half Manganese (Mn) | 2016/11/23 | <1.5 | | ug | |
| | | | Front Half Nickel (Ni) | 2016/11/23 | <1.0 | | ug | |
| | | | Front Half Selenium (Se) | 2016/11/23 | <2.0 | | ug | |
| 4750416 | N_R | RPD - Sample/Sample Dup | Front Half Antimony (Sb) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Arsenic (As) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | 2.5 | | % | 20 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Lead (Pb) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | 2.8 | | % | 20 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | 2.2 | | % | 20 |
| | | | Front Half Selenium (Se) | 2016/11/23 | NC | | % | 20 |
| 4750430 | RON | Reagent Blank | 1B Mercury (Hg) | 2016/11/17 | <0.015 | | ug | |
| 4750430 | RON | Matrix Spike(DKG395) | 1B Mercury (Hg) | 2016/11/17 | | 101 | % | 85 - 115 |
| 4750430 | RON | MS/MSD RPD | 1B Mercury (Hg) | 2016/11/21 | 1.7 | | % | 20 |
| 4750430 | RON | Spiked Blank | 1B Mercury (Hg) | 2016/11/17 | | 99 | % | 90 - 110 |
| 4750430 | RON | RPD | 1B Mercury (Hg) | 2016/11/21 | 1.3 | | % | 20 |
| 4750430 | RON | Method Blank | 1B Mercury (Hg) | 2016/11/17 | <0.015 | | ug | |
| 4750430 | RON | RPD - Sample/Sample Dup | 1B Mercury (Hg) | 2016/11/21 | NC | | % | 20 |
| 4750856 | RON | Reagent Blank | 3B Mercury (Hg) | 2016/11/17 | <0.013 | | ug | |
| 4750856 | RON | Matrix Spike(DKG395) | 3B Mercury (Hg) | 2016/11/17 | | 97 | % | 85 - 115 |
| 4750856 | RON | MS/MSD RPD | 3B Mercury (Hg) | 2016/11/17 | 0.92 | | % | 20 |
| 4750856 | RON | Spiked Blank | 3B Mercury (Hg) | 2016/11/17 | | 99 | % | 90 - 110 |
| 4750856 | RON | RPD | 3B Mercury (Hg) | 2016/11/17 | 0.91 | | % | 20 |
| 4750856 | RON | Method Blank | 3B Mercury (Hg) | 2016/11/17 | <0.013 | | ug | |
| 4750856 | RON | RPD - Sample/Sample Dup | 3B Mercury (Hg) | 2016/11/17 | NC | | % | 20 |
| 4754312 | RON | Matrix Spike(DKG396) | 2B Mercury (Hg) | 2016/11/21 | | 105 | % | 85 - 115 |
| 4754312 | RON | MS/MSD RPD | 2B Mercury (Hg) | 2016/11/21 | 1.4 | | % | 20 |
| 4754312 | RON | Spiked Blank | 2B Mercury (Hg) | 2016/11/21 | | 105 | % | 90 - 110 |
| 4754312 | RON | RPD | 2B Mercury (Hg) | 2016/11/21 | 0.19 | | % | 20 |
| 4754312 | RON | Method Blank | 2B Mercury (Hg) | 2016/11/21 | <0.015 | | ug | |
| 4754312 | RON | RPD - Sample/Sample Dup | 2B Mercury (Hg) | 2016/11/21 | NC | | % | 20 |
| 4754482 | RON | Reagent Blank | 3C Mercury (Hg) | 2016/11/21 | <0.013 | | ug | |
| 4754482 | RON | Matrix Spike(DKG474) | 3C Mercury (Hg) | 2016/11/21 | | 98 | % | 85 - 115 |
| 4754482 | RON | MS/MSD RPD | 3C Mercury (Hg) | 2016/11/21 | 0.51 | | % | 20 |
| 4754482 | RON | Spiked Blank | 3C Mercury (Hg) | 2016/11/21 | | 104 | % | 90 - 110 |
| 4754482 | RON | RPD | 3C Mercury (Hg) | 2016/11/21 | 1.8 | | % | 20 |
| 4754482 | RON | Method Blank | 3C Mercury (Hg) | 2016/11/21 | <0.013 | | ug | |
| 4754482 | RON | RPD - Sample/Sample Dup | 3C Mercury (Hg) | 2016/11/21 | NC | | % | 20 |
| 4762091 | RON | Reagent Blank | 1B Mercury (Hg) | 2016/11/21 | <0.015 | | ug | |
| 4762091 | RON | Matrix Spike(DMT416) | 1B Mercury (Hg) | 2016/11/21 | | 104 | % | 85 - 115 |
| 4762091 | RON | MS/MSD RPD | 1B Mercury (Hg) | 2016/11/21 | 1.2 | | % | 20 |
| 4762091 | RON | Spiked Blank | 1B Mercury (Hg) | 2016/11/21 | | 106 | % | 90 - 110 |
| 4762091 | RON | RPD | 1B Mercury (Hg) | 2016/11/21 | 2.0 | | % | 20 |
| 4762091 | RON | Method Blank | 1B Mercury (Hg) | 2016/11/21 | <0.015 | | ug | |
| 4762091 | RON | RPD - Sample/Sample Dup | 1B Mercury (Hg) | 2016/11/21 | NC | | % | 20 |
| 4762094 | N_R | Matrix Spike(DMT409) | Front Half Antimony (Sb) | 2016/11/23 | | 103 | % | 70 - 130 |
| | | | Front Half Arsenic (As) | 2016/11/23 | | 97 | % | 70 - 130 |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Front Half Beryllium (Be) | 2016/11/23 | | 104 | % | 70 - 130 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | | 99 | % | 70 - 130 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | | 94 | % | 70 - 130 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | | 100 | % | 70 - 130 |
| | | | Front Half Lead (Pb) | 2016/11/23 | | 93 | % | 70 - 130 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | | 100 | % | 70 - 130 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | | 103 | % | 70 - 130 |
| | | | Front Half Selenium (Se) | 2016/11/23 | | 96 | % | 70 - 130 |
| 4762094 | N_R | MS/MSD RPD | Front Half Antimony (Sb) | 2016/11/23 | 5.0 | | % | 20 |
| | | | Front Half Arsenic (As) | 2016/11/23 | 4.2 | | % | 20 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | 4.9 | | % | 20 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | 1.0 | | % | 20 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | 2.2 | | % | 20 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | 0 | | % | 20 |
| | | | Front Half Lead (Pb) | 2016/11/23 | 4.4 | | % | 20 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | 1.0 | | % | 20 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | 6.0 | | % | 20 |
| | | | Front Half Selenium (Se) | 2016/11/23 | 1.0 | | % | 20 |
| 4762094 | N_R | Spiked Blank | Front Half Antimony (Sb) | 2016/11/23 | | 105 | % | 85 - 115 |
| | | | Front Half Arsenic (As) | 2016/11/23 | | 98 | % | 85 - 115 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | | 101 | % | 85 - 115 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | | 106 | % | 85 - 115 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | | 101 | % | 85 - 115 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | | 106 | % | 85 - 115 |
| | | | Front Half Lead (Pb) | 2016/11/23 | | 92 | % | 85 - 115 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | | 101 | % | 85 - 115 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | | 105 | % | 85 - 115 |
| | | | Front Half Selenium (Se) | 2016/11/23 | | 101 | % | 85 - 115 |
| 4762094 | N_R | RPD | Front Half Antimony (Sb) | 2016/11/23 | 11 | | % | 20 |
| | | | Front Half Arsenic (As) | 2016/11/23 | 2.3 | | % | 20 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | 0.74 | | % | 20 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | 8.5 | | % | 20 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | 0.53 | | % | 20 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | 5.6 | | % | 20 |
| | | | Front Half Lead (Pb) | 2016/11/23 | 1.4 | | % | 20 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | 2.6 | | % | 20 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | 4.4 | | % | 20 |
| | | | Front Half Selenium (Se) | 2016/11/23 | 1.1 | | % | 20 |
| 4762094 | N_R | Method Blank | Front Half Antimony (Sb) | 2016/11/23 | <0.80 | | ug | |
| | | | Front Half Arsenic (As) | 2016/11/23 | <0.80 | | ug | |
| | | | Front Half Beryllium (Be) | 2016/11/23 | <0.20 | | ug | |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | <0.20 | | ug | |
| | | | Front Half Chromium (Cr) | 2016/11/23 | <0.60 | | ug | |
| | | | Front Half Cobalt (Co) | 2016/11/23 | <0.20 | | ug | |
| | | | Front Half Lead (Pb) | 2016/11/23 | <0.40 | | ug | |
| | | | Front Half Manganese (Mn) | 2016/11/23 | <1.5 | | ug | |
| | | | Front Half Nickel (Ni) | 2016/11/23 | <1.0 | | ug | |
| | | | Front Half Selenium (Se) | 2016/11/23 | <2.0 | | ug | |
| 4762094 | N_R | RPD - Sample/Sample Dup | Front Half Antimony (Sb) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Arsenic (As) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Beryllium (Be) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Cadmium (Cd) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Chromium (Cr) | 2016/11/23 | 7.1 | | % | 20 |
| | | | Front Half Cobalt (Co) | 2016/11/23 | NC | | % | 20 |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Front Half Lead (Pb) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Manganese (Mn) | 2016/11/23 | NC | | % | 20 |
| | | | Front Half Nickel (Ni) | 2016/11/23 | 4.1 | | % | 20 |
| | | | Front Half Selenium (Se) | 2016/11/23 | NC | | % | 20 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Reagent Blank: A blank matrix containing all reagents used in the analytical procedure. Used to determine any analytical contamination.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2329
Report Date: 2016/11/25

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Frank Mo, B.Sc., Inorganic Lab. Manager

Ralph Siebert, Operations Manager - Inorganic Analyses

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

B602329

Chain of Custody Form

Maxxam

6740 Campobello Rd
Mississauga Ontario L5N 2L8
www.maxxamanalytics.com
Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

**CLIENT INFORMATION**

Company Name: ArcelorMittal Monessen
Project Manager: William Lowell
e-mail: wlowell@montrose-env.com
Address: 1050 William Pitt Way
Pittsburgh PA 15238

**SECTION**

Phone: 412 826 3636 Fax: —
Sampled by: John Lukas

**ANALYSIS REQUESTED**

| Field Sample ID | Total Volume Sampled | Flow Rate | Collection Date | Sample Collection Time | RM 5/29 Parameters emailed | RM 23/0010 Parameters emailed | RM 315 TSO Parameters emailed |
|---|---|---|---|---|---|---|---|
| PEC Stack RM 5/29 Run 1,2 & 3 | ~105 dcf | 150 | 10/25/16 10/28/16 | ~120 min | ✓ | | |
| Quench Stack RM 23/0010 Run 1,2 & 3 | ~140 dcf | 150 | 10/28/16 11/1/16 | ~180 min | | ✓ | |
| Quench RM 315 TSO Run 1,2 & 3 | ~71 dcf | 150 | 10/29/16 11/1/16 | ~180 min | | | ✓ |

**TAT Requirement**

STD 10 Business day ✓
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

**PROJECT INFORMATION**

Project #:
Name:
PO #:
Maxxam Quote #:
Maxxam Contact:

**REPORTING REQUIREMENTS**

Summary Report only ☐
EDD ☐
Regulation

**Notes**

**PROJECT SPECIFIC COMMENTS**

Client Signature: John Lukas
Affiliation: Montrose
Date/Time: 11/7/16 1200

Received by: [signature] JAYODA PERERA
Affiliation: MAXXAM
Date/Time: 11-7-16 1200PM 2016 11 07 18 30

9-3/73/61

Maxxam

6740 Campobello Rd
Mississauga Ontario L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

ANALYSIS REQUESTED

**CLIENT INFORMATION**

Company Name: ArcelorMittal Monessen
Project Manager: William Cowell
e-mail: wcowell@montrose-env.com
Address: 1050 William Pitt Way
Pittsburgh PA 15238

**SECTION**

Phone: 412 820 3611 Fax: —
Sampled by: John Wilson

| Field Sample ID | Total Volume Sampled | Flow Rate | Collection Date | Sample Collection Time | JM 5/29 Parameters e-mail |
|---|---|---|---|---|---|
| PEC Stack AM 5/29 Run 1, 2 and 3 | ~105 dcf | 150 | 10/26/16 11/1/16 | ~120 min | ✓ |
| Quench Tower AM 5/29 Run 1, 3, and 4 | ~105 dcf | 150 | 10/27/16 10/31/16 | ~120 min | ✓ |

**TAT Requirement**

STD 10 Business day ☑
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

**PROJECT INFORMATION**

Project # 106377 (16-167
Name William Cowell
PO #: —
Maxxam Quote #: —
Maxxam Contact: Clayton Johnson

**REPORTING REQUIREMENTS**

Summary Report only ☐
EDD ☐
Regulation

**Notes**

**PROJECT SPECIFIC COMMENTS**

Quench tower Run 2 MS/29 voided

Client Signature: John Wilson
Affiliation: Montrose
Date/Time: 11/7/16 1200

Received by: [signature] JAYODA PERERA
Affiliation: MAXXAM
Date/Time: 11-7-16 1200 EM

2016-11-07
15:30

COC-1031 (04/13) - A

# Methods 0010/23

Maxxam
A Bureau Veritas Group Company

Your Project #: 106377/ (16-167)
Your C.O.C. #: 23262

**Attention:John Wilson**

Montrose Air Quality Services, LLC
ACCI Pittsburg, PA
1050 William Pitt Way
Pittsburgh, PA
USA 15238

**Report Date: 2016/12/02**
Report #: R4271803
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B6O1812**
**Received: 2016/11/07, 18:30**

Sample Matrix: Stack Sampling Train
# Samples Received: 6

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | 5 | 2016/11/09 | 2016/11/24 | BRL SOP-00200 | EPA 8270D/M0010 m |
| SVOCs in MM5 SamplingTrain (EPA0010) | 1 | 2016/11/09 | 2016/11/25 | BRL SOP-00200 | EPA 8270D/M0010 m |
| 2,3,7,8-TCDF Confirmation (M23) | 4 | N/A | 2016/12/01 | BRL SOP-00404 | EPA M23/23A m |
| Dioxins/Furans in Air (Method 23) | 6 | 2016/11/09 | 2016/11/30 | BRL SOP-00404 | EPA M23/23A m |

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Your Project #: 106377/ (16-167)
Your C.O.C. #: 23262

**Attention:John Wilson**

Montrose Air Quality Services, LLC
ACCI Pittsburg, PA
1050 William Pitt Way
Pittsburgh, PA
USA 15238

**Report Date: 2016/12/02**
Report #: R4271803
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B6O1812**
**Received: 2016/11/07, 18:30**

Encryption Key

Clayton Johnson
Project Manager - Air Toxics, Source Evaluation
02 Dec 2016 13:54:10

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC905 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- PEC-R1** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Dioxins & Furans** | | | | | | | | | |
| 2,3,7,8-Tetra CDD * | pg | <3.4 | 3.4 | 30 | 6.0 | 1.00 | 3.40 | | 4767357 |
| 1,2,3,7,8-Penta CDD * | pg | <3.2 | 3.2 | 30 | 6.0 | 1.00 | 3.20 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDD * | pg | <3.2 | 3.2 | 30 | 6.0 | 0.100 | 0.320 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDD * | pg | <3.2 | 3.2 | 30 | 6.0 | 0.100 | 0.320 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDD * | pg | <2.9 | 2.9 | 30 | 6.0 | 0.100 | 0.290 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDD * | pg | 5.6 | 3.1 | 30 | 9.0 | 0.0100 | 0.0560 | | 4767357 |
| Total Tetra CDD * | pg | <3.4 | 3.4 | 30 | N/A | | | 0 | 4767357 |
| Total Penta CDD * | pg | <3.2 | 3.2 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDD * | pg | <13 (1) | 13 | 30 | N/A | | | 0 | 4767357 |
| Total Hepta CDD * | pg | 13.1 | 3.1 | 30 | N/A | | | 2 | 4767357 |
| 2,3,7,8-Tetra CDF ** | pg | 7.4 | 3.5 | 30 | 6.0 | 0.100 | 0.740 | | 4767357 |
| 1,2,3,7,8-Penta CDF ** | pg | <4.3 | 4.3 | 30 | 6.0 | 0.0300 | 0.129 | | 4767357 |
| 2,3,4,7,8-Penta CDF ** | pg | <4.3 | 4.3 | 30 | 6.0 | 0.300 | 1.29 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDF ** | pg | <2.9 | 2.9 | 30 | 6.0 | 0.100 | 0.290 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDF ** | pg | <2.7 | 2.7 | 30 | 6.0 | 0.100 | 0.270 | | 4767357 |
| 2,3,4,6,7,8-Hexa CDF ** | pg | <3.0 | 3.0 | 30 | 6.0 | 0.100 | 0.300 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDF ** | pg | <3.2 | 3.2 | 30 | 6.0 | 0.100 | 0.320 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDF ** | pg | 4.1 | 2.8 | 30 | 9.0 | 0.0100 | 0.0410 | | 4767357 |
| 1,2,3,4,7,8,9-Hepta CDF ** | pg | <3.3 | 3.3 | 30 | 6.0 | 0.0100 | 0.0330 | | 4767357 |
| Total Tetra CDF ** | pg | 17.0 | 3.5 | 30 | N/A | | | 3 | 4767357 |
| Total Penta CDF ** | pg | <4.3 | 4.3 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDF ** | pg | <2.9 | 2.9 | 30 | N/A | | | 0 | 4767357 |
| Total Hepta CDF ** | pg | 4.1 | 3.0 | 30 | N/A | | | 1 | 4767357 |
| TOTAL TOXIC EQUIVALENCY | pg | | | | | | 11.0 | | |

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC905 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- PEC-R1** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Surrogate Recovery (%)** | | | | | | | | | |
| C13-1234678 HeptaCDD * | % | 79 | | | | | | | 4767357 |
| C13-1234678 HeptaCDF ** | % | 72 | | | | | | | 4767357 |
| C13-123478 HexaCDD * | % | 106 | | | | | | | 4767357 |
| C13-123478 HexaCDF ** | % | 89 | | | | | | | 4767357 |
| C13-1234789 HeptaCDF ** | % | 98 | | | | | | | 4767357 |
| C13-123678 HexaCDD * | % | 94 | | | | | | | 4767357 |
| C13-123678 HexaCDF ** | % | 84 | | | | | | | 4767357 |
| C13-12378 PentaCDD * | % | 81 | | | | | | | 4767357 |
| C13-12378 PentaCDF ** | % | 89 | | | | | | | 4767357 |
| C13-123789 HexaCDF ** | % | 66 | | | | | | | 4767357 |
| C13-23478 PentaCDF ** | % | 102 | | | | | | | 4767357 |
| C13-2378 TetraCDD * | % | 106 | | | | | | | 4767357 |
| C13-2378 TetraCDF ** | % | 89 | | | | | | | 4767357 |
| C13-Octachlorodibenzo-p-Dioxin | % | 75 | | | | | | | 4767357 |
| Cl37-2378 TetraCDD * | % | 101 | | | | | | | 4767357 |

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

** CDF = Chloro Dibenzo-p-Furan



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC906 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- PEC-R2** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Dioxins & Furans** | | | | | | | | | |
| 2,3,7,8-Tetra CDD * | pg | <3.7 | 3.7 | 30 | 6.0 | 1.00 | 3.70 | | 4767357 |
| 1,2,3,7,8-Penta CDD * | pg | <3.8 | 3.8 | 30 | 6.0 | 1.00 | 3.80 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDD * | pg | <3.3 | 3.3 | 30 | 6.0 | 0.100 | 0.330 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDD * | pg | <3.3 | 3.3 | 30 | 6.0 | 0.100 | 0.330 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDD * | pg | <3.0 | 3.0 | 30 | 6.0 | 0.100 | 0.300 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDD * | pg | 6.0 | 4.0 | 30 | 9.0 | 0.0100 | 0.0600 | | 4767357 |
| Total Tetra CDD * | pg | 17.5 | 3.7 | 30 | N/A | | | 2 | 4767357 |
| Total Penta CDD * | pg | <14 (1) | 14 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDD * | pg | 5.3 | 3.2 | 30 | N/A | | | 1 | 4767357 |
| Total Hepta CDD * | pg | 6.0 | 4.0 | 30 | N/A | | | 1 | 4767357 |
| 2,3,7,8-Tetra CDF ** | pg | 36.0 | 3.6 | 30 | 6.0 | 0.100 | 3.60 | | 4767357 |
| 1,2,3,7,8-Penta CDF ** | pg | 4.5 | 3.9 | 30 | 6.0 | 0.0300 | 0.135 | | 4767357 |
| 2,3,4,7,8-Penta CDF ** | pg | 9.3 | 3.9 | 30 | 6.0 | 0.300 | 2.79 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDF ** | pg | 17.5 | 3.8 | 30 | 6.0 | 0.100 | 1.75 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDF ** | pg | 5.5 | 3.6 | 30 | 6.0 | 0.100 | 0.550 | | 4767357 |
| 2,3,4,6,7,8-Hexa CDF ** | pg | 5.5 | 4.0 | 30 | 6.0 | 0.100 | 0.550 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDF ** | pg | <4.2 | 4.2 | 30 | 6.0 | 0.100 | 0.420 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDF ** | pg | 15.1 | 2.6 | 30 | 9.0 | 0.0100 | 0.151 | | 4767357 |
| 1,2,3,4,7,8,9-Hepta CDF ** | pg | <3.1 | 3.1 | 30 | 6.0 | 0.0100 | 0.0310 | | 4767357 |
| Total Tetra CDF ** | pg | 103 | 3.6 | 30 | N/A | | | 8 | 4767357 |
| Total Penta CDF ** | pg | 79.7 | 3.9 | 30 | N/A | | | 5 | 4767357 |
| Total Hexa CDF ** | pg | 45.2 | 3.9 | 30 | N/A | | | 4 | 4767357 |
| Total Hepta CDF ** | pg | 15.1 | 2.8 | 30 | N/A | | | 1 | 4767357 |
| **TCDF Confirmation** | | | | | | | | | |
| Confirmation 2,3,7,8-Tetra CDF ** | pg | 22.1 | 3.5 | 30 | N/A | 0.100 | 2.21 | | 4775791 |
| TOTAL TOXIC EQUIVALENCY | pg | | | | | | 17.1 | | |

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC906 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- PEC-R2** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Surrogate Recovery (%)** | | | | | | | | | |
| Confirmation C13-2378 TetraCDF ** | % | 100 | | | | | | | 4775791 |
| C13-1234678 HeptaCDD * | % | 70 | | | | | | | 4767357 |
| C13-1234678 HeptaCDF ** | % | 68 | | | | | | | 4767357 |
| C13-123478 HexaCDD * | % | 104 | | | | | | | 4767357 |
| C13-123478 HexaCDF ** | % | 97 | | | | | | | 4767357 |
| C13-1234789 HeptaCDF ** | % | 97 | | | | | | | 4767357 |
| C13-123678 HexaCDD * | % | 91 | | | | | | | 4767357 |
| C13-123678 HexaCDF ** | % | 75 | | | | | | | 4767357 |
| C13-12378 PentaCDD * | % | 80 | | | | | | | 4767357 |
| C13-12378 PentaCDF ** | % | 87 | | | | | | | 4767357 |
| C13-123789 HexaCDF ** | % | 67 | | | | | | | 4767357 |
| C13-23478 PentaCDF ** | % | 100 | | | | | | | 4767357 |
| C13-2378 TetraCDD * | % | 111 | | | | | | | 4767357 |
| C13-2378 TetraCDF ** | % | 92 | | | | | | | 4767357 |
| C13-Octachlorodibenzo-p-Dioxin | % | 74 | | | | | | | 4767357 |
| Cl37-2378 TetraCDD * | % | 97 | | | | | | | 4767357 |

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

** CDF = Chloro Dibenzo-p-Furan

* CDD = Chloro Dibenzo-p-Dioxin



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC907 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- PEC-R3** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Dioxins & Furans** | | | | | | | | | |
| 2,3,7,8-Tetra CDD * | pg | <3.4 | 3.4 | 30 | 6.0 | 1.00 | 3.40 | | 4767357 |
| 1,2,3,7,8-Penta CDD * | pg | <3.0 | 3.0 | 30 | 6.0 | 1.00 | 3.00 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDD * | pg | <3.0 | 3.0 | 30 | 6.0 | 0.100 | 0.300 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDD * | pg | <3.0 | 3.0 | 30 | 6.0 | 0.100 | 0.300 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDD * | pg | <2.8 | 2.8 | 30 | 6.0 | 0.100 | 0.280 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDD * | pg | 5.0 | 3.6 | 30 | 9.0 | 0.0100 | 0.0500 | | 4767357 |
| Total Tetra CDD * | pg | <4.7 (1) | 4.7 | 30 | N/A | | | 0 | 4767357 |
| Total Penta CDD * | pg | <3.0 | 3.0 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDD * | pg | <7.8 (1) | 7.8 | 30 | N/A | | | 0 | 4767357 |
| Total Hepta CDD * | pg | 5.0 | 3.6 | 30 | N/A | | | 1 | 4767357 |
| 2,3,7,8-Tetra CDF ** | pg | 3.9 (2) | 3.9 | 30 | 6.0 | 0.100 | 0.390 | | 4767357 |
| 1,2,3,7,8-Penta CDF ** | pg | <2.7 | 2.7 | 30 | 6.0 | 0.0300 | 0.0810 | | 4767357 |
| 2,3,4,7,8-Penta CDF ** | pg | <2.7 | 2.7 | 30 | 6.0 | 0.300 | 0.810 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDF ** | pg | <3.3 | 3.3 | 30 | 6.0 | 0.100 | 0.330 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDF ** | pg | <3.2 | 3.2 | 30 | 6.0 | 0.100 | 0.320 | | 4767357 |
| 2,3,4,6,7,8-Hexa CDF ** | pg | <3.5 | 3.5 | 30 | 6.0 | 0.100 | 0.350 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDF ** | pg | <3.6 | 3.6 | 30 | 6.0 | 0.100 | 0.360 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDF ** | pg | 3.1 | 2.6 | 30 | 9.0 | 0.0100 | 0.0310 | | 4767357 |
| 1,2,3,4,7,8,9-Hepta CDF ** | pg | <3.1 | 3.1 | 30 | 6.0 | 0.0100 | 0.0310 | | 4767357 |
| Total Tetra CDF ** | pg | 3.9 | 3.9 | 30 | N/A | | | 1 | 4767357 |
| Total Penta CDF ** | pg | <2.7 | 2.7 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDF ** | pg | <3.4 | 3.4 | 30 | N/A | | | 0 | 4767357 |
| Total Hepta CDF ** | pg | 3.1 | 2.8 | 30 | N/A | | | 1 | 4767357 |
| TOTAL TOXIC EQUIVALENCY | pg | | | | | | 10.0 | | |

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

(2) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC907 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- PEC-R3** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Surrogate Recovery (%)** | | | | | | | | | |
| C13-1234678 HeptaCDD * | % | 62 | | | | | | | 4767357 |
| C13-1234678 HeptaCDF ** | % | 60 | | | | | | | 4767357 |
| C13-123478 HexaCDD * | % | 103 | | | | | | | 4767357 |
| C13-123478 HexaCDF ** | % | 99 | | | | | | | 4767357 |
| C13-1234789 HeptaCDF ** | % | 96 | | | | | | | 4767357 |
| C13-123678 HexaCDD * | % | 84 | | | | | | | 4767357 |
| C13-123678 HexaCDF ** | % | 66 | | | | | | | 4767357 |
| C13-12378 PentaCDD * | % | 74 | | | | | | | 4767357 |
| C13-12378 PentaCDF ** | % | 77 | | | | | | | 4767357 |
| C13-123789 HexaCDF ** | % | 65 | | | | | | | 4767357 |
| C13-23478 PentaCDF ** | % | 104 | | | | | | | 4767357 |
| C13-2378 TetraCDD * | % | 95 | | | | | | | 4767357 |
| C13-2378 TetraCDF ** | % | 80 | | | | | | | 4767357 |
| C13-Octachlorodibenzo-p-Dioxin | % | 61 | | | | | | | 4767357 |
| Cl37-2378 TetraCDD * | % | 93 | | | | | | | 4767357 |

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

** CDF = Chloro Dibenzo-p-Furan



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC954 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- QUENCH-R1** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Dioxins & Furans** | | | | | | | | | |
| 2,3,7,8-Tetra CDD * | pg | <3.2 | 3.2 | 30 | 6.0 | 1.00 | 3.20 | | 4767357 |
| 1,2,3,7,8-Penta CDD * | pg | <5.6 | 5.6 | 30 | 6.0 | 1.00 | 5.60 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDD * | pg | <3.6 | 3.6 | 30 | 6.0 | 0.100 | 0.360 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDD * | pg | 11.0 | 3.7 | 30 | 6.0 | 0.100 | 1.10 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDD * | pg | 13.2 (1) | 3.4 | 30 | 6.0 | 0.100 | 1.32 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDD * | pg | 289 | 3.5 | 30 | 9.0 | 0.0100 | 2.89 | | 4767357 |
| Total Tetra CDD * | pg | <6.8 (2) | 6.8 | 30 | N/A | | | 0 | 4767357 |
| Total Penta CDD * | pg | <18 (3) | 18 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDD * | pg | 282 | 3.5 | 30 | N/A | | | 6 | 4767357 |
| Total Hepta CDD * | pg | 1590 | 3.5 | 30 | N/A | | | 2 | 4767357 |
| 2,3,7,8-Tetra CDF ** | pg | 31.2 | 3.7 | 30 | 6.0 | 0.100 | 3.12 | | 4767357 |
| 1,2,3,7,8-Penta CDF ** | pg | <4.4 | 4.4 | 30 | 6.0 | 0.0300 | 0.132 | | 4767357 |
| 2,3,4,7,8-Penta CDF ** | pg | <4.4 | 4.4 | 30 | 6.0 | 0.300 | 1.32 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDF ** | pg | 7.6 | 3.0 | 30 | 6.0 | 0.100 | 0.760 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDF ** | pg | <2.9 | 2.9 | 30 | 6.0 | 0.100 | 0.290 | | 4767357 |
| 2,3,4,6,7,8-Hexa CDF ** | pg | 3.9 | 3.1 | 30 | 6.0 | 0.100 | 0.390 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDF ** | pg | <3.3 | 3.3 | 30 | 6.0 | 0.100 | 0.330 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDF ** | pg | 19.7 | 3.3 | 30 | 9.0 | 0.0100 | 0.197 | | 4767357 |
| 1,2,3,4,7,8,9-Hepta CDF ** | pg | <3.9 | 3.9 | 30 | 6.0 | 0.0100 | 0.0390 | | 4767357 |
| Total Tetra CDF ** | pg | 51.0 | 3.7 | 30 | N/A | | | 3 | 4767357 |
| Total Penta CDF ** | pg | 9.8 | 4.4 | 30 | N/A | | | 1 | 4767357 |
| Total Hexa CDF ** | pg | 25.5 | 3.1 | 30 | N/A | | | 4 | 4767357 |
| Total Hepta CDF ** | pg | 66.3 | 3.5 | 30 | N/A | | | 2 | 4767357 |
| **TCDF Confirmation** | | | | | | | | | |
| Confirmation 2,3,7,8-Tetra CDF ** | pg | 28.8 | 3.8 | 30 | N/A | 0.100 | 2.88 | | 4775791 |

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical
(2) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.
(3) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.
RT>2 seconds - PCDD/DF analysis-Peak maxima of monitored ions exceeds 2 seconds



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC954 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- QUENCH-R1** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| TOTAL TOXIC EQUIVALENCY | pg | | | | | | 20.8 | | |
| **Surrogate Recovery (%)** | | | | | | | | | |
| Confirmation C13-2378 TetraCDF ** | % | 76 | | | | | | | 4775791 |
| C13-1234678 HeptaCDD * | % | 61 | | | | | | | 4767357 |
| C13-1234678 HeptaCDF ** | % | 56 | | | | | | | 4767357 |
| C13-123478 HexaCDD * | % | 96 | | | | | | | 4767357 |
| C13-123478 HexaCDF ** | % | 85 | | | | | | | 4767357 |
| C13-1234789 HeptaCDF ** | % | 98 | | | | | | | 4767357 |
| C13-123678 HexaCDD * | % | 78 | | | | | | | 4767357 |
| C13-123678 HexaCDF ** | % | 68 | | | | | | | 4767357 |
| C13-12378 PentaCDD * | % | 65 | | | | | | | 4767357 |
| C13-12378 PentaCDF ** | % | 67 | | | | | | | 4767357 |
| C13-123789 HexaCDF ** | % | 69 | | | | | | | 4767357 |
| C13-23478 PentaCDF ** | % | 107 | | | | | | | 4767357 |
| C13-2378 TetraCDD * | % | 89 | | | | | | | 4767357 |
| C13-2378 TetraCDF ** | % | 76 | | | | | | | 4767357 |
| C13-Octachlorodibenzo-p-Dioxin | % | 60 | | | | | | | 4767357 |
| Cl37-2378 TetraCDD * | % | 95 | | | | | | | 4767357 |

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
* CDD = Chloro Dibenzo-p-Dioxin



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC955 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- QUENCH-R3** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Dioxins & Furans** | | | | | | | | | |
| 2,3,7,8-Tetra CDD * | pg | <3.4 | 3.4 | 30 | 6.0 | 1.00 | 3.40 | | 4767357 |
| 1,2,3,7,8-Penta CDD * | pg | <4.3 | 4.3 | 30 | 6.0 | 1.00 | 4.30 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDD * | pg | <3.2 | 3.2 | 30 | 6.0 | 0.100 | 0.320 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDD * | pg | 11.6 | 3.3 | 30 | 6.0 | 0.100 | 1.16 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDD * | pg | 16.5 | 3.0 | 30 | 6.0 | 0.100 | 1.65 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDD * | pg | 215 | 3.0 | 30 | 9.0 | 0.0100 | 2.15 | | 4767357 |
| Total Tetra CDD * | pg | <3.4 | 3.4 | 30 | N/A | | | 0 | 4767357 |
| Total Penta CDD * | pg | 6.4 | 4.3 | 30 | N/A | | | 1 | 4767357 |
| Total Hexa CDD * | pg | 284 | 3.2 | 30 | N/A | | | 5 | 4767357 |
| Total Hepta CDD * | pg | 850 | 3.0 | 30 | N/A | | | 2 | 4767357 |
| 2,3,7,8-Tetra CDF ** | pg | 27.4 | 4.9 | 30 | 6.0 | 0.100 | 2.74 | | 4767357 |
| 1,2,3,7,8-Penta CDF ** | pg | <4.4 | 4.4 | 30 | 6.0 | 0.0300 | 0.132 | | 4767357 |
| 2,3,4,7,8-Penta CDF ** | pg | <4.4 | 4.4 | 30 | 6.0 | 0.300 | 1.32 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDF ** | pg | <4.1 | 4.1 | 30 | 6.0 | 0.100 | 0.410 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDF ** | pg | <3.9 | 3.9 | 30 | 6.0 | 0.100 | 0.390 | | 4767357 |
| 2,3,4,6,7,8-Hexa CDF ** | pg | <4.3 | 4.3 | 30 | 6.0 | 0.100 | 0.430 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDF ** | pg | <4.5 | 4.5 | 30 | 6.0 | 0.100 | 0.450 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDF ** | pg | 8.6 | 3.0 | 30 | 9.0 | 0.0100 | 0.0860 | | 4767357 |
| 1,2,3,4,7,8,9-Hepta CDF ** | pg | <3.5 | 3.5 | 30 | 6.0 | 0.0100 | 0.0350 | | 4767357 |
| Total Tetra CDF ** | pg | 27.4 | 4.9 | 30 | N/A | | | 1 | 4767357 |
| Total Penta CDF ** | pg | <4.4 | 4.4 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDF ** | pg | <4.2 | 4.2 | 30 | N/A | | | 0 | 4767357 |
| Total Hepta CDF ** | pg | 8.6 | 3.2 | 30 | N/A | | | 1 | 4767357 |
| **TCDF Confirmation** | | | | | | | | | |
| Confirmation 2,3,7,8-Tetra CDF ** | pg | 7.2 (1) | 1.6 | 30 | N/A | 0.100 | 0.720 | | 4775791 |
| TOTAL TOXIC EQUIVALENCY | pg | | | | | | 17.0 | | |

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC955 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- QUENCH-R3** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Surrogate Recovery (%)** | | | | | | | | | |
| Confirmation C13-2378 TetraCDF ** | % | 57 | | | | | | | 4775791 |
| C13-1234678 HeptaCDD * | % | 63 | | | | | | | 4767357 |
| C13-1234678 HeptaCDF ** | % | 60 | | | | | | | 4767357 |
| C13-123478 HexaCDD * | % | 98 | | | | | | | 4767357 |
| C13-123478 HexaCDF ** | % | 95 | | | | | | | 4767357 |
| C13-1234789 HeptaCDF ** | % | 96 | | | | | | | 4767357 |
| C13-123678 HexaCDD * | % | 84 | | | | | | | 4767357 |
| C13-123678 HexaCDF ** | % | 68 | | | | | | | 4767357 |
| C13-12378 PentaCDD * | % | 72 | | | | | | | 4767357 |
| C13-12378 PentaCDF ** | % | 77 | | | | | | | 4767357 |
| C13-123789 HexaCDF ** | % | 65 | | | | | | | 4767357 |
| C13-23478 PentaCDF ** | % | 102 | | | | | | | 4767357 |
| C13-2378 TetraCDD * | % | 91 | | | | | | | 4767357 |
| C13-2378 TetraCDF ** | % | 56 | | | | | | | 4767357 |
| C13-Octachlorodibenzo-p-Dioxin | % | 64 | | | | | | | 4767357 |
| Cl37-2378 TetraCDD * | % | 101 | | | | | | | 4767357 |

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
* CDD = Chloro Dibenzo-p-Dioxin


Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC956 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- QUENCH-R4** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Dioxins & Furans** | | | | | | | | | |
| 2,3,7,8-Tetra CDD * | pg | <4.6 | 4.6 | 30 | 6.0 | 1.00 | 4.60 | | 4767357 |
| 1,2,3,7,8-Penta CDD * | pg | <4.2 | 4.2 | 30 | 6.0 | 1.00 | 4.20 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDD * | pg | <3.9 | 3.9 | 30 | 6.0 | 0.100 | 0.390 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDD * | pg | <3.9 | 3.9 | 30 | 6.0 | 0.100 | 0.390 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDD * | pg | 5.5 | 3.6 | 30 | 6.0 | 0.100 | 0.550 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDD * | pg | 48.3 | 2.9 | 30 | 9.0 | 0.0100 | 0.483 | | 4767357 |
| Total Tetra CDD * | pg | 12.0 | 4.6 | 30 | N/A | | | 2 | 4767357 |
| Total Penta CDD * | pg | 11.8 | 4.2 | 30 | N/A | | | 1 | 4767357 |
| Total Hexa CDD * | pg | 76.5 | 3.8 | 30 | N/A | | | 3 | 4767357 |
| Total Hepta CDD * | pg | 186 | 2.9 | 30 | N/A | | | 2 | 4767357 |
| 2,3,7,8-Tetra CDF ** | pg | 47.7 | 4.2 | 30 | 6.0 | 0.100 | 4.77 | | 4767357 |
| 1,2,3,7,8-Penta CDF ** | pg | <4.4 | 4.4 | 30 | 6.0 | 0.0300 | 0.132 | | 4767357 |
| 2,3,4,7,8-Penta CDF ** | pg | <4.4 | 4.4 | 30 | 6.0 | 0.300 | 1.32 | | 4767357 |
| 1,2,3,4,7,8-Hexa CDF ** | pg | <3.8 | 3.8 | 30 | 6.0 | 0.100 | 0.380 | | 4767357 |
| 1,2,3,6,7,8-Hexa CDF ** | pg | <3.7 | 3.7 | 30 | 6.0 | 0.100 | 0.370 | | 4767357 |
| 2,3,4,6,7,8-Hexa CDF ** | pg | <4.0 | 4.0 | 30 | 6.0 | 0.100 | 0.400 | | 4767357 |
| 1,2,3,7,8,9-Hexa CDF ** | pg | <4.2 | 4.2 | 30 | 6.0 | 0.100 | 0.420 | | 4767357 |
| 1,2,3,4,6,7,8-Hepta CDF ** | pg | 3.9 | 2.6 | 30 | 9.0 | 0.0100 | 0.0390 | | 4767357 |
| 1,2,3,4,7,8,9-Hepta CDF ** | pg | <3.1 | 3.1 | 30 | 6.0 | 0.0100 | 0.0310 | | 4767357 |
| Total Tetra CDF ** | pg | 74.5 | 4.2 | 30 | N/A | | | 3 | 4767357 |
| Total Penta CDF ** | pg | <4.7 (1) | 4.7 | 30 | N/A | | | 0 | 4767357 |
| Total Hexa CDF ** | pg | <3.9 | 3.9 | 30 | N/A | | | 0 | 4767357 |
| Total Hepta CDF ** | pg | 9.3 | 2.8 | 30 | N/A | | | 2 | 4767357 |
| **TCDF Confirmation** | | | | | | | | | |
| Confirmation 2,3,7,8-Tetra CDF ** | pg | 30.5 | 3.6 | 30 | N/A | 0.100 | 3.05 | | 4775791 |
| TOTAL TOXIC EQUIVALENCY | pg | | | | | | 16.8 | | |

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## EPA M23 DIOXINS AND FURANS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC956 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | | | | | | | |
| **COC Number** | | 23262 | | | | **TOXIC EQUIVALENCY** | | # of | |
| | **UNITS** | **M23- QUENCH-R4** | **EDL** | **RDL** | **MDL** | **TEF (2005 WHO)** | **TEQ(DL)** | **Isomers** | **QC Batch** |
| **Surrogate Recovery (%)** | | | | | | | | | |
| Confirmation C13-2378 TetraCDF ** | % | 108 | | | | | | | 4775791 |
| C13-1234678 HeptaCDD * | % | 80 | | | | | | | 4767357 |
| C13-1234678 HeptaCDF ** | % | 74 | | | | | | | 4767357 |
| C13-123478 HexaCDD * | % | 101 | | | | | | | 4767357 |
| C13-123478 HexaCDF ** | % | 98 | | | | | | | 4767357 |
| C13-1234789 HeptaCDF ** | % | 95 | | | | | | | 4767357 |
| C13-123678 HexaCDD * | % | 101 | | | | | | | 4767357 |
| C13-123678 HexaCDF ** | % | 81 | | | | | | | 4767357 |
| C13-12378 PentaCDD * | % | 89 | | | | | | | 4767357 |
| C13-12378 PentaCDF ** | % | 95 | | | | | | | 4767357 |
| C13-123789 HexaCDF ** | % | 65 | | | | | | | 4767357 |
| C13-23478 PentaCDF ** | % | 98 | | | | | | | 4767357 |
| C13-2378 TetraCDD * | % | 113 | | | | | | | 4767357 |
| C13-2378 TetraCDF ** | % | 100 | | | | | | | 4767357 |
| C13-Octachlorodibenzo-p-Dioxin | % | 73 | | | | | | | 4767357 |
| Cl37-2378 TetraCDD * | % | 102 | | | | | | | 4767357 |

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
* CDD = Chloro Dibenzo-p-Dioxin



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC905 | | | DKC906 | DKC907 | | | DKC954 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/28 | | | 2016/10/28 | 2016/10/28 | | | 2016/10/26 | | | |
| **COC Number** | | 23262 | | | 23262 | 23262 | | | 23262 | | | |
| | **UNITS** | **M23- PEC-R1** | **RDL** | **MDL** | **M23- PEC-R2** | **M23- PEC-R3** | **RDL** | **MDL** | **M23- QUENCH-R1** | **RDL** | **MDL** | **QC Batch** |
| **Semivolatile Organics** | | | | | | | | | | | | |
| Acenaphthene | ug | <20 | 20 | 3 | <20 | <20 | 20 | 3 | 30 | 20 | 3 | 4740326 |
| Acenaphthylene | ug | <20 | 20 | 4 | <20 | <20 | 20 | 4 | 69 | 20 | 4 | 4740326 |
| Anthracene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | 33 | 20 | 5 | 4740326 |
| Benzo(a)anthracene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | <20 | 20 | 5 | 4740326 |
| Benzo(a)pyrene | ug | <20 | 20 | 4 | <20 | <20 | 20 | 4 | <20 | 20 | 4 | 4740326 |
| Benzo(b)fluoranthene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | <20 | 20 | 5 | 4740326 |
| Benzo(g,h,i)perylene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | <20 | 20 | 5 | 4740326 |
| Benzo(k)fluoranthene | ug | <20 | 20 | 4 | <20 | <20 | 20 | 4 | <20 | 20 | 4 | 4740326 |
| Chrysene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | <20 | 20 | 5 | 4740326 |
| Dibenz(a,h)anthracene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | <20 | 20 | 5 | 4740326 |
| Fluoranthene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | 52 | 20 | 5 | 4740326 |
| Fluorene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | 58 | 20 | 5 | 4740326 |
| Indeno(1,2,3-cd)pyrene | ug | <20 | 20 | 3 | <20 | <20 | 20 | 3 | <20 | 20 | 3 | 4740326 |
| Naphthalene | ug | 128 | 20 | 3 | 184 | 301 | 80 | 10 | 228 | 80 | 10 | 4740326 |
| Phenanthrene | ug | <20 | 20 | 5 | <20 | <20 | 20 | 5 | 156 | 80 | 20 | 4740326 |
| Pyrene | ug | <20 | 20 | 4 | <20 | <20 | 20 | 4 | 46 | 20 | 4 | 4740326 |
| **Surrogate Recovery (%)** | | | | | | | | | | | | |
| 2,4,6-Tribromophenol | % | 112 | | | 82 | 97 | | | 68 | | | 4740326 |
| 2,6-Dibromo-4-fluorophenol (FS) | % | 51 | | | 48 | 49 | | | 44 | | | 4740326 |
| 2-Fluorobiphenyl | % | 90 | | | 103 | 89 | | | 77 | | | 4740326 |
| 2-Fluorophenol | % | 87 | | | 78 | 79 | | | 63 | | | 4740326 |
| D10-Pyrene (FS) | % | 107 | | | 114 | 108 | | | 102 | | | 4740326 |
| D14-Terphenyl | % | 110 | | | 112 | 106 | | | 92 | | | 4740326 |
| D5-Nitrobenzene | % | 85 | | | 99 | 85 | | | 73 | | | 4740326 |
| D5-Phenol | % | 88 | | | 96 | 89 | | | 70 | | | 4740326 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKC955 | DKC956 | | | |
|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/10/26 | 2016/10/26 | | | |
| **COC Number** | | 23262 | 23262 | | | |
| | **UNITS** | **M23- QUENCH-R3** | **M23- QUENCH-R4** | **RDL** | **MDL** | **QC Batch** |
| **Semivolatile Organics** | | | | | | |
| Acenaphthene | ug | 36 | 24 | 20 | 3 | 4740326 |
| Acenaphthylene | ug | 37 | <20 | 20 | 4 | 4740326 |
| Anthracene | ug | 27 | <20 | 20 | 5 | 4740326 |
| Benzo(a)anthracene | ug | <20 | <20 | 20 | 5 | 4740326 |
| Benzo(a)pyrene | ug | <20 | <20 | 20 | 4 | 4740326 |
| Benzo(b)fluoranthene | ug | <20 | <20 | 20 | 5 | 4740326 |
| Benzo(g,h,i)perylene | ug | <20 | <20 | 20 | 5 | 4740326 |
| Benzo(k)fluoranthene | ug | <20 | <20 | 20 | 4 | 4740326 |
| Chrysene | ug | <20 | <20 | 20 | 5 | 4740326 |
| Dibenz(a,h)anthracene | ug | <20 | <20 | 20 | 5 | 4740326 |
| Fluoranthene | ug | 59 | 29 | 20 | 5 | 4740326 |
| Fluorene | ug | 44 | 30 | 20 | 5 | 4740326 |
| Indeno(1,2,3-cd)pyrene | ug | <20 | <20 | 20 | 3 | 4740326 |
| Naphthalene | ug | 137 | 126 | 20 | 3 | 4740326 |
| Phenanthrene | ug | 148 | 77 | 20 | 5 | 4740326 |
| Pyrene | ug | 41 | 25 | 20 | 4 | 4740326 |
| **Surrogate Recovery (%)** | | | | | | |
| 2,4,6-Tribromophenol | % | 65 | 76 | | | 4740326 |
| 2,6-Dibromo-4-fluorophenol (FS) | % | 41 | 50 | | | 4740326 |
| 2-Fluorobiphenyl | % | 76 | 103 | | | 4740326 |
| 2-Fluorophenol | % | 62 | 75 | | | 4740326 |
| D10-Pyrene (FS) | % | 101 | 121 | | | 4740326 |
| D14-Terphenyl | % | 97 | 117 | | | 4740326 |
| D5-Nitrobenzene | % | 77 | 96 | | | 4740326 |
| D5-Phenol | % | 72 | 86 | | | 4740326 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## TEST SUMMARY

**Maxxam ID:** DKC905 **Collected:** 2016/10/28
**Sample ID:** M23- PEC- R1 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | GC/MS | 4740326 | 2016/11/09 | 2016/11/24 | Lidija Tomic |
| Dioxins/Furans in Air (Method 23) | HRMS/MS | 4767357 | 2016/11/09 | 2016/11/30 | Owen Cosby |

**Maxxam ID:** DKC906 **Collected:** 2016/10/28
**Sample ID:** M23- PEC- R2 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | GC/MS | 4740326 | 2016/11/09 | 2016/11/24 | Lidija Tomic |
| 2,3,7,8-TCDF Confirmation (M23) | HRMS/MS | 4775791 | N/A | 2016/12/01 | Vica Cioranic |
| Dioxins/Furans in Air (Method 23) | HRMS/MS | 4767357 | 2016/11/09 | 2016/11/30 | Owen Cosby |

**Maxxam ID:** DKC907 **Collected:** 2016/10/28
**Sample ID:** M23- PEC- R3 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | GC/MS | 4740326 | 2016/11/09 | 2016/11/24 | Lidija Tomic |
| Dioxins/Furans in Air (Method 23) | HRMS/MS | 4767357 | 2016/11/09 | 2016/11/30 | Owen Cosby |

**Maxxam ID:** DKC954 **Collected:** 2016/10/26
**Sample ID:** M23- QUENCH- R1 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | GC/MS | 4740326 | 2016/11/09 | 2016/11/24 | Lidija Tomic |
| 2,3,7,8-TCDF Confirmation (M23) | HRMS/MS | 4775791 | N/A | 2016/12/01 | Vica Cioranic |
| Dioxins/Furans in Air (Method 23) | HRMS/MS | 4767357 | 2016/11/09 | 2016/11/30 | Owen Cosby |

**Maxxam ID:** DKC955 **Collected:** 2016/10/26
**Sample ID:** M23- QUENCH- R3 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | GC/MS | 4740326 | 2016/11/09 | 2016/11/24 | Lidija Tomic |
| 2,3,7,8-TCDF Confirmation (M23) | HRMS/MS | 4775791 | N/A | 2016/12/01 | Vica Cioranic |
| Dioxins/Furans in Air (Method 23) | HRMS/MS | 4767357 | 2016/11/09 | 2016/11/30 | Owen Cosby |

**Maxxam ID:** DKC956 **Collected:** 2016/10/26
**Sample ID:** M23- QUENCH- R4 **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| SVOCs in MM5 SamplingTrain (EPA0010) | GC/MS | 4740326 | 2016/11/09 | 2016/11/25 | Lidija Tomic |
| 2,3,7,8-TCDF Confirmation (M23) | HRMS/MS | 4775791 | N/A | 2016/12/01 | Vica Cioranic |
| Dioxins/Furans in Air (Method 23) | HRMS/MS | 4767357 | 2016/11/09 | 2016/11/30 | Owen Cosby |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## GENERAL COMMENTS

ABNs:
ABNMM5-TR:
No Perylene found in the samples. An estimated mdl is 5 ug
Perylene has not been subjected to Maxxam's standard validation procedure for this matrix. The analysis was performed with the client consent, however results should be viewed with discretion. Recovery for perylene is based on the method spike.
Perylene
Spike =99.425 %
Spike Dup = 104.59%

Perylene was not present in any of the samples - estimated DL=15ug

Sample DKC906 [M23- PEC- R2] : A 5 X dilution was run for Naphthalene. Mdl raised accordingly.

Sample DKC907 [M23- PEC- R3] : A 5 X dilution was run for Naphthalene. Mdl raised accordingly.

Sample DKC954 [M23- QUENCH- R1] : A 5 X dilution was run for Naphthalene and Phenanthrene. Mdl raised accordingly.

**Results relate only to the items tested.**



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4740326 | LTO | Spiked Blank | 2,4,6-Tribromophenol | 2016/11/24 | | 104 | % | 24 - 121 |
| | | | 2-Fluorobiphenyl | 2016/11/24 | | 96 | % | 30 - 115 |
| | | | 2-Fluorophenol | 2016/11/24 | | 80 | % | 30 - 130 |
| | | | Acenaphthene | 2016/11/24 | | 102 | % | 40 - 125 |
| | | | Acenaphthylene | 2016/11/24 | | 101 | % | 40 - 125 |
| | | | Anthracene | 2016/11/24 | | 100 | % | 40 - 125 |
| | | | Benzo(a)anthracene | 2016/11/24 | | 109 | % | 40 - 125 |
| | | | Benzo(a)pyrene | 2016/11/24 | | 99 | % | 40 - 125 |
| | | | Benzo(b)fluoranthene | 2016/11/24 | | 104 | % | 40 - 125 |
| | | | Benzo(g,h,i)perylene | 2016/11/24 | | 101 | % | 40 - 125 |
| | | | Benzo(k)fluoranthene | 2016/11/24 | | 107 | % | 40 - 125 |
| | | | Chrysene | 2016/11/24 | | 116 | % | 40 - 125 |
| | | | D14-Terphenyl | 2016/11/24 | | 110 | % | 18 - 137 |
| | | | D5-Nitrobenzene | 2016/11/24 | | 89 | % | 23 - 120 |
| | | | D5-Phenol | 2016/11/24 | | 94 | % | 24 - 113 |
| | | | Dibenz(a,h)anthracene | 2016/11/24 | | 99 | % | 40 - 125 |
| | | | Fluoranthene | 2016/11/24 | | 109 | % | 40 - 125 |
| | | | Fluorene | 2016/11/24 | | 103 | % | 40 - 125 |
| | | | Indeno(1,2,3-cd)pyrene | 2016/11/24 | | 109 | % | 40 - 125 |
| | | | Naphthalene | 2016/11/24 | | 93 | % | 40 - 125 |
| | | | Phenanthrene | 2016/11/24 | | 107 | % | 40 - 125 |
| | | | Pyrene | 2016/11/24 | | 108 | % | 40 - 125 |
| 4740326 | LTO | RPD | Acenaphthene | 2016/11/24 | 1.2 | | % | 50 |
| | | | Acenaphthylene | 2016/11/24 | 7.2 | | % | 50 |
| | | | Anthracene | 2016/11/24 | 4.7 | | % | 50 |
| | | | Benzo(a)anthracene | 2016/11/24 | 4.6 | | % | 50 |
| | | | Benzo(a)pyrene | 2016/11/24 | 0.77 | | % | 50 |
| | | | Benzo(b)fluoranthene | 2016/11/24 | 0.59 | | % | 50 |
| | | | Benzo(g,h,i)perylene | 2016/11/24 | 0.14 | | % | 50 |
| | | | Benzo(k)fluoranthene | 2016/11/24 | 2.5 | | % | 50 |
| | | | Chrysene | 2016/11/24 | 1.5 | | % | 50 |
| | | | Dibenz(a,h)anthracene | 2016/11/24 | 2.2 | | % | 50 |
| | | | Fluoranthene | 2016/11/24 | 4.8 | | % | 50 |
| | | | Fluorene | 2016/11/24 | 5.2 | | % | 50 |
| | | | Indeno(1,2,3-cd)pyrene | 2016/11/24 | 11 | | % | 50 |
| | | | Naphthalene | 2016/11/24 | 0.66 | | % | 50 |
| | | | Phenanthrene | 2016/11/24 | 1.2 | | % | 50 |
| | | | Pyrene | 2016/11/24 | 1.1 | | % | 50 |
| 4740326 | LTO | Method Blank | 2,4,6-Tribromophenol | 2016/11/24 | | 103 | % | 24 - 121 |
| | | | 2-Fluorobiphenyl | 2016/11/24 | | 104 | % | 30 - 115 |
| | | | 2-Fluorophenol | 2016/11/24 | | 88 | % | 30 - 130 |
| | | | Acenaphthene | 2016/11/24 | <20 | | ug | |
| | | | Acenaphthylene | 2016/11/24 | <20 | | ug | |
| | | | Anthracene | 2016/11/24 | <20 | | ug | |
| | | | Benzo(a)anthracene | 2016/11/24 | <20 | | ug | |
| | | | Benzo(a)pyrene | 2016/11/24 | <20 | | ug | |
| | | | Benzo(b)fluoranthene | 2016/11/24 | <20 | | ug | |
| | | | Benzo(g,h,i)perylene | 2016/11/24 | <20 | | ug | |
| | | | Benzo(k)fluoranthene | 2016/11/24 | <20 | | ug | |
| | | | Chrysene | 2016/11/24 | <20 | | ug | |
| | | | D14-Terphenyl | 2016/11/24 | | 106 | % | 18 - 137 |
| | | | D5-Nitrobenzene | 2016/11/24 | | 104 | % | 23 - 120 |
| | | | D5-Phenol | 2016/11/24 | | 102 | % | 24 - 113 |
| | | | Dibenz(a,h)anthracene | 2016/11/24 | <20 | | ug | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Fluoranthene | 2016/11/24 | <20 | | ug | |
| | | | Fluorene | 2016/11/24 | <20 | | ug | |
| | | | Indeno(1,2,3-cd)pyrene | 2016/11/24 | <20 | | ug | |
| | | | Naphthalene | 2016/11/24 | <20 | | ug | |
| | | | Phenanthrene | 2016/11/24 | <20 | | ug | |
| | | | Pyrene | 2016/11/24 | <20 | | ug | |
| 4767357 | OBC | Spiked Blank | C13-1234678 HeptaCDD | 2016/11/29 | | 64 | % | 25 - 130 |
| | | | C13-1234678 HeptaCDF | 2016/11/29 | | 61 | % | 25 - 130 |
| | | | C13-123678 HexaCDD | 2016/11/29 | | 72 | % | 40 - 130 |
| | | | C13-123678 HexaCDF | 2016/11/29 | | 60 | % | 40 - 130 |
| | | | C13-12378 PentaCDD | 2016/11/29 | | 78 | % | 40 - 130 |
| | | | C13-12378 PentaCDF | 2016/11/29 | | 80 | % | 40 - 130 |
| | | | C13-123789 HexaCDF | 2016/11/29 | | 58 | % | 40 - 130 |
| | | | C13-2378 TetraCDD | 2016/11/29 | | 93 | % | 40 - 130 |
| | | | C13-2378 TetraCDF | 2016/11/29 | | 80 | % | 40 - 130 |
| | | | C13-Octachlorodibenzo-p-Dioxin | 2016/11/29 | | 71 | % | 25 - 130 |
| | | | 2,3,7,8-Tetra CDD | 2016/11/29 | | 90 | % | 80 - 140 |
| | | | 1,2,3,7,8-Penta CDD | 2016/11/29 | | 86 | % | 80 - 140 |
| | | | 1,2,3,4,7,8-Hexa CDD | 2016/11/29 | | 135 | % | 80 - 140 |
| | | | 1,2,3,6,7,8-Hexa CDD | 2016/11/29 | | 108 | % | 80 - 140 |
| | | | 1,2,3,7,8,9-Hexa CDD | 2016/11/29 | | 114 | % | 80 - 140 |
| | | | 1,2,3,4,6,7,8-Hepta CDD | 2016/11/29 | | 102 | % | 80 - 140 |
| | | | 2,3,7,8-Tetra CDF | 2016/11/29 | | 96 | % | 80 - 140 |
| | | | 1,2,3,7,8-Penta CDF | 2016/11/29 | | 89 | % | 80 - 140 |
| | | | 2,3,4,7,8-Penta CDF | 2016/11/29 | | 93 | % | 80 - 140 |
| | | | 1,2,3,4,7,8-Hexa CDF | 2016/11/29 | | 125 | % | 80 - 140 |
| | | | 1,2,3,6,7,8-Hexa CDF | 2016/11/29 | | 100 | % | 80 - 140 |
| | | | 2,3,4,6,7,8-Hexa CDF | 2016/11/29 | | 103 | % | 80 - 140 |
| | | | 1,2,3,7,8,9-Hexa CDF | 2016/11/29 | | 125 | % | 80 - 140 |
| | | | 1,2,3,4,6,7,8-Hepta CDF | 2016/11/29 | | 97 | % | 80 - 140 |
| | | | 1,2,3,4,7,8,9-Hepta CDF | 2016/11/29 | | 100 | % | 80 - 140 |
| 4767357 | OBC | RPD | 2,3,7,8-Tetra CDD | 2016/11/29 | 3.3 | | % | 20 |
| | | | 1,2,3,7,8-Penta CDD | 2016/11/29 | 3.4 | | % | 20 |
| | | | 1,2,3,4,7,8-Hexa CDD | 2016/11/29 | 4.5 | | % | 20 |
| | | | 1,2,3,6,7,8-Hexa CDD | 2016/11/29 | 3.8 | | % | 20 |
| | | | 1,2,3,7,8,9-Hexa CDD | 2016/11/29 | 1.7 | | % | 20 |
| | | | 1,2,3,4,6,7,8-Hepta CDD | 2016/11/29 | 1.9 | | % | 20 |
| | | | 2,3,7,8-Tetra CDF | 2016/11/29 | 1.0 | | % | 20 |
| | | | 1,2,3,7,8-Penta CDF | 2016/11/29 | 1.1 | | % | 20 |
| | | | 2,3,4,7,8-Penta CDF | 2016/11/29 | 5.2 | | % | 20 |
| | | | 1,2,3,4,7,8-Hexa CDF | 2016/11/29 | 2.4 | | % | 20 |
| | | | 1,2,3,6,7,8-Hexa CDF | 2016/11/29 | 3.0 | | % | 20 |
| | | | 2,3,4,6,7,8-Hexa CDF | 2016/11/29 | 1.9 | | % | 20 |
| | | | 1,2,3,7,8,9-Hexa CDF | 2016/11/29 | 3.3 | | % | 20 |
| | | | 1,2,3,4,6,7,8-Hepta CDF | 2016/11/29 | 1.0 | | % | 20 |
| | | | 1,2,3,4,7,8,9-Hepta CDF | 2016/11/29 | 5.1 | | % | 20 |
| 4767357 | OBC | Method Blank | C13-1234678 HeptaCDD | 2016/11/30 | | 89 | % | 25 - 130 |
| | | | C13-1234678 HeptaCDF | 2016/11/30 | | 75 | % | 25 - 130 |
| | | | C13-123678 HexaCDD | 2016/11/30 | | 90 | % | 40 - 130 |
| | | | C13-123678 HexaCDF | 2016/11/30 | | 77 | % | 40 - 130 |
| | | | C13-12378 PentaCDD | 2016/11/30 | | 85 | % | 40 - 130 |
| | | | C13-12378 PentaCDF | 2016/11/30 | | 92 | % | 40 - 130 |
| | | | C13-123789 HexaCDF | 2016/11/30 | | 67 | % | 40 - 130 |
| | | | C13-2378 TetraCDD | 2016/11/30 | | 109 | % | 40 - 130 |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | C13-2378 TetraCDF | 2016/11/30 | | 95 | % | 40 - 130 |
| | | | C13-Octachlorodibenzo-p-Dioxin | 2016/11/30 | | 75 | % | 25 - 130 |
| | | | 2,3,7,8-Tetra CDD | 2016/11/30 | <3.1, EDL=3.1 | | pg | |
| | | | 1,2,3,7,8-Penta CDD | 2016/11/30 | <3.4, EDL=3.4 | | pg | |
| | | | 1,2,3,4,7,8-Hexa CDD | 2016/11/30 | <3.6, EDL=3.6 | | pg | |
| | | | 1,2,3,6,7,8-Hexa CDD | 2016/11/30 | <3.6, EDL=3.6 | | pg | |
| | | | 1,2,3,7,8,9-Hexa CDD | 2016/11/30 | <3.3, EDL=3.3 | | pg | |
| | | | 1,2,3,4,6,7,8-Hepta CDD | 2016/11/30 | <3.1, EDL=3.1 | | pg | |
| | | | Total Tetra CDD | 2016/11/30 | <3.7, EDL=3.7 (1) | | pg | |
| | | | Total Penta CDD | 2016/11/30 | <3.4, EDL=3.4 | | pg | |
| | | | Total Hexa CDD | 2016/11/30 | <6.8, EDL=6.8 (1) | | pg | |
| | | | Total Hepta CDD | 2016/11/30 | <3.1, EDL=3.1 | | pg | |
| | | | 2,3,7,8-Tetra CDF | 2016/11/30 | <2.7, EDL=2.7 | | pg | |
| | | | 1,2,3,7,8-Penta CDF | 2016/11/30 | <3.7, EDL=3.7 | | pg | |
| | | | 2,3,4,7,8-Penta CDF | 2016/11/30 | <3.7, EDL=3.7 | | pg | |
| | | | 1,2,3,4,7,8-Hexa CDF | 2016/11/30 | <3.3, EDL=3.3 | | pg | |
| | | | 1,2,3,6,7,8-Hexa CDF | 2016/11/30 | <3.1, EDL=3.1 | | pg | |
| | | | 2,3,4,6,7,8-Hexa CDF | 2016/11/30 | <3.4, EDL=3.4 | | pg | |
| | | | 1,2,3,7,8,9-Hexa CDF | 2016/11/30 | <3.6, EDL=3.6 | | pg | |
| | | | 1,2,3,4,6,7,8-Hepta CDF | 2016/11/30 | <2.7, EDL=2.7 | | pg | |
| | | | 1,2,3,4,7,8,9-Hepta CDF | 2016/11/30 | <3.1, EDL=3.1 | | pg | |
| | | | Total Tetra CDF | 2016/11/30 | <2.7, EDL=2.7 | | pg | |
| | | | Total Penta CDF | 2016/11/30 | <3.7, EDL=3.7 | | pg | |
| | | | Total Hexa CDF | 2016/11/30 | <3.4, EDL=3.4 | | pg | |
| | | | Total Hepta CDF | 2016/11/30 | <2.9, EDL=2.9 | | pg | |
| 4775791 | VCI | Method Blank | Confirmation 2,3,7,8-Tetra CDF | 2016/12/01 | <2.4, EDL=2.4 | | pg | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Confirmation C13-2378 TetraCDF | 2016/12/01 | | 97 | % | 40 - 135 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1812
Report Date: 2016/12/02

Montrose Air Quality Services, LLC
Client Project #: 106377/ (16-167)

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Karen Nicol

Karen Nicol, Supervisor, Semi-Volatiles

Owen Cosby, BSc.C.Chem, Supervisor, HRMS Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

B 601812

**Maxxam**
A Bureau Veritas Group Company

6740 Campobello Rd
Mississauga Ontario ,L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

**CLIENT INFORMATION**

Company Name: ArcelorMittal Monessen

Project Manager: William Cowell

e-mail: wcowell@mittal.com

Address: 1050 William Pitt Way
Pittsburgh, PA 15238

**SECTION**

Phone: 412 826 3636 Fax:

Sampled by: John Gibson

**ANALYSIS REQUESTED**

| Field Sample ID | | Total Volume Sampled | Flow Rate | Collection Date | Sample Collection Time | CPA RM 5/29 Pb-test only | CPA RM 23/0010 Parameters as listed | RM 316 Formaldehyde | CPA RM 0031 Parameters as listed |
|---|---|---|---|---|---|---|---|---|---|
| PEC Stack RM23/0010 | Run 1, 2 and 3 | ~140 dcf | 150 | 10/28/16 - 10/31/16 | ~180 min | | ✓ | | |
| " RM316 | Run 1, 2 and 3 + Blank | ~30 dcf | 150 | 11/1/16 | ~120 min | | ✓ | ✓ | |
| " " RM0031 | Run 1, 2 and 3 + 3 blanks | ~60 L | 0.5 LPM | 10/26/16 | ~120 min | | | | ✓ |
| Quench Stack RM23/0010 | Run 1, 3 and 4 | ~140 dcf | 150 | 11/1/16 | ~180 min | | ✓ | | |

**TAT Requirement**

STD 10 Business day ☑
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

**PROJECT INFORMATION**

Project #: 106372 (16-167)
Name: William Cowell
PO #:
Maxxam Quote #:
Maxxam Contact: Clayton Sutherson

**REPORTING REQUIREMENTS**

Summary Report only ☐
EDD ☐
Regulation

**Notes**

**PROJECT SPECIFIC COMMENTS**

Quench Stack RM 23/0010 Run 2 VOIDED due to failed leak check

Client Signature:
Affiliation: Mittal
Date/Time:

Received by: JAYODA PERERA
Affiliation: MAXXAM
Date/Time: 11-7-16 12:00 PM

2016-11-07 18:30

12.5 / 12.0 / 10.3 . 10.2 / 10.8 / 9.7

CODE: 10-10 (01-16) - Air

# Method 316

Maxxam
A Bureau Veritas Group Company

Your Project #: 106377 (16-167)
Site Location: ARCELLOR MITTAL
Your C.O.C. #: 23262

**Attention:John Wilson**

Montrose Air Quality Services, LLC
ACCI Pittsburg, PA
1050 William Pitt Way
Pittsburgh, PA
USA 15238

**Report Date: 2016/11/21**
Report #: R4253693
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B6O1818**
**Received: 2016/11/07, 18:30**

Sample Matrix: Stack Sampling Train
# Samples Received: 4

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| Formaldehyde (M316) | 4 | 2016/11/10 | 2016/11/10 | BRL SOP-00113 | EPA 316 m |
| Final Volume of Impinger | 4 | N/A | 2016/11/10 | | |

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Clayton Johnson
Project Manager - Air Toxics, Source Evaluation
21 Nov 2016 15:26:37

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1818
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377 (16-167)
Site Location: ARCELLOR MITTAL

## RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

| **Maxxam ID** | | DKD039 | | | DKD040 | | | DKD041 | | | DKD042 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | | | 2016/11/01 | | | 2016/11/01 | | | 2016/11/01 | | | |
| **COC Number** | | 23262 | | | 23262 | | | 23262 | | | 23262 | | | |
| | **UNITS** | **M316- BLANK** | **RDL** | **MDL** | **M316- R1** | **RDL** | **MDL** | **M316- R2** | **RDL** | **MDL** | **M316- R3** | **RDL** | **MDL** | **QC Batch** |
| **Aldehydes & Ketones** | | | | | | | | | | | | | | |
| Formaldehyde | ug | <7.5 | 7.5 | 4.5 | <8.5 | 8.5 | 5.1 | 14 | 8.8 | 5.3 | 12 | 7.5 | 4.5 | 4742481 |
| | | | | | | | | | | | | | | |
| Impinger Volume | ml | 300 | 1 | 1 | 340 | 1 | 1 | 350 | 1 | 1 | 300 | 1 | 1 | 4742484 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1818
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377 (16-167)
Site Location: ARCELLOR MITTAL

## TEST SUMMARY

**Maxxam ID:** DKD039
**Sample ID:** M316- BLANK
**Matrix:** Stack Sampling Train

**Collected:** 2016/11/01
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Formaldehyde (M316) | /SPEC | 4742481 | 2016/11/10 | 2016/11/10 | Manoj Gera |
| Final Volume of Impinger | | 4742484 | N/A | 2016/11/10 | Frank Mo |

**Maxxam ID:** DKD040
**Sample ID:** M316- R1
**Matrix:** Stack Sampling Train

**Collected:** 2016/11/01
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Formaldehyde (M316) | /SPEC | 4742481 | 2016/11/10 | 2016/11/10 | Manoj Gera |
| Final Volume of Impinger | | 4742484 | N/A | 2016/11/10 | Frank Mo |

**Maxxam ID:** DKD041
**Sample ID:** M316- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/11/01
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Formaldehyde (M316) | /SPEC | 4742481 | 2016/11/10 | 2016/11/10 | Manoj Gera |
| Final Volume of Impinger | | 4742484 | N/A | 2016/11/10 | Frank Mo |

**Maxxam ID:** DKD041 Dup
**Sample ID:** M316- R2
**Matrix:** Stack Sampling Train

**Collected:** 2016/11/01
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Formaldehyde (M316) | /SPEC | 4742481 | 2016/11/10 | 2016/11/10 | Manoj Gera |

**Maxxam ID:** DKD042
**Sample ID:** M316- R3
**Matrix:** Stack Sampling Train

**Collected:** 2016/11/01
**Shipped:**
**Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Formaldehyde (M316) | /SPEC | 4742481 | 2016/11/10 | 2016/11/10 | Manoj Gera |
| Final Volume of Impinger | | 4742484 | N/A | 2016/11/10 | Frank Mo |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1818
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377 (16-167)
Site Location: ARCELLOR MITTAL

## GENERAL COMMENTS

Sample DKD042 [M316- R3] : Sample filtered due to suspended particles.

**Results relate only to the items tested.**



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1818
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377 (16-167)
Site Location: ARCELLOR MITTAL

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4742481 | MGE | Matrix Spike(DKD041) | Formaldehyde | 2016/11/10 | | -0.40 (1) | % | 80 - 120 |
| 4742481 | MGE | Spiked Blank | Formaldehyde | 2016/11/10 | | 105 | % | 91 - 107 |
| 4742481 | MGE | Method Blank | Formaldehyde | 2016/11/10 | <7.5 | | ug | |
| 4742481 | MGE | RPD - Sample/Sample Dup | Formaldehyde | 2016/11/10 | NC | | % | 20 |

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Matrix spike failed due to interference.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O1818
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377 (16-167)
Site Location: ARCELLOR MITTAL

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Frank Mo, B.Sc., Inorganic Lab. Manager

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

B601812 / B601818

Maxxam
A Bureau Veritas Group Company

6740 Campobello Rd
Mississauga Ontario L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

**CLIENT INFORMATION**

Company Name: ArcelorMittal Monessen
Project Manager: William Cowell
e-mail: wcowell@montrose-env.com
Address: 1050 William Pitt Way
Pittsburgh, PA 15238

**SECTION**

Phone: 412 826 3636 Fax:
Sampled by: John Wilson

**ANALYSIS REQUESTED**

| Field Sample ID | Total Volume Sampled | Flow Rate | Collection Date | Sample Collection Time | ~~EPA RM 5/29 Parameters Emailed~~ | EPA RM 23/0010 Parameters emailed | RM 316 Emailed hyde | EPA RM 0031 Parameters emailed |
|---|---|---|---|---|---|---|---|---|
| PEC Stack RM23/0010 Run 1, 2 and 3 | ~140 dcf | 150 | 10/23/16-10/28/16 | ~180 min | | ✓ | | |
| " RM316 Run 1, 2 and 3 + Blank | ~30 dcf | 150 | 11/1/16 | ~120 min | | ~~✓~~ | ✓ | |
| " " RM0031 Run 1, 2 and 3 + Blanks | ~60 L | 0.5 LPM | 11/1/16 | ~120 min | | | | ✓ |
| Quench Stack RM23/0010 Run 1, 3 and 4 | ~140 dcf | 150 | 10/20/16-11/1/16 | ~180 min | | ✓ | | |

**TAT Requirement**

STD 10 Business day ☑
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

**PROJECT INFORMATION**

Project #: 106377 (16-167)
Name: William Cowell
PO #:
Maxxam Quote #: —
Maxxam Contact: Clayton Johnson

**REPORTING REQUIREMENTS**

Summary Report only ☐
EDD ☐
Regulation

**Notes**

**PROJECT SPECIFIC COMMENTS**

Quench Stack RM 23/0010 Run 2 VOIDED due to failed leak check

Client Signature: [signature]
Affiliation: Montrose
Date/Time:

Received by: [signature] JAYODA PERERA (E)
Affiliation: MAXXAM 2016-11-07
Date/Time: 11-7-16 12:00 PM

18:30 12.5/12.0/10.3, 10.2/10.8/9.7

COC-1031 (04-13) - Air

# Methods 0031

Maxxam
A Bureau Veritas Group Company

Your Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL
Your C.O.C. #: 23262

**Attention:John Wilson**

Montrose Air Quality Services, LLC
ACCI Pittsburg, PA
1050 William Pitt Way
Pittsburgh, PA
USA 15238

**Report Date: 2016/11/21**
Report #: R4253761
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B6O2302**
**Received: 2016/11/07, 18:30**

Sample Matrix: Stack Sampling Train
# Samples Received: 20

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | 9 | N/A | 2016/11/16 | CAM SOP-00226 | EPA 8260C m |
| VOST EPA5041A, 8260C for 0030, 0031 | 3 | N/A | 2016/11/09 | BRL SOP-00302 | EPA5041A, 8260C |
| VOST EPA5041A, 8260C for 0030, 0031 | 8 | N/A | 2016/11/11 | BRL SOP-00302 | EPA5041A, 8260C |

**Remarks:**

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods. Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Clayton Johnson
Project Manager - Air Toxics, Source Evaluation
21 Nov 2016 15:34:59

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG267 | DKG268 | DKG269 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | 2016/11/01 | 2016/11/01 | | | |
| **COC Number** | | 23262 | 23262 | 23262 | | | |
| | **UNITS** | **M0031- TRIB- #11 A/B/C** | **M0031- FB- #10 A/B/C** | **M0031- R1- A- #1 A/B/C** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | | | |
| Chloromethane | ug | <0.015 | <0.015 | 0.022 | 0.015 | 0.015 | 4740507 |
| Vinyl Chloride | ug | <0.013 | <0.013 | <0.013 | 0.013 | 0.013 | 4740507 |
| Bromomethane | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4740507 |
| Chloroethane | ug | <0.0090 | <0.0090 | <0.0090 | 0.0090 | 0.0090 | 4740507 |
| 1,1-Dichloroethylene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4740507 |
| Iodomethane | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4740507 |
| Carbon Disulfide | ug | <0.026 | <0.026 | 0.112 | 0.026 | 0.026 | 4740507 |
| Methylene Chloride(Dichloromethane) | ug | 0.030 | 1.46 | 0.449 | 0.019 | 0.020 | 4740507 |
| Chloroform | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4740507 |
| 1,2-Dichloroethane | ug | <0.0070 | <0.0070 | <0.0070 | 0.0070 | 0.0070 | 4740507 |
| 1,1,1-Trichloroethane | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4740507 |
| Carbon Tetrachloride | ug | <0.016 | <0.016 | <0.016 | 0.016 | 0.016 | 4740507 |
| Benzene | ug | <0.0090 | <0.0090 | 1.27 | 0.0090 | 0.0090 | 4740507 |
| 1,1,2-Trichloroethane | ug | <0.016 | <0.016 | <0.016 | 0.016 | 0.016 | 4740507 |
| 1,2-Dichloropropane | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4740507 |
| Trichloroethylene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4740507 |
| Toluene | ug | <0.014 | 0.157 | 0.884 | 0.014 | 0.014 | 4740507 |
| Tetrachloroethylene | ug | <0.018 | <0.018 | <0.018 | 0.018 | 0.018 | 4740507 |
| Chlorobenzene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4740507 |
| Ethylbenzene | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4740507 |
| m / p-Xylene | ug | <0.015 | <0.015 | 0.069 | 0.015 | 0.015 | 4740507 |
| Styrene | ug | <0.012 | <0.012 | 0.048 | 0.012 | 0.012 | 4740507 |
| o-Xylene | ug | <0.015 | <0.015 | 0.020 | 0.015 | 0.015 | 4740507 |
| Bromoform | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4740507 |
| 1,1,2,2-Tetrachloroethane | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4740507 |
| Acrylonitrile | ug | <0.025 | <0.025 | <0.025 | 0.025 | 0.025 | 4740507 |
| **Surrogate Recovery (%)** | | | | | | | |
| Bromofluorobenzene | % | 99 | 99 | 98 | | | 4740507 |
| D10-Ethylbenzene (FS) | % | 95 | 124 | 91 | | | 4740507 |
| D4-1,2-Dichloroethane | % | 110 | 107 | 115 | | | 4740507 |
| D8-Toluene | % | 100 | 101 | 98 | | | 4740507 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG270 | DKG271 | DKG272 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | 2016/11/01 | 2016/11/01 | | | |
| **COC Number** | | 23262 | 23262 | 23262 | | | |
| | **UNITS** | **M0031- R1- B- #2 A/B/C** | **M0031- R1- C- #3 A/B/C** | **M0031- R2- A- #4 A/B/C** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | | | |
| Chloromethane | ug | 0.074 | 0.068 | 0.045 | 0.015 | 0.015 | 4744893 |
| Vinyl Chloride | ug | <0.013 | <0.013 | <0.013 | 0.013 | 0.013 | 4744893 |
| Bromomethane | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4744893 |
| Chloroethane | ug | <0.0090 | <0.0090 | <0.0090 | 0.0090 | 0.0090 | 4744893 |
| 1,1-Dichloroethylene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Iodomethane | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4744893 |
| Carbon Disulfide | ug | 0.136 | 0.203 | 0.206 | 0.026 | 0.026 | 4744893 |
| Methylene Chloride(Dichloromethane) | ug | 1.11 | 0.101 | 0.141 | 0.019 | 0.020 | 4744893 |
| Chloroform | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| 1,2-Dichloroethane | ug | <0.0070 | <0.0070 | <0.0070 | 0.0070 | 0.0070 | 4744893 |
| 1,1,1-Trichloroethane | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4744893 |
| Carbon Tetrachloride | ug | <0.016 | <0.016 | <0.016 | 0.016 | 0.016 | 4744893 |
| Benzene | ug | 1.22 | 1.54 | 2.96 | 0.0090 | 0.0090 | 4744893 |
| 1,1,2-Trichloroethane | ug | <0.016 | <0.016 | <0.016 | 0.016 | 0.016 | 4744893 |
| 1,2-Dichloropropane | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Trichloroethylene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Toluene | ug | 0.410 | 0.195 | 0.810 | 0.014 | 0.014 | 4744893 |
| Tetrachloroethylene | ug | <0.018 | <0.018 | 0.031 | 0.018 | 0.018 | 4744893 |
| Chlorobenzene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Ethylbenzene | ug | <0.014 | 0.019 | 0.021 | 0.014 | 0.014 | 4744893 |
| m / p-Xylene | ug | 0.042 | 0.077 | 0.226 | 0.015 | 0.015 | 4744893 |
| Styrene | ug | 0.046 | 0.065 | 0.111 | 0.012 | 0.012 | 4744893 |
| o-Xylene | ug | <0.015 | 0.024 | 0.053 | 0.015 | 0.015 | 4744893 |
| Bromoform | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4744893 |
| 1,1,2,2-Tetrachloroethane | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4744893 |
| Acrylonitrile | ug | <0.025 | <0.025 | <0.025 | 0.025 | 0.025 | 4744893 |
| **Surrogate Recovery (%)** | | | | | | | |
| Bromofluorobenzene | % | 101 | 100 | 99 | | | 4744893 |
| D10-Ethylbenzene (FS) | % | 109 | 110 | 107 | | | 4744893 |
| D4-1,2-Dichloroethane | % | 111 | 111 | 114 | | | 4744893 |
| D8-Toluene | % | 99 | 100 | 98 | | | 4744893 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG273 | DKG274 | DKG275 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | 2016/11/01 | 2016/11/01 | | | |
| **COC Number** | | 23262 | 23262 | 23262 | | | |
| | **UNITS** | **M0031- R2- B- #5 A/B/C** | **M0031- R2- C- #6 A/B/C** | **M0031- R3- A- #7 A/B/C** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | | | |
| Chloromethane | ug | 0.057 | 0.046 | 0.048 | 0.015 | 0.015 | 4744893 |
| Vinyl Chloride | ug | <0.013 | <0.013 | <0.013 | 0.013 | 0.013 | 4744893 |
| Bromomethane | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4744893 |
| Chloroethane | ug | <0.0090 | <0.0090 | <0.0090 | 0.0090 | 0.0090 | 4744893 |
| 1,1-Dichloroethylene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Iodomethane | ug | <0.015 | <0.015 | <0.015 | 0.015 | 0.015 | 4744893 |
| Carbon Disulfide | ug | 0.138 | 0.151 | 0.175 | 0.026 | 0.026 | 4744893 |
| Methylene Chloride(Dichloromethane) | ug | 0.116 | 5.21 | 0.591 | 0.019 | 0.020 | 4744893 |
| Chloroform | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| 1,2-Dichloroethane | ug | <0.0070 | <0.0070 | <0.0070 | 0.0070 | 0.0070 | 4744893 |
| 1,1,1-Trichloroethane | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4744893 |
| Carbon Tetrachloride | ug | <0.016 | <0.016 | <0.016 | 0.016 | 0.016 | 4744893 |
| Benzene | ug | 1.99 | 2.30 | 1.32 | 0.0090 | 0.0090 | 4744893 |
| 1,1,2-Trichloroethane | ug | <0.016 | <0.016 | <0.016 | 0.016 | 0.016 | 4744893 |
| 1,2-Dichloropropane | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Trichloroethylene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Toluene | ug | 0.464 | 3.41 | 0.379 | 0.014 | 0.014 | 4744893 |
| Tetrachloroethylene | ug | 0.046 | <0.018 | <0.018 | 0.018 | 0.018 | 4744893 |
| Chlorobenzene | ug | <0.011 | <0.011 | <0.011 | 0.011 | 0.011 | 4744893 |
| Ethylbenzene | ug | 0.017 | 0.125 | 0.015 | 0.014 | 0.014 | 4744893 |
| m / p-Xylene | ug | 0.164 | 0.290 | 0.068 | 0.015 | 0.015 | 4744893 |
| Styrene | ug | 0.083 | 0.247 | 0.032 | 0.012 | 0.012 | 4744893 |
| o-Xylene | ug | 0.041 | 0.072 | 0.026 | 0.015 | 0.015 | 4744893 |
| Bromoform | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4744893 |
| 1,1,2,2-Tetrachloroethane | ug | <0.014 | <0.014 | <0.014 | 0.014 | 0.014 | 4744893 |
| Acrylonitrile | ug | <0.025 | <0.025 | <0.025 | 0.025 | 0.025 | 4744893 |
| **Surrogate Recovery (%)** | | | | | | | |
| Bromofluorobenzene | % | 100 | 100 | 101 | | | 4744893 |
| D10-Ethylbenzene (FS) | % | 109 | 117 | 117 | | | 4744893 |
| D4-1,2-Dichloroethane | % | 112 | 104 | 108 | | | 4744893 |
| D8-Toluene | % | 101 | 97 | 100 | | | 4744893 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG276 | DKG277 | DKG278 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | 2016/11/01 | 2016/11/01 | | | |
| **COC Number** | | 23262 | 23262 | 23262 | | | |
| | **UNITS** | **M0031- R3- B- #8 A/B/C** | **M0031- R3- C- #9 A/B/C** | **COND- R1- A** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | | | |
| Chloromethane | ug | 0.052 | 0.015 | | 0.015 | 0.015 | 4744893 |
| Chloromethane | ug/L | | | <2.0 | 2.0 | 2.0 | 4748218 |
| Vinyl Chloride | ug | <0.013 | <0.013 | | 0.013 | 0.013 | 4744893 |
| Vinyl Chloride | ug/L | | | <0.40 | 0.40 | 0.40 | 4748218 |
| Bromomethane | ug | <0.015 | <0.015 | | 0.015 | 0.015 | 4744893 |
| Bromomethane | ug/L | | | <3.0 | 3.0 | 3.0 | 4748218 |
| Chloroethane | ug | <0.0090 | <0.0090 | | 0.0090 | 0.0090 | 4744893 |
| Chloroethane | ug/L | | | <1.0 | 1.0 | 1.0 | 4748218 |
| 1,1-Dichloroethylene | ug | <0.011 | <0.011 | | 0.011 | 0.011 | 4744893 |
| Iodomethane | ug | <0.015 | <0.015 | | 0.015 | 0.015 | 4744893 |
| Iodomethane | ug/L | | | <0.60 | 0.60 | 0.60 | 4748218 |
| Carbon Disulfide | ug | 0.206 | <0.026 | | 0.026 | 0.026 | 4744893 |
| Carbon Disulfide | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Methylene Chloride(Dichloromethane) | ug | 0.746 | <0.019 | | 0.019 | 0.020 | 4744893 |
| Methylene Chloride(Dichloromethane) | ug/L | | | 15 | 1.0 | 1.0 | 4748218 |
| 1,1-Dichloroethane | ug/L | | | <0.40 | 0.40 | 0.40 | 4748218 |
| Chloroform | ug | <0.011 | <0.011 | | 0.011 | 0.011 | 4744893 |
| Chloroform | ug/L | | | <0.40 | 0.40 | 0.40 | 4748218 |
| 1,2-Dichloroethane | ug | <0.0070 | <0.0070 | | 0.0070 | 0.0070 | 4744893 |
| 1,2-Dichloroethane | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| 1,1,1-Trichloroethane | ug | <0.014 | <0.014 | | 0.014 | 0.014 | 4744893 |
| 1,1,1-Trichloroethane | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Carbon Tetrachloride | ug | <0.016 | <0.016 | | 0.016 | 0.016 | 4744893 |
| Carbon Tetrachloride | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Benzene | ug | 1.70 | 0.460 | | 0.0090 | 0.0090 | 4744893 |
| Benzene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| 1,1,2-Trichloroethane | ug | <0.016 | <0.016 | | 0.016 | 0.016 | 4744893 |
| 1,2-Dichloropropane | ug | <0.011 | <0.011 | | 0.011 | 0.011 | 4744893 |
| 1,2-Dichloropropane | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Trichloroethylene | ug | <0.011 | <0.011 | | 0.011 | 0.011 | 4744893 |
| Trichloroethylene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Toluene | ug | 0.394 | 0.078 | | 0.014 | 0.014 | 4744893 |
| Toluene | ug/L | | | 2.4 | 0.50 | 0.50 | 4748218 |
| Tetrachloroethylene | ug | <0.018 | <0.018 | | 0.018 | 0.018 | 4744893 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG276 | DKG277 | DKG278 | | | |
|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | 2016/11/01 | 2016/11/01 | | | |
| **COC Number** | | 23262 | 23262 | 23262 | | | |
| | **UNITS** | **M0031- R3- B- #8 A/B/C** | **M0031- R3- C- #9 A/B/C** | **COND- R1- A** | **RDL** | **MDL** | **QC Batch** |
| Tetrachloroethylene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Chlorobenzene | ug | <0.011 | <0.011 | | 0.011 | 0.011 | 4744893 |
| Chlorobenzene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Ethylbenzene | ug | 0.015 | <0.014 | | 0.014 | 0.014 | 4744893 |
| Ethylbenzene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| m / p-Xylene | ug | 0.068 | 0.024 | | 0.015 | 0.015 | 4744893 |
| p+m-Xylene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Styrene | ug | 0.067 | 0.015 | | 0.012 | 0.012 | 4744893 |
| Styrene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| o-Xylene | ug | 0.022 | <0.015 | | 0.015 | 0.015 | 4744893 |
| o-Xylene | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| Bromoform | ug | <0.014 | <0.014 | | 0.014 | 0.014 | 4744893 |
| Bromoform | ug/L | | | <0.40 | 0.40 | 0.40 | 4748218 |
| 1,1,2,2-Tetrachloroethane | ug | <0.014 | <0.014 | | 0.014 | 0.014 | 4744893 |
| 1,1,2,2-Tetrachloroethane | ug/L | | | <1.0 | 1.0 | 1.0 | 4748218 |
| Acrylonitrile | ug | <0.025 | <0.025 | | 0.025 | 0.025 | 4744893 |
| Total Xylenes | ug/L | | | <0.50 | 0.50 | 0.50 | 4748218 |
| **Surrogate Recovery (%)** | | | | | | | |
| 4-Bromofluorobenzene | % | | | 87 | | | 4748218 |
| D4-1,2-Dichloroethane | % | | | 118 | | | 4748218 |
| D8-Toluene | % | | | 106 | | | 4748218 |
| Bromofluorobenzene | % | 101 | 101 | | | | 4744893 |
| D10-Ethylbenzene (FS) | % | 120 | 101 | | | | 4744893 |
| D4-1,2-Dichloroethane | % | 109 | 111 | | | | 4744893 |
| D8-Toluene | % | 101 | 100 | | | | 4744893 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG279 | | | DKG280 | | | DKG281 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | | | 2016/11/01 | | | 2016/11/01 | | | |
| **COC Number** | | 23262 | | | 23262 | | | 23262 | | | |
| | **UNITS** | **COND- R1-B** | **RDL** | **MDL** | **COND- R1-C** | **RDL** | **MDL** | **COND- R2-A** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | | | | | | | |
| Chloromethane | ug/L | <200 | 200 | 200 | <2000 | 2000 | 2000 | <2.0 | 2.0 | 2.0 | 4748218 |
| Vinyl Chloride | ug/L | <40 | 40 | 40 | <400 | 400 | 400 | <0.40 | 0.40 | 0.40 | 4748218 |
| Bromomethane | ug/L | <300 | 300 | 300 | <3000 | 3000 | 3000 | <3.0 | 3.0 | 3.0 | 4748218 |
| Chloroethane | ug/L | <100 | 100 | 100 | <1000 | 1000 | 1000 | <1.0 | 1.0 | 1.0 | 4748218 |
| Iodomethane | ug/L | <60 | 60 | 60 | <600 | 600 | 600 | <0.60 | 0.60 | 0.60 | 4748218 |
| Carbon Disulfide | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Methylene Chloride(Dichloromethane) | ug/L | <100 | 100 | 100 | <1000 | 1000 | 1000 | 16 | 1.0 | 1.0 | 4748218 |
| 1,1-Dichloroethane | ug/L | <40 | 40 | 40 | <400 | 400 | 400 | <0.40 | 0.40 | 0.40 | 4748218 |
| Chloroform | ug/L | <40 | 40 | 40 | <400 | 400 | 400 | <0.40 | 0.40 | 0.40 | 4748218 |
| 1,2-Dichloroethane | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| 1,1,1-Trichloroethane | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Carbon Tetrachloride | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Benzene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| 1,2-Dichloropropane | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Trichloroethylene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Toluene | ug/L | 560 | 50 | 50 | 5500 | 500 | 500 | 4.3 | 0.50 | 0.50 | 4748218 |
| Tetrachloroethylene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Chlorobenzene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Ethylbenzene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| p+m-Xylene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Styrene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| o-Xylene | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| Bromoform | ug/L | <40 | 40 | 40 | <400 | 400 | 400 | <0.40 | 0.40 | 0.40 | 4748218 |
| 1,1,2,2-Tetrachloroethane | ug/L | <100 | 100 | 100 | <1000 | 1000 | 1000 | <1.0 | 1.0 | 1.0 | 4748218 |
| Total Xylenes | ug/L | <50 | 50 | 50 | <500 | 500 | 500 | <0.50 | 0.50 | 0.50 | 4748218 |
| **Surrogate Recovery (%)** | | | | | | | | | | | |
| 4-Bromofluorobenzene | % | 81 | | | 82 | | | 81 | | | 4748218 |
| D4-1,2-Dichloroethane | % | 118 | | | 118 | | | 118 | | | 4748218 |
| D8-Toluene | % | 105 | | | 106 | | | 105 | | | 4748218 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG282 | DKG283 | DKG284 | DKG285 | | | |
|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | 2016/11/01 | 2016/11/01 | 2016/11/01 | | | |
| **COC Number** | | 23262 | 23262 | 23262 | 23262 | | | |
| | **UNITS** | **COND- R2-B** | **COND- R2-C** | **COND- R3-A** | **COND- R3-B** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | | | | |
| Chloromethane | ug/L | <200 | <200 | <200 | <200 | 200 | 200 | 4748218 |
| Vinyl Chloride | ug/L | <40 | <40 | <40 | <40 | 40 | 40 | 4748218 |
| Bromomethane | ug/L | <300 | <300 | <300 | <300 | 300 | 300 | 4748218 |
| Chloroethane | ug/L | <100 | <100 | <100 | <100 | 100 | 100 | 4748218 |
| Iodomethane | ug/L | <60 | <60 | <60 | <60 | 60 | 60 | 4748218 |
| Carbon Disulfide | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Methylene Chloride(Dichloromethane) | ug/L | <100 | <100 | <100 | <100 | 100 | 100 | 4748218 |
| 1,1-Dichloroethane | ug/L | <40 | <40 | <40 | <40 | 40 | 40 | 4748218 |
| Chloroform | ug/L | <40 | <40 | <40 | <40 | 40 | 40 | 4748218 |
| 1,2-Dichloroethane | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| 1,1,1-Trichloroethane | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Carbon Tetrachloride | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Benzene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| 1,2-Dichloropropane | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Trichloroethylene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Toluene | ug/L | 770 | 780 | 760 | 740 | 50 | 50 | 4748218 |
| Tetrachloroethylene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Chlorobenzene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Ethylbenzene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| p+m-Xylene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Styrene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| o-Xylene | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| Bromoform | ug/L | <40 | <40 | <40 | <40 | 40 | 40 | 4748218 |
| 1,1,2,2-Tetrachloroethane | ug/L | <100 | <100 | <100 | <100 | 100 | 100 | 4748218 |
| Total Xylenes | ug/L | <50 | <50 | <50 | <50 | 50 | 50 | 4748218 |
| **Surrogate Recovery (%)** | | | | | | | | |
| 4-Bromofluorobenzene | % | 80 | 79 | 83 | 81 | | | 4748218 |
| D4-1,2-Dichloroethane | % | 117 | 118 | 119 | 121 | | | 4748218 |
| D8-Toluene | % | 102 | 106 | 103 | 103 | | | 4748218 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

| **Maxxam ID** | | DKG286 | | | |
|---|---|---|---|---|---|
| **Sampling Date** | | 2016/11/01 | | | |
| **COC Number** | | 23262 | | | |
| | **UNITS** | **COND- R3-C** | **RDL** | **MDL** | **QC Batch** |
| **Volatile Organics** | | | | | |
| Chloromethane | ug/L | <2000 | 2000 | 2000 | 4748218 |
| Vinyl Chloride | ug/L | <400 | 400 | 400 | 4748218 |
| Bromomethane | ug/L | <3000 | 3000 | 3000 | 4748218 |
| Chloroethane | ug/L | <1000 | 1000 | 1000 | 4748218 |
| Iodomethane | ug/L | <600 | 600 | 600 | 4748218 |
| Carbon Disulfide | ug/L | <500 | 500 | 500 | 4748218 |
| Methylene Chloride(Dichloromethane) | ug/L | <1000 | 1000 | 1000 | 4748218 |
| 1,1-Dichloroethane | ug/L | <400 | 400 | 400 | 4748218 |
| Chloroform | ug/L | <400 | 400 | 400 | 4748218 |
| 1,2-Dichloroethane | ug/L | <500 | 500 | 500 | 4748218 |
| 1,1,1-Trichloroethane | ug/L | <500 | 500 | 500 | 4748218 |
| Carbon Tetrachloride | ug/L | <500 | 500 | 500 | 4748218 |
| Benzene | ug/L | <500 | 500 | 500 | 4748218 |
| 1,2-Dichloropropane | ug/L | <500 | 500 | 500 | 4748218 |
| Trichloroethylene | ug/L | <500 | 500 | 500 | 4748218 |
| Toluene | ug/L | 12000 | 500 | 500 | 4748218 |
| Tetrachloroethylene | ug/L | <500 | 500 | 500 | 4748218 |
| Chlorobenzene | ug/L | <500 | 500 | 500 | 4748218 |
| Ethylbenzene | ug/L | <500 | 500 | 500 | 4748218 |
| p+m-Xylene | ug/L | <500 | 500 | 500 | 4748218 |
| Styrene | ug/L | <500 | 500 | 500 | 4748218 |
| o-Xylene | ug/L | <500 | 500 | 500 | 4748218 |
| Bromoform | ug/L | <400 | 400 | 400 | 4748218 |
| 1,1,2,2-Tetrachloroethane | ug/L | <1000 | 1000 | 1000 | 4748218 |
| Total Xylenes | ug/L | <500 | 500 | 500 | 4748218 |
| **Surrogate Recovery (%)** | | | | | |
| 4-Bromofluorobenzene | % | 80 | | | 4748218 |
| D4-1,2-Dichloroethane | % | 120 | | | 4748218 |
| D8-Toluene | % | 103 | | | 4748218 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## TEST SUMMARY

**Maxxam ID:** DKG267 **Collected:** 2016/11/01
**Sample ID:** M0031- TRIB- #11 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4740507 | N/A | 2016/11/09 | Yujie Yan |

**Maxxam ID:** DKG268 **Collected:** 2016/11/01
**Sample ID:** M0031- FB- #10 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4740507 | N/A | 2016/11/09 | Yujie Yan |

**Maxxam ID:** DKG269 **Collected:** 2016/11/01
**Sample ID:** M0031- R1- A- #1 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4740507 | N/A | 2016/11/09 | Yujie Yan |

**Maxxam ID:** DKG270 **Collected:** 2016/11/01
**Sample ID:** M0031- R1- B- #2 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG271 **Collected:** 2016/11/01
**Sample ID:** M0031- R1- C- #3 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG272 **Collected:** 2016/11/01
**Sample ID:** M0031- R2- A- #4 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG273 **Collected:** 2016/11/01
**Sample ID:** M0031- R2- B- #5 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## TEST SUMMARY

**Maxxam ID:** DKG274 **Collected:** 2016/11/01
**Sample ID:** M0031- R2- C- #6 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG275 **Collected:** 2016/11/01
**Sample ID:** M0031- R3- A- #7 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG276 **Collected:** 2016/11/01
**Sample ID:** M0031- R3- B- #8 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG277 **Collected:** 2016/11/01
**Sample ID:** M0031- R3- C- #9 A/B/C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST EPA5041A, 8260C for 0030, 0031 | GC/MS | 4744893 | N/A | 2016/11/11 | Yujie Yan |

**Maxxam ID:** DKG278 **Collected:** 2016/11/01
**Sample ID:** COND- R1- A **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG279 **Collected:** 2016/11/01
**Sample ID:** COND- R1- B **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG280 **Collected:** 2016/11/01
**Sample ID:** COND- R1- C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## TEST SUMMARY

**Maxxam ID:** DKG281 **Collected:** 2016/11/01
**Sample ID:** COND- R2- A **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG282 **Collected:** 2016/11/01
**Sample ID:** COND- R2- B **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG283 **Collected:** 2016/11/01
**Sample ID:** COND- R2- C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG284 **Collected:** 2016/11/01
**Sample ID:** COND- R3- A **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG285 **Collected:** 2016/11/01
**Sample ID:** COND- R3- B **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |

**Maxxam ID:** DKG286 **Collected:** 2016/11/01
**Sample ID:** COND- R3- C **Shipped:**
**Matrix:** Stack Sampling Train **Received:** 2016/11/07

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| VOST Condensate (8260Cmod) | P&T/MS | 4748218 | N/A | 2016/11/16 | Yujie Yan |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## GENERAL COMMENTS

VOST analysis:
WS#4744893: In the continuing calibration standard, iodomethane and acrylonitrile exceeded the acceptance limit of 20%. The reference standard was acceptable therefore the data should not be affected.

Condensate analysis:
Condensate samples had 65mls.
Vinyl Chloride exceeded 130% recovery in the reference standard. There were no positives found for this compound therefore the data should not be affected.

Sample DKG268 [M0031- FB- #10 A/B/C] : Dichloromethane is over the calibration range. Data should be considered an estimate only.

Sample DKG269 [M0031- R1- A- #1 A/B/C] : Benzene is over the calibration range. Data should be considered an estimate only.

Sample DKG270 [M0031- R1- B- #2 A/B/C] : Dichloromethane and benzene are over the calibration range. Data should be considered an estimate only.

Sample DKG271 [M0031- R1- C- #3 A/B/C] : Benzene is over the calibration range. Data should be considered an estimate only.

Sample DKG272 [M0031- R2- A- #4 A/B/C] : Benzene is over the calibration range. Data should be considered an estimate only.

Sample DKG273 [M0031- R2- B- #5 A/B/C] : Benzene is over the calibration range. Data should be considered an estimate only.

Sample DKG274 [M0031- R2- C- #6 A/B/C] : Received VOST tube B and C with stems broken off. Sorbent packing were transferred to empty VOST tubes for analysis. The outer container with tube B was also broken.
Dichloromethane, benzene and toluene exceed calibration range in this sample, results for these analytes are estimates only.

Sample DKG275 [M0031- R3- A- #7 A/B/C] : Benzene is over the calibration range. Data should be considered an estimate only.

Sample DKG276 [M0031- R3- B- #8 A/B/C] : Benzene is over the calibration range. Data should be considered an estimate only.

Sample DKG278 [COND- R1- A] : Acrylonitrile < 5ug/L

Sample DKG279 [COND- R1- B] : Sample was analyzed at a 100x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 500ug/L

Sample DKG280 [COND- R1- C] : Sample was analyzed at a 1000x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 5000ug/L

Sample DKG281 [COND- R2- A] : Acrylonitrile < 5ug/L

Sample DKG282 [COND- R2- B] : Sample was analyzed at a 100x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 500ug/L

Sample DKG283 [COND- R2- C] : Sample was analyzed at a 100x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 500ug/L

Sample DKG284 [COND- R3- A] : Sample was analyzed at a 100x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 500ug/L

Sample DKG285 [COND- R3- B] : Sample was analyzed at a 100x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 500ug/L

Sample DKG286 [COND- R3- C] : Sample was analyzed at a 1000x dilution. The DLs were adjusted accordingly.
Acrylonitrile < 5000ug/L



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## GENERAL COMMENTS

**Results relate only to the items tested.**



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4740507 | YYA | Spiked Blank | Bromofluorobenzene | 2016/11/09 | | 100 | % | 43 - 131 |
| | | | D10-Ethylbenzene (FS) | 2016/11/09 | | 115 | % | 47 - 157 |
| | | | D4-1,2-Dichloroethane | 2016/11/09 | | 100 | % | 64 - 133 |
| | | | D8-Toluene | 2016/11/09 | | 99 | % | 68 - 121 |
| | | | Chloromethane | 2016/11/09 | | 119 | % | 50 - 150 |
| | | | Vinyl Chloride | 2016/11/09 | | 108 | % | 50 - 150 |
| | | | Bromomethane | 2016/11/09 | | 102 | % | 50 - 150 |
| | | | Chloroethane | 2016/11/09 | | 105 | % | 50 - 150 |
| | | | 1,1-Dichloroethylene | 2016/11/09 | | 107 | % | 50 - 150 |
| | | | Iodomethane | 2016/11/09 | | 91 | % | N/A |
| | | | Carbon Disulfide | 2016/11/09 | | 102 | % | 50 - 150 |
| | | | Methylene Chloride(Dichloromethane) | 2016/11/09 | | 106 | % | 50 - 150 |
| | | | Chloroform | 2016/11/09 | | 107 | % | 50 - 150 |
| | | | 1,2-Dichloroethane | 2016/11/09 | | 108 | % | 50 - 150 |
| | | | 1,1,1-Trichloroethane | 2016/11/09 | | 106 | % | 50 - 150 |
| | | | Carbon Tetrachloride | 2016/11/09 | | 107 | % | 50 - 150 |
| | | | Benzene | 2016/11/09 | | 106 | % | 50 - 150 |
| | | | 1,1,2-Trichloroethane | 2016/11/09 | | 108 | % | 50 - 150 |
| | | | 1,2-Dichloropropane | 2016/11/09 | | 107 | % | 50 - 150 |
| | | | Trichloroethylene | 2016/11/09 | | 106 | % | 50 - 150 |
| | | | Toluene | 2016/11/09 | | 106 | % | 50 - 150 |
| | | | Tetrachloroethylene | 2016/11/09 | | 109 | % | 50 - 150 |
| | | | Chlorobenzene | 2016/11/09 | | 108 | % | 50 - 150 |
| | | | Ethylbenzene | 2016/11/09 | | 107 | % | 50 - 150 |
| | | | m / p-Xylene | 2016/11/09 | | 108 | % | 50 - 150 |
| | | | Styrene | 2016/11/09 | | 109 | % | 50 - 150 |
| | | | o-Xylene | 2016/11/09 | | 109 | % | 50 - 150 |
| | | | Bromoform | 2016/11/09 | | 109 | % | 50 - 150 |
| | | | 1,1,2,2-Tetrachloroethane | 2016/11/09 | | 111 | % | 50 - 150 |
| | | | Acrylonitrile | 2016/11/09 | | 95 | % | N/A |
| 4740507 | YYA | Method Blank | Bromofluorobenzene | 2016/11/09 | | 99 | % | 43 - 131 |
| | | | D10-Ethylbenzene (FS) | 2016/11/09 | | 107 | % | 47 - 157 |
| | | | D4-1,2-Dichloroethane | 2016/11/09 | | 108 | % | 64 - 133 |
| | | | D8-Toluene | 2016/11/09 | | 101 | % | 68 - 121 |
| | | | Chloromethane | 2016/11/09 | <0.015 | | ug | |
| | | | Vinyl Chloride | 2016/11/09 | <0.013 | | ug | |
| | | | Bromomethane | 2016/11/09 | <0.015 | | ug | |
| | | | Chloroethane | 2016/11/09 | <0.0090 | | ug | |
| | | | 1,1-Dichloroethylene | 2016/11/09 | <0.011 | | ug | |
| | | | Iodomethane | 2016/11/09 | <0.015 | | ug | |
| | | | Carbon Disulfide | 2016/11/09 | <0.026 | | ug | |
| | | | Methylene Chloride(Dichloromethane) | 2016/11/09 | <0.019 | | ug | |
| | | | Chloroform | 2016/11/09 | <0.011 | | ug | |
| | | | 1,2-Dichloroethane | 2016/11/09 | <0.0070 | | ug | |
| | | | 1,1,1-Trichloroethane | 2016/11/09 | <0.014 | | ug | |
| | | | Carbon Tetrachloride | 2016/11/09 | <0.016 | | ug | |
| | | | Benzene | 2016/11/09 | <0.0090 | | ug | |
| | | | 1,1,2-Trichloroethane | 2016/11/09 | <0.016 | | ug | |
| | | | 1,2-Dichloropropane | 2016/11/09 | <0.011 | | ug | |
| | | | Trichloroethylene | 2016/11/09 | <0.011 | | ug | |
| | | | Toluene | 2016/11/09 | <0.014 | | ug | |
| | | | Tetrachloroethylene | 2016/11/09 | <0.018 | | ug | |
| | | | Chlorobenzene | 2016/11/09 | <0.011 | | ug | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Ethylbenzene | 2016/11/09 | <0.014 | | ug | |
| | | | m / p-Xylene | 2016/11/09 | <0.015 | | ug | |
| | | | Styrene | 2016/11/09 | <0.012 | | ug | |
| | | | o-Xylene | 2016/11/09 | <0.015 | | ug | |
| | | | Bromoform | 2016/11/09 | <0.014 | | ug | |
| | | | 1,1,2,2-Tetrachloroethane | 2016/11/09 | <0.014 | | ug | |
| | | | Acrylonitrile | 2016/11/09 | <0.025 | | ug | |
| 4744893 | YYA | Spiked Blank | Bromofluorobenzene | 2016/11/11 | | 101 | % | 43 - 131 |
| | | | D10-Ethylbenzene (FS) | 2016/11/11 | | 105 | % | 47 - 157 |
| | | | D4-1,2-Dichloroethane | 2016/11/11 | | 100 | % | 64 - 133 |
| | | | D8-Toluene | 2016/11/11 | | 99 | % | 68 - 121 |
| | | | Chloromethane | 2016/11/11 | | 127 | % | 50 - 150 |
| | | | Vinyl Chloride | 2016/11/11 | | 105 | % | 50 - 150 |
| | | | Bromomethane | 2016/11/11 | | 92 | % | 50 - 150 |
| | | | Chloroethane | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | 1,1-Dichloroethylene | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | Iodomethane | 2016/11/11 | | 71 | % | N/A |
| | | | Carbon Disulfide | 2016/11/11 | | 96 | % | 50 - 150 |
| | | | Methylene Chloride(Dichloromethane) | 2016/11/11 | | 97 | % | 50 - 150 |
| | | | Chloroform | 2016/11/11 | | 103 | % | 50 - 150 |
| | | | 1,2-Dichloroethane | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | 1,1,1-Trichloroethane | 2016/11/11 | | 103 | % | 50 - 150 |
| | | | Carbon Tetrachloride | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | Benzene | 2016/11/11 | | 102 | % | 50 - 150 |
| | | | 1,1,2-Trichloroethane | 2016/11/11 | | 103 | % | 50 - 150 |
| | | | 1,2-Dichloropropane | 2016/11/11 | | 102 | % | 50 - 150 |
| | | | Trichloroethylene | 2016/11/11 | | 107 | % | 50 - 150 |
| | | | Toluene | 2016/11/11 | | 102 | % | 50 - 150 |
| | | | Tetrachloroethylene | 2016/11/11 | | 105 | % | 50 - 150 |
| | | | Chlorobenzene | 2016/11/11 | | 105 | % | 50 - 150 |
| | | | Ethylbenzene | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | m / p-Xylene | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | Styrene | 2016/11/11 | | 105 | % | 50 - 150 |
| | | | o-Xylene | 2016/11/11 | | 104 | % | 50 - 150 |
| | | | Bromoform | 2016/11/11 | | 107 | % | 50 - 150 |
| | | | 1,1,2,2-Tetrachloroethane | 2016/11/11 | | 103 | % | 50 - 150 |
| | | | Acrylonitrile | 2016/11/11 | | 111 | % | N/A |
| 4744893 | YYA | Method Blank | Bromofluorobenzene | 2016/11/11 | | 102 | % | 43 - 131 |
| | | | D10-Ethylbenzene (FS) | 2016/11/11 | | 90 | % | 47 - 157 |
| | | | D4-1,2-Dichloroethane | 2016/11/11 | | 107 | % | 64 - 133 |
| | | | D8-Toluene | 2016/11/11 | | 100 | % | 68 - 121 |
| | | | Chloromethane | 2016/11/11 | <0.015 | | ug | |
| | | | Vinyl Chloride | 2016/11/11 | <0.013 | | ug | |
| | | | Bromomethane | 2016/11/11 | <0.015 | | ug | |
| | | | Chloroethane | 2016/11/11 | <0.0090 | | ug | |
| | | | 1,1-Dichloroethylene | 2016/11/11 | <0.011 | | ug | |
| | | | Iodomethane | 2016/11/11 | <0.015 | | ug | |
| | | | Carbon Disulfide | 2016/11/11 | <0.026 | | ug | |
| | | | Methylene Chloride(Dichloromethane) | 2016/11/11 | <0.019 | | ug | |
| | | | Chloroform | 2016/11/11 | <0.011 | | ug | |
| | | | 1,2-Dichloroethane | 2016/11/11 | <0.0070 | | ug | |
| | | | 1,1,1-Trichloroethane | 2016/11/11 | <0.014 | | ug | |
| | | | Carbon Tetrachloride | 2016/11/11 | <0.016 | | ug | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Benzene | 2016/11/11 | <0.0090 | | ug | |
| | | | 1,1,2-Trichloroethane | 2016/11/11 | <0.016 | | ug | |
| | | | 1,2-Dichloropropane | 2016/11/11 | <0.011 | | ug | |
| | | | Trichloroethylene | 2016/11/11 | <0.011 | | ug | |
| | | | Toluene | 2016/11/11 | <0.014 | | ug | |
| | | | Tetrachloroethylene | 2016/11/11 | <0.018 | | ug | |
| | | | Chlorobenzene | 2016/11/11 | <0.011 | | ug | |
| | | | Ethylbenzene | 2016/11/11 | <0.014 | | ug | |
| | | | m / p-Xylene | 2016/11/11 | <0.015 | | ug | |
| | | | Styrene | 2016/11/11 | <0.012 | | ug | |
| | | | o-Xylene | 2016/11/11 | <0.015 | | ug | |
| | | | Bromoform | 2016/11/11 | <0.014 | | ug | |
| | | | 1,1,2,2-Tetrachloroethane | 2016/11/11 | <0.014 | | ug | |
| | | | Acrylonitrile | 2016/11/11 | <0.025 | | ug | |
| 4748218 | YYA | Spiked Blank | 4-Bromofluorobenzene | 2016/11/16 | | 91 | % | 70 - 130 |
| | | | D4-1,2-Dichloroethane | 2016/11/16 | | 117 | % | 70 - 130 |
| | | | D8-Toluene | 2016/11/16 | | 106 | % | 70 - 130 |
| | | | Chloromethane | 2016/11/16 | | 124 | % | 60 - 140 |
| | | | Vinyl Chloride | 2016/11/16 | | 162 (1) | % | 70 - 130 |
| | | | Bromomethane | 2016/11/16 | | 108 | % | 60 - 140 |
| | | | Chloroethane | 2016/11/16 | | 114 | % | 70 - 130 |
| | | | Iodomethane | 2016/11/16 | | 78 | % | N/A |
| | | | Carbon Disulfide | 2016/11/16 | | 103 | % | N/A |
| | | | Methylene Chloride(Dichloromethane) | 2016/11/16 | | 106 | % | 70 - 130 |
| | | | 1,1-Dichloroethane | 2016/11/16 | | 109 | % | 70 - 130 |
| | | | Chloroform | 2016/11/16 | | 110 | % | 70 - 130 |
| | | | 1,2-Dichloroethane | 2016/11/16 | | 116 | % | 70 - 130 |
| | | | 1,1,1-Trichloroethane | 2016/11/16 | | 107 | % | 70 - 130 |
| | | | Carbon Tetrachloride | 2016/11/16 | | 115 | % | 70 - 130 |
| | | | Benzene | 2016/11/16 | | 102 | % | 70 - 130 |
| | | | 1,2-Dichloropropane | 2016/11/16 | | 102 | % | 70 - 130 |
| | | | Trichloroethylene | 2016/11/16 | | 93 | % | 70 - 130 |
| | | | Toluene | 2016/11/16 | | 106 | % | 70 - 130 |
| | | | Tetrachloroethylene | 2016/11/16 | | 88 | % | 70 - 130 |
| | | | Chlorobenzene | 2016/11/16 | | 99 | % | 70 - 130 |
| | | | Ethylbenzene | 2016/11/16 | | 106 | % | 70 - 130 |
| | | | p+m-Xylene | 2016/11/16 | | 102 | % | 70 - 130 |
| | | | Styrene | 2016/11/16 | | 105 | % | 70 - 130 |
| | | | o-Xylene | 2016/11/16 | | 103 | % | 70 - 130 |
| | | | Bromoform | 2016/11/16 | | 84 | % | 70 - 130 |
| | | | 1,1,2,2-Tetrachloroethane | 2016/11/16 | | 110 | % | 70 - 130 |
| | | | Total Xylenes | 2016/11/16 | | 102 | % | N/A |
| 4748218 | YYA | Method Blank | 4-Bromofluorobenzene | 2016/11/16 | | 79 | % | 70 - 130 |
| | | | D4-1,2-Dichloroethane | 2016/11/16 | | 115 | % | 70 - 130 |
| | | | D8-Toluene | 2016/11/16 | | 105 | % | 70 - 130 |
| | | | Chloromethane | 2016/11/16 | <2.0 | | ug/L | |
| | | | Vinyl Chloride | 2016/11/16 | <0.40 | | ug/L | |
| | | | Bromomethane | 2016/11/16 | <3.0 | | ug/L | |
| | | | Chloroethane | 2016/11/16 | <1.0 | | ug/L | |
| | | | Iodomethane | 2016/11/16 | <0.60 | | ug/L | |
| | | | Carbon Disulfide | 2016/11/16 | <0.50 | | ug/L | |
| | | | Methylene Chloride(Dichloromethane) | 2016/11/16 | <1.0 | | ug/L | |
| | | | 1,1-Dichloroethane | 2016/11/16 | <0.40 | | ug/L | |



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | % Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| | | | Chloroform | 2016/11/16 | <0.40 | | ug/L | |
| | | | 1,2-Dichloroethane | 2016/11/16 | <0.50 | | ug/L | |
| | | | 1,1,1-Trichloroethane | 2016/11/16 | <0.50 | | ug/L | |
| | | | Carbon Tetrachloride | 2016/11/16 | <0.50 | | ug/L | |
| | | | Benzene | 2016/11/16 | <0.50 | | ug/L | |
| | | | 1,2-Dichloropropane | 2016/11/16 | <0.50 | | ug/L | |
| | | | Trichloroethylene | 2016/11/16 | <0.50 | | ug/L | |
| | | | Toluene | 2016/11/16 | <0.50 | | ug/L | |
| | | | Tetrachloroethylene | 2016/11/16 | <0.50 | | ug/L | |
| | | | Chlorobenzene | 2016/11/16 | <0.50 | | ug/L | |
| | | | Ethylbenzene | 2016/11/16 | <0.50 | | ug/L | |
| | | | p+m-Xylene | 2016/11/16 | <0.50 | | ug/L | |
| | | | Styrene | 2016/11/16 | <0.50 | | ug/L | |
| | | | o-Xylene | 2016/11/16 | <0.50 | | ug/L | |
| | | | Bromoform | 2016/11/16 | <0.40 | | ug/L | |
| | | | 1,1,2,2-Tetrachloroethane | 2016/11/16 | <1.0 | | ug/L | |
| | | | Total Xylenes | 2016/11/16 | <0.50 | | ug/L | |

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6O2302
Report Date: 2016/11/21

Montrose Air Quality Services, LLC
Client Project #: 106377(16-167)
Site Location: ARCELLOR MITTAL

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Maureen Smith

Maureen Smith, Supervisor, Volatiles

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

B601812 / B601818 / B602302

Maxxam

6740 Campobello Rd
Mississauga Ontario ,L5N 2L8
www.maxxamanalytics.com
Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

**CLIENT INFORMATION**

Company Name: ArcelorMittal Monessen
Project Manager: William Cowell
e-mail: wcowell@montrose-env.com
Address: 1050 William Pitt Way
Pittsburgh, PA 15238

**SECTION**

Phone: 412 826 3636 Fax:
Sampled by: John Wilson

**ANALYSIS REQUESTED**

| Field Sample ID | Total Volume Sampled | Flow Rate | Collection Date | Sample Collection Time | ~~EPA RM 5/29 Parameters enabled~~ | EPA RM 23/0010 Parameters enabled | RM 316 Formaldehyde | EPA RM 0031 Parameters enabled |
|---|---|---|---|---|---|---|---|---|
| PEC Stack RM23/0010 Run 1, 2 and 3 | ~140 dcf | 150 | 10/23/16-10/28/16 | ~180 min | | ✓ | | |
| " " RM316 Run 1, 2 and 3 + Blank | ~30 dcf | 150 | 11/1/16 | ~120 min | | ~~✓~~ | ✓ | |
| " " RM0031 Run 1, 2 and 3 + Blanks | ~60 L | 0.5 LPM | 11/1/16 | ~120 min | | | | ✓ |
| Quench Stack RM23/0010 Run 1, 3 and 4 | ~140 dcf | 150 | 11/1/16 | ~180 min | | ✓ | | |

**TAT Requirement**

STD 10 Business day ✓
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

**PROJECT INFORMATION**

Project #: 106322 (16-167)
Name: William Cowell
PO #:
Maxxam Quote #:
Maxxam Contact: Clayton Johnson

**REPORTING REQUIREMENTS**

Summary Report only ☐
EDD ☐
Regulation

**Notes**

**PROJECT SPECIFIC COMMENTS**

Quench Stack RM 23/0010 Run 2 VOIDED due to failed leak check

Client Signature: [signature]
Affiliation: Montrose
Date/Time:

Received by: [signature] MAYODA PERERA (E)
Affiliation: MAXXAM 2016-11-07
Date/Time: 11-7-16 12:00 PM

18 30 12.5/12.0/10.3, 10.2/10.8/9.7

CCC-1031 (04/13) - All

# Method 15

# PUSHING EMISSIONSCOMBUSTION STACK GAS HYDROGEN SULFIDE ANALYTICAL REPORT ARCELOMITTAL - MONESSEN, MONESSEN, PA

January 3, 2017

**Prepared for:**

ArcelorMittal - Monessen
Monessen, PA

**Prepared by:**

Montrose Air Quality Services, LLC.
1050 William Pitt Way
Pittsburgh, Pennsylvania 15238
412-826-3636

PA Lab Registration #02-04775

Project No. 16-167

MONTROSE
AIR QUALITY SERVICES

## CERTIFICATION STATEMENT

This statement certifies that "to the best of their knowledge," based on state and federal regulations, operating permits, plan approvals applicable to each source tested, and reasonable inquiry, the statements and information presented in the attached document are true, accurate, and complete.

**PUSHING EMISSIONS COMBUSTION STACK GAS**
**HYDROGEN SULFIDE ANALYTICAL REPORT**
**ARCELORMITTAL - MONESSEN, MONESSEN, PA**

Project No. 16-167

Frank Barton, Field Project Manager
Montrose Air Quality Services, LLC.

1-3-2017
Date

Matthew Dallesasse, District Manager
Montrose Air Quality Services, LLC.

1/3/17
Date

Disclaimer – This document is intended solely for the use of the individual to whom it is addressed and others authorized to receive it.

Table 1. Analysis of Pushing Emission Combustion Stack Gas for Hydrogen Sulfide (H2S)
Test Dates November 3 through November 4, 2016
Pushing Emission Combustion Stack, ArcelorMittal - Monessen, Monessen, PA

| | Start Time | End Time | Run Average |
|---|---|---|---|
| Run 1 | 11/3/16 9:33 | 11/3/16 17:26 | < 0.5 ppm |
| Run 2 | 11/3/16 17:33 | 11/4/16 11:25 | < 0.5 ppm |
| Run 3 | 11/4/16 11:36 | 11/4/16 18:28 | < 0.5 ppm |
| | | | **Average of Runs 1 - 3** |
| | | | < 0.5 ppm |

< indicates below detection limit

The samples were anaylzed by gas chromatography using a flame photometric detector as described by USEPA Method 15.

# Method Narrative

# TABLE OF CONTENTS

Page

METHOD NARRATIVE ..... 1
1. GC Programs and Settings ..... 1
2. Test Procedures ..... 2
2.1 Removal of SO2 ..... 2
2.2 Sampling Components ..... 3
2.3 Sampling Procedure ..... 3

# APPENDICES

A: Run Results
B: Calibration Gas Certificates
C: H2S Calibration Data
D: Runs 1-3 Data
E: Citrate Buffer Verification Files

# PUSHING EMISSIONS COMBUSTION STACK GAS HYDROGEN SULFIDE ANALYTICAL REPORT ARCELORMITTAL - MONESSEN, MONESSEN, PA

## METHOD NARRATIVE

Gas chromatography (GC) analysis was performed on stack gas from the Pushing Emissions Combustion (PEC) exhaust stack on an SRI 8610C GC Multiple Gas #3 Analyzer. The GC was configured with the following components:

1. Rotary injection valve with a 1.0 milliliter (ml) sample loop
2. A 60 meter (m) MXT 1 Column manufactured by RESTEK Corporation eluting to a Combination Flame Ionization Detector / Flame Photometric Detector (FID / FPD) for analysis of sulfur Compounds.
3. The FID / FPD is supplied hydrogen at 30 pounds per square inch (psi) and air is pumped to the detector by an internal air compressor at a rate of 3 liters per minute (lpm).
4. UHP helium is used as the carrier gas and has a flow pressure of 27 psi.

### 1. GC Programs and Settings

- Injection Components Temperature: 62°C
- Detector Temperature: FID / FPD 180°C
- Column Oven Temperature Program:
    - Initial injection temperature 150°C
    - Hold for 3.5 minutes

Run Events:

| Time | Event |
|---|---|
| 0.00 Min | Run Start |
| 0.05 Min | Valve Rotates (sample injected) |
| 0.50 Min | Auto Zero to Base Line |
| 3.50 Min | Valve Rotates (run ends) |

## 2. Test Procedures

The testing followed USEPA Method 15, *Determination of Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide Emissions from Stationary Sources*, for the initial calibration and post test run procedures. Samples were analyzed for Hydrogen Sulfide (H2S) for three runs. Because emissions are released only during pushes, sampling was done during pushes. Each run consisted of twenty-four pushes. Three sample injections were taken during each push. Samples were injected at the start of the push and every one and half to two minutes during the push as the battery was emptied and the Hot Car approached the Quench Tower.

An overall calibration curve was generated prior to sampling and confirmed at the conclusion of testing. Each point on the curve was obtained by injecting gas from separate certified calibration bottled gases into the GC. Three consecutive injections were performed per calibration gas level and the results were within the required 5%. The sampling occurred over a two day period. The initial calibration was verified by injecting one H2S calibration gas level at the end of each run.

A line loss test was conducted at the end of the testing program. The post-line loss test was performed to comply with USEPA Method 15. The post line loss test indicated no loss of H2S concentration.

### 2.1 Removal of SO2

Sulfur Dioxide (SO2) and COS elute though the GC column at similar times making them hard or impossible to discriminate. For that reason it is necessary to remove the SO2 from the sample gas. This is accomplished by making a citrate buffer solution that will "scrub" the SO2 from the sample gas and will have no effect on the sulfur compounds of interest. The scrubber solution is made by dissolving 300 g of potassium citrate and 41 g of anhydrous citric acid in 1 liter of water.

The effectiveness of the scrubber solution was verified before and after each run. Analysis of an SO2 calibration gas eluted through the scrubber proved the removal of SO2. Analysis of calibration gas containing H2S, COS, and CS2 eluted through the scrubber showed no effect on

these compounds. Analysis results of SO2 calibration gas bypassing the scrubber contained SO2. These GC chromatograms are included with the run result chromatograms.

## 2.2 Sampling Components

The sampling system included a heated probe, impinger set-up, 3/8 inch line, three-way valve, GC sampling system, and sample pump.

The impinger set-up was made up of three impingers connected in series. The first two impingers contained 100 milliliters each of the citrate buffer solution (for the removal of SO2) and the third impinger was empty. Another purpose of the impingers was to remove moisture from the stack gas. This was achieved by keeping the impingers in an ice water bath condensing out the moisture as it passed through the buffer solution.

## 2.3 Sampling Procedure

The heated probe (heated to 300°F) was inserted into the PEC exhaust stack sample port. To insure that fresh stack gas was being analyzed by the GC, a sample pump continually pulled exhaust gas through the probe, impinger set-up, sample line, and the three way valve. In the normal valve position (time when not sampling), the exhaust gas was vented into the outside air. When the valve was in the sampling position, the stack gas was pulled through the sample loop of the GC for a period of at least 5 seconds. The three way valve was then returned back to the venting position. The rotary valve was then actuated, introducing the gas sample to the GC column for separation and elution to the detector. Prior to the start of sampling a leak check was performed by making an air tight seal at the sample probe end while the sample pump was running. The impingers containing the citrate buffer were then observed to verify that the bubbling activity decreased to a point that air bubbles occurred at a rate of less than one per second.

# APPENDIX A

# Run Results

# Pushing Emission Combustion Stack

| Date | Push | | | Run 1 | | | | |
|---|---|---|---|---|---|---|---|---|
| 11/3/2016 | | Start time | Stop | Injection | | | | |
| | 1 | 9:33:00 | 9:37:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 2 | 9:51:00 | 9:55:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 3 | 10:04:00 | 10:09:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 4 | 10:21:00 | 10:25:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 5 | 10:37:00 | 10:40:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 6 | 10:54:00 | 10:58:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 7 | 11:20:00 | 11:24:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 8 | 11:32:00 | 11:36:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 9 | 11:43:00 | 11:48:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 10 | 11:54:00 | 11:59:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 11 | 12:47:00 | 12:51:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 12 | 12:59:00 | 13:03:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |

# Pushing Emission Combustion Stack

| Date | Push | | | Run 1 | | | | |
|---|---|---|---|---|---|---|---|---|
| 11/3/2016 | | Start time | Stop | Injection | | | | |
| | 13 | 13:11:00 | 13:16:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 14 | 13:25:00 | 13:30:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 15 | 13:39:00 | 13:43:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 16 | 13:53:00 | 13:57:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 17 | 14:05:00 | 14:09:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 18 | 14:21:00 | 14:25:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 19 | 14:53:00 | 14:57:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | : | 3 | H2S | - | - | < 0.5 ppm |
| | 20 | 15:03:00 | 15:07:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 21 | 15:49:00 | 15:54:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 22 | 16:02:00 | 16:06:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 23 | 16:14:00 | 16:20:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 24 | 17:22:00 | 17:26:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |

# This page intentionally left blank

# Pushing Emission Combustion Stack

| Date | Push | | | Run 2 | | | | |
|---|---|---|---|---|---|---|---|---|
| 11/3/2016 | | Start time | Stop | Injection | | | | |
| | 1 | 17:33:00 | 17:38:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 2 | 17:45:00 | 17:49:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 3 | 17:56:00 | 18:01:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 4 | 18:09:00 | 18:14:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 5 | 18:21:00 | 18:25:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 6 | 18:32:00 | 18:37:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 7 | 18:46:00 | 18:49:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 8 | 18:57:00 | 19:02:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 9 | 19:09:00 | 19:13:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 10 | 20:12:00 | 20:17:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 11 | 20:24:00 | 20:27:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 12 | 20:36:00 | 20:39:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |

# Pushing Emission Combustion Stack

| Date | Push | | | Run 2 | | | | |
|---|---|---|---|---|---|---|---|---|
| 11/4/2016 | | Start time | Stop | Injection | | | | |
| | 13 | 15:03:00 | 6:59:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 14 | 7:57:00 | 8:01:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 15 | 8:10:00 | 8:14:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 16 | 8:30:00 | 8:35:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 17 | 8:49:00 | 8:54:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 18 | 9:10:00 | 9:14:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 19 | 9:23:00 | 9:28:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | : | 3 | H2S | - | - | < 0.5 ppm |
| | 20 | 10:12:00 | 10:16:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 21 | 10:27:00 | 10:33:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 22 | 10:43:00 | 10:48:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 23 | 11:00:00 | 11:05:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 24 | 11:21:00 | 11:25:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |

# This page intentionally left blank

# Pushing Emission Combustion Stack

| Date | Push | | | Run 3 | | | | |
|---|---|---|---|---|---|---|---|---|
| 11/4/2016 | | Start time | Stop | Injection | | | | |
| | 1 | 11:36:00 | 11:40:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 2 | 11:59:00 | 12:03:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 3 | 12:12:00 | 12:16:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 4 | 12:31:00 | 12:38:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 5 | 13:14:00 | 13:18:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 6 | 13:27:00 | 13:32:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 7 | 13:38:00 | 13:43:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 8 | 13:48:00 | 13:53:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 9 | 13:59:00 | 14:03:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 10 | 14:10:00 | 14:14:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 11 | 14:21:00 | 14:26:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 12 | 14:32:00 | 14:36:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |

# Pushing Emission Combustion Stack

| Date | Push | | | Run 3 | | | | |
|---|---|---|---|---|---|---|---|---|
| 11/4/2016 | | Start time | Stop | Injection | | | | |
| | 13 | 14:44:00 | 14:48:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 14 | 14:54:00 | 14:59:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 15 | 15:09:00 | 15:13:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 16 | 16:10:00 | 16:14:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 17 | 16:23:00 | 16:27:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 18 | 16:35:00 | 16:40:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 19 | 16:48:00 | 16:53:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | : | 3 | H2S | - | - | < 0.5 ppm |
| | 20 | 17:00:00 | 17:05:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 21 | 17:12:00 | 17:17:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 22 | 17:59:00 | 18:04:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 23 | 18:12:00 | 18:15:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |
| | 24 | 18:24:00 | 18:28:00 | | Component | Retention | Area | External |
| | | | | 1 | H2S | - | - | < 0.5 ppm |
| | | | | 2 | H2S | - | - | < 0.5 ppm |
| | | | | 3 | H2S | - | - | < 0.5 ppm |

# APPENDIX B

# Calibration Gas Certificates

Airgas

# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

**Airgas, Inc.**
600 Union Landing Road
Cinnaminson, NJ 08077
856-829-7878 Fax: 856-829-6576
www.airgas.com

| | | | |
|---|---|---|---|
| Part Number: | E02NI99E15A0485 | Reference Number: | 82-124453828-1 |
| Cylinder Number: | CC437195 | Cylinder Volume: | 144.3 CF |
| Laboratory: | ASG - Riverton - NJ | Cylinder Pressure: | 2015 PSIG |
| PGVP Number: | B52014 | Valve Outlet: | 330 |
| Gas Code: | H2S,BALN | Certification Date: | Sep 24, 2014 |

**Expiration Date: Sep 24, 2017**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

### ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|---|---|---|---|---|---|
| HYDROGEN SULFIDE | 10.00 PPM | 9.994 PPM | G1 | +/- 1.6% | 09/17/2014, 09/24/2014 |
| NITROGEN | Balance | | | | |

### CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|---|---|---|---|---|---|
| GMIS | 1242064581010 | CC315795 | 9.994 PPM HYDROGEN SULFIDE/NITROGEN | +/- 1.6% | Apr 04, 2016 |
| PRM | 12320 | D249622 | 10.00 PPM HYDROGEN SULFIDE/NITROGEN | +/- 1.5% | Jul 19, 2015 |

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

### ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|---|---|---|
| Ametek AE-921-S411 H2S | NDUV | Sep 02, 2014 |

**Triad Data Available Upon Request**

Walter E Miller

**Approved for Release**

Airgas

# CERTIFICATE OF ANALYSIS
## Grade of Product: EPA Protocol

**Airgas Specialty Gases**
630 United Drive
Durham , NC 27713
919-544-3773 Fax: 919-544-3774
Airgas.com

| | | | |
|---|---|---|---|
| Part Number: | E02NI99E15A0604 | Reference Number: | 122-124500606-1 |
| Cylinder Number: | CC245222 | Cylinder Volume: | 144.4 CF |
| Laboratory: | ASG - Durham - NC | Cylinder Pressure: | 2015 PSIG |
| PGVP Number: | B22015 | Valve Outlet: | 330 |
| Gas Code: | H2S,BALN | Certification Date: | Jul 07, 2015 |

**Expiration Date: Jul 07, 2018**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

### ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|---|---|---|---|---|---|
| HYDROGEN SULFIDE | 55.00 PPM | 56.00 PPM | G1 | +/- 1.1% NIST Traceable | 06/29/2015, 07/07/2015 |
| NITROGEN | Balance | | | | |

### CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|---|---|---|---|---|---|
| GMIS | 124139721114 | CC221527 | 49.29 PPM HYDROGEN SULFIDE/NITROGEN | +/- 0.8% | Apr 11, 2017 |
| RGM | 12338 | CC162437 | 49.14 PPM HYDROGEN SULFIDE/NITROGEN | +/- 0.7% | Nov 20, 2017 |

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

### ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|---|---|---|
| Ametek 9900 H2S ZX-9900-S1170 | Ultraviolet | Jun 23, 2015 |

**Triad Data Available Upon Request**

C S Williams
**Approved for Release**

Airgas

# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

**Airgas, Inc.**
600 Union Landing Road
Cinnaminson, NJ 08077
856-829-7878 Fax: 856-829-6576
Airgas.com

| | | | |
|---|---|---|---|
| Part Number: | E02NI99E15A0445 | Reference Number: | 82-124479697-1 |
| Cylinder Number: | CC448299 | Cylinder Volume: | 144.4 CF |
| Laboratory: | ASG - Riverton - NJ | Cylinder Pressure: | 2015 PSIG |
| PGVP Number: | B52015 | Valve Outlet: | 330 |
| Gas Code: | H2S,BALN | Certification Date: | Mar 05, 2015 |

**Expiration Date: Mar 05, 2018**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

### ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|---|---|---|---|---|---|
| HYDROGEN SULFIDE | 150.0 PPM | 145.2 PPM | G1 | +/- 0.7% | 02/26/2015, 03/05/2015 |
| NITROGEN | Balance | | | | |

### CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|---|---|---|---|---|---|
| GMIS | 124395711102 | CC365062 | 201.5 PPM HYDROGEN SULFIDE/NITROGEN | +/- 0.6% | Oct 16, 2017 |
| RGM | 12344 | XC028492B | 197.3 PPM HYDROGEN SULFIDE/NITROGEN | +/- 0.5% | Nov 12, 2017 |

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

### ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|---|---|---|
| Ametek 9000 RM | NDUV | Feb 25, 2015 |

**Triad Data Available Upon Request**

**Approved for Release**

# APPENDIX C

# H2S Calibration DATA

## Pre and Post Calibration DATA
## Calibration Curve
## Calibration Chromatograms

**MONTROSE CEM Calibration, Bias and Drift Data Sheet**
**Based on 40 CFR Part 60, Appendix A-4, Method 15**

| | | | |
|---|---|---|---|
| **Client** | ArcelorMittal - Monessen | **Date** | November 3 through November 4, 2016 |
| **Project No** | 16-167 | **Run 1** | Start: 11-3-2016 9:33 / End: 11-3-2016 17:26 |
| **Plant** | Monessen | **Run 2** | Start: 11-3-2016 17:33 / End: 11-4-2016 11:25 |
| **Unit** | PEC Stack | **Run 3** | Start: 11-4-2016 11:36 / End: 11-4-2016 18:28 |
| **Operation** | Normal | | |
| **Tester(s)** | FB | | |

| Cal. Gas | LOW Conc. | MID Conc. | HIGH Conc. | Tank ID or Lot Number LOW | MID | HIGH | Conc. Units |
|---|---|---|---|---|---|---|---|
| H2S | 10.0 | 56.0 | 145.2 | CC437195 | CC245222 | CC448299 | ppm |

| Gas | Calibration Level | Initial Calibration Responses Per Injection (units of area under the curve) | | | Average Area | Calibration Precision (% of each injection with relation to each other) | | |
|---|---|---|---|---|---|---|---|---|
| | | Injection 1 | 2 | 3 | | Injection 1 | 2 | 3 |
| H2S | Low | 32.0596 | 32.2542 | 31.8648 | 32.0595 | 0.00% | 0.61% | 0.61% |
| | Mid | 1478.6844 | 1483.6106 | 1550.0056 | 1504.1002 | 1.69% | 1.36% | 3.05% |
| | High | 6841.4872 | 6862.4535 | 6928.6987 | 6877.5465 | 0.52% | 0.22% | 0.74% |
| LIMITS | | | | | | ≥ 5% | ≥ 5% | ≥ 5% |

| Gas | Calibration Level | Final Calibration Responses Per Injection (units of area under the curve) | | | Average Area | Calibration Precision (% of each injection with relation to each other) | | |
|---|---|---|---|---|---|---|---|---|
| | | Injection 1 | 2 | 3 | | Injection 1 | 2 | 3 |
| H2S | Low | 32.0935 | 31.1106 | 30.8659 | 31.3567 | 2.35% | 0.78% | 1.57% |
| | Mid | 1482.9033 | 1475.3814 | 1431.3080 | 1463.1976 | 1.35% | 0.83% | 2.18% |
| | High | 7046.1390 | 6949.4760 | 7030.8858 | 7008.8336 | 0.53% | 0.85% | 0.31% |
| LIMITS | | | | | | ≥ 5% | ≥ 5% | ≥ 5% |

## POST TEST CALIBRATION DATA

**Pre and Post Calibration agreement within 5%**

**H2S**

| | | Pre Calibration | Post Calibration | % of Average | Less than 5% |
|---|---|---|---|---|---|
| **10.0** | **ppm H2S** | 32.06 | 32.09 | | |
| | | 32.25 | 31.11 | | |
| | | 31.86 | 30.87 | | |
| | **Average** | 32.06 | 31.36 | 2.2% | YES |

| | | Pre Calibration | Post Calibration | % of Average | Less than 5% |
|---|---|---|---|---|---|
| **56.0** | **ppm H2S** | 1478.68 | 1482.90 | | |
| | | 1483.61 | 1475.38 | | |
| | | 1550.01 | 1431.31 | | |
| | **Average** | 1504.10 | 1463.20 | 2.7% | YES |

| | | Pre Calibration | Post Calibration | % of Average | Less than 5% |
|---|---|---|---|---|---|
| **145.2** | **ppm H2S** | 6841.49 | 7046.14 | | |
| | | 6862.45 | 6949.48 | | |
| | | 6928.70 | 7030.89 | | |
| | **Average** | 6877.55 | 7008.83 | 1.9% | YES |

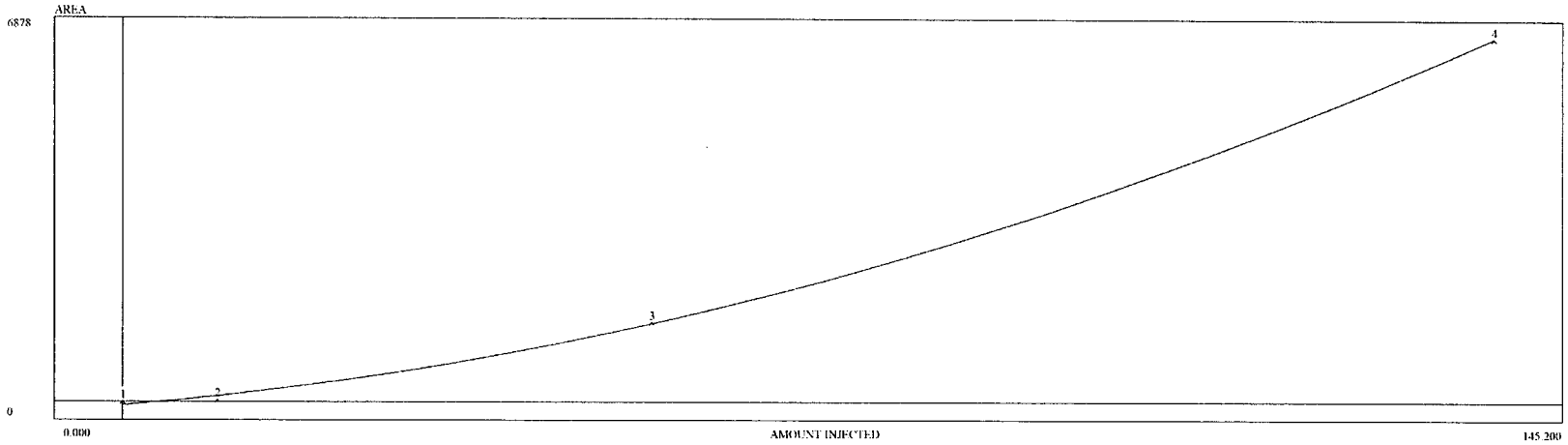
## POST TEST LINE LOSS CHECK

| **10.0 ppm** | **Average** | **Area** | **% of Average** |
|---|---|---|---|
| | **1** | 31.2492 | 3.50% |
| | **2** | 33.6604 | 3.95% |
| | **3** | 32.2366 | 0.45% |
| | **Average** | **32.3821** | |

| | **Area** |
|---|---|
| Calibration Standard | 32.1 |
| Post Test Line Loss Injection Average | 32.4 |
| **Post Test Line Loss** | -1.01% |

# This page intentionally left blank

Calibration file: C:\Users\fbarton\Desktop\GC Projects\Monessen\16-167 ICR Testing\PECS Stack\11-4-2016\11-2 through 11-4 2016 Pec Stacks\H2S Cal 11-03-2016.cal




Avg slope of curve: 47.80
Y-axis intercept: 0.00
Linearity: 0.60
Number of levels: 4
SD/rel SD of CF's: 22.2/114.6
Y=0.2270X^2+14.8437X+-60.2279
r2: 0.9997
Last calibrated: Thu Nov 03 07:53:40 2016

| Lvl | Area/ht. | Amount | CF | Current | Previous #1 | Previous #2 |
|---|---|---|---|---|---|---|
| 1 | 0.000 | 0.000 | 0.000 | 0.000 | N/A | N/A |
| 2 | 32.060 | 9.994 | 3.208 | 32.060 | N/A | N/A |
| 3 | 1504.100 | 56.000 | 26.859 | 1504.100 | N/A | N/A |
| 4 | 6877.547 | 145.200 | 47.366 | 6877.517 | N/A | N/A |

# 11-03-2016 H2S Cal Curve

# This page intentionally left blank

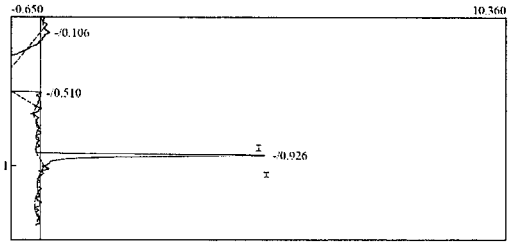
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:54:48
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Zero Cal 01
Comments: Ambient Air

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




Component Retention Area

0.0000

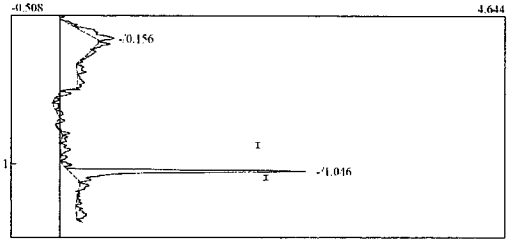
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:56:15
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Zero Cal 02
Comments: Ambient Air

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




Component Retention Area

0.0000

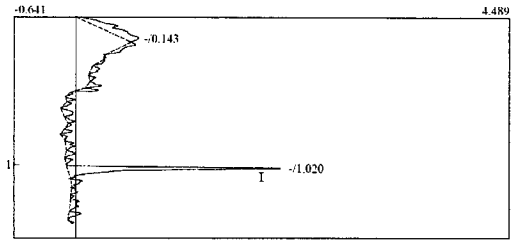
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:57:46
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Zero Cal 03
Comments: Ambient Air

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




Component Retention Area

0.0000

# PEC Stack Zero Cal

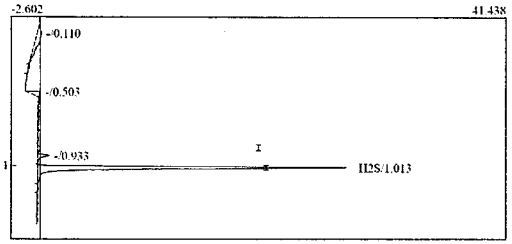
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:46:43
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Low Cal 01
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.013 | 32.0596 |
| | | 32.0596 |

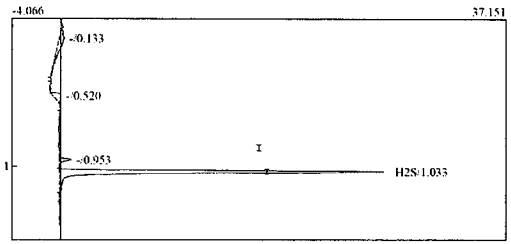
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:48:33
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Low Cal 02
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.033 | 32.2542 |
| | | 32.2542 |

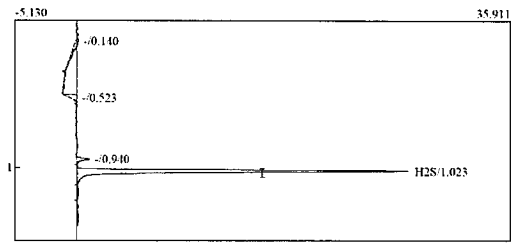
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:50:31
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Low Cal 03
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.023 | 31.8648 |
| | | 31.8648 |

# PEC Stack H2S Low Cal

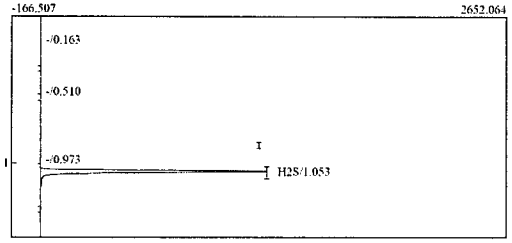
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:33:50
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Mid Cal 01
Comments: H2S - 56.0 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.053 | 1478.6844 |
| | | 1478.6844 |

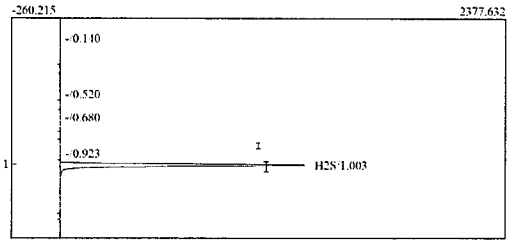
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:36:40
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Mid Cal 02
Comments: H2S - 56.0 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.003 | 1483.6106 |
| | | 1483.6106 |

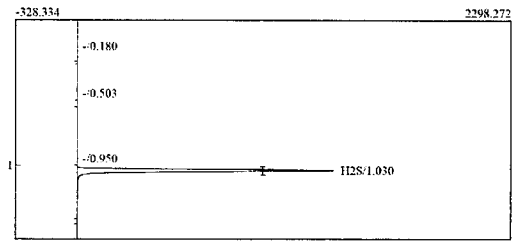
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:38:38
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Mid Cal 03
Comments: H2S - 56.0 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.030 | 1550.0056 |
| | | 1550.0056 |

# PEC Stack H2S Mid Cal

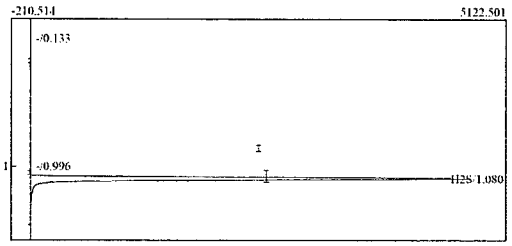
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:09:44
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S High Cal 01
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.080 | 6841.4872 |
| | | 6841.4872 |

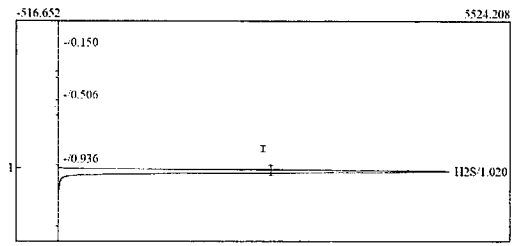
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:11:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S High Cal 02
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.020 | 6862.4535 |
| | | 6862.4535 |

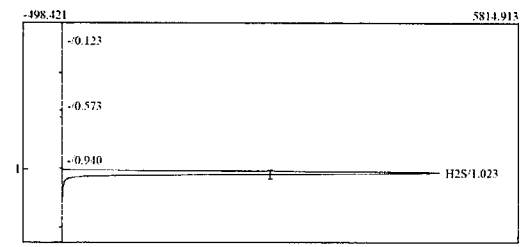
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 07:13:37
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S High Cal 03
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.023 | 6928.6987 |
| | | 6928.6987 |

# PEC Stack H2S High Cal

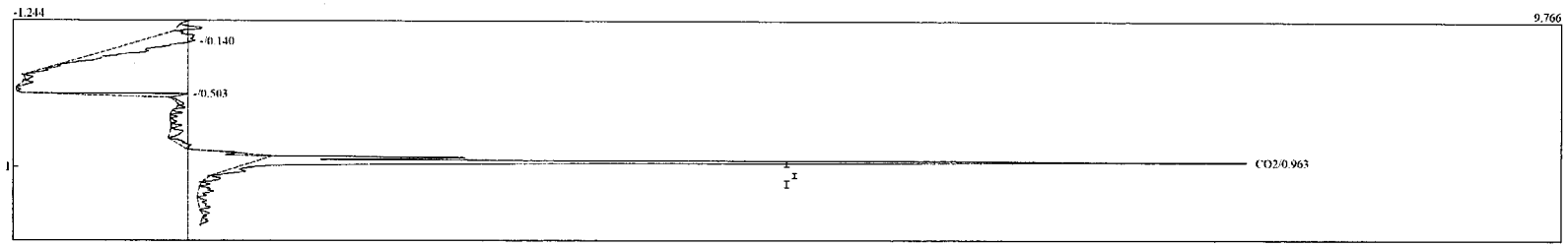
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:17:12
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack CO2 Time Check

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| CO2 | 0.963 | 9.4794 |
| | | 9.4794 |

# CO2 Time Check

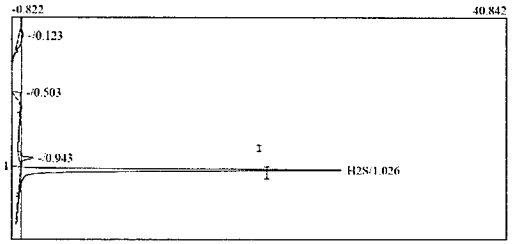
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:45:54
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Low Cal 01
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.026 | 32.0935 |
| | | 32.0935 |

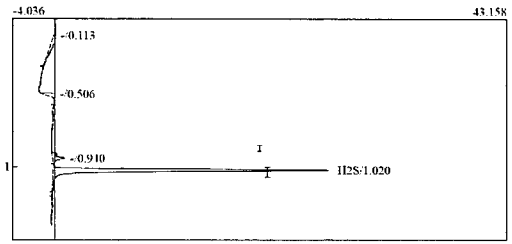
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:47:59
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Low Cal 02
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.020 | 31.1106 |
| | | 31.1106 |

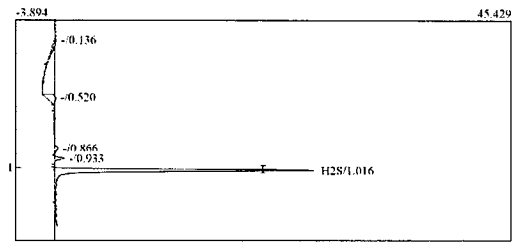
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:50:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Low Cal 03
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.016 | 30.8659 |
| | | 30.8659 |

# PEC Stack H2S Post Low Cal

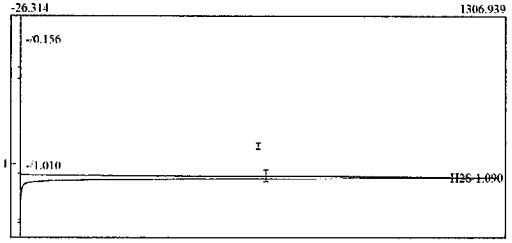
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 20:06:28
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Mid Cal 01
Comments: H2S - 56.0 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.090 | 1482.9033 |
| | | 1482.9033 |

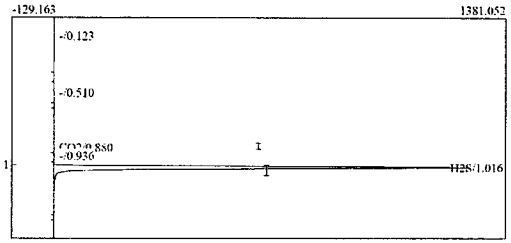
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:57:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Mid Cal 02
Comments: H2S - 56.0 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| CO2 | 0.880 | 0.6742 |
| H2S | 1.016 | 1475.3814 |
| | | 1476.0556 |

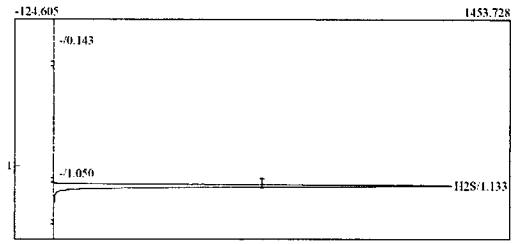
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 20:02:52
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Mid Cal 03
Comments: H2S - 56.0 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.133 | 1431.3080 |
| | | 1431.3080 |

# PEC Stack H2S Post Mid Cal

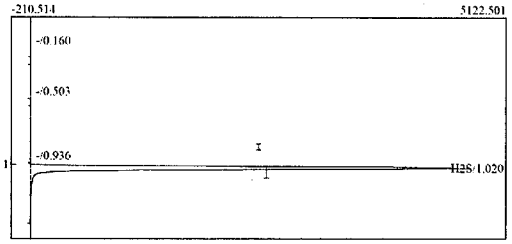
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:41:08
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post High Cal 01
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.020 | 7046.1390 |
| | | 7046.1390 |

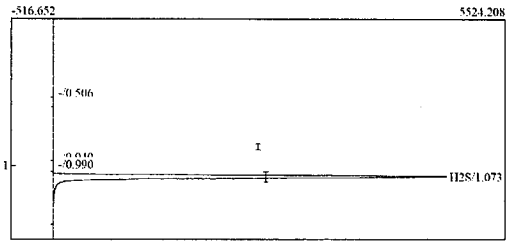
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:35:17
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post High Cal 02
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.073 | 6949.4760 |
| | | 6949.4760 |

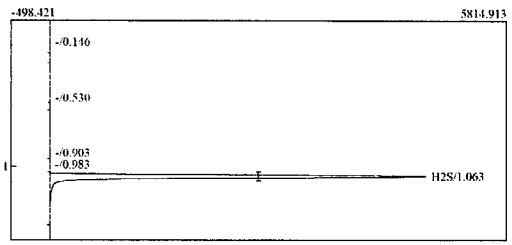
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:39:00
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post High Cal 03
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.063 | 7030.8858 |
| | | 7030.8858 |

# PEC Stack H2S Post High Cal

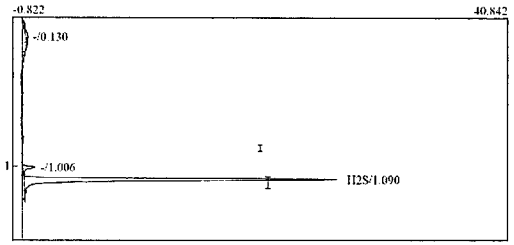
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:23:56
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Line Loss 01
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.090 | 31.2492 |
| | | 31.2492 |

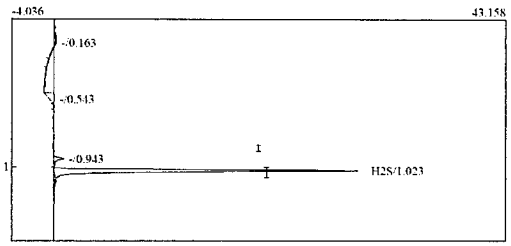
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:25:45
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Line Loss 02
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.023 | 33.6604 |
| | | 33.6604 |

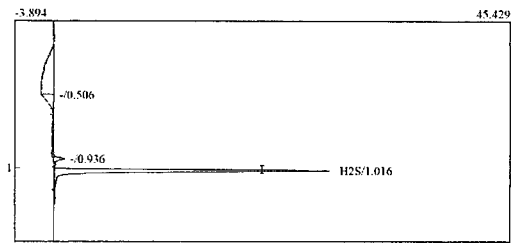
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 19:27:39
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack H2S Post Line Loss 03
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.016 | 32.2366 |
| | | 32.2366 |

# PEC Stack H2S Post Line Loss

# APPENDIX D

# Run 1 – 3 DATA

## Run Chromatograms

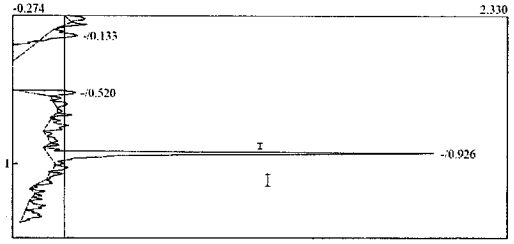
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:33:09
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 1 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

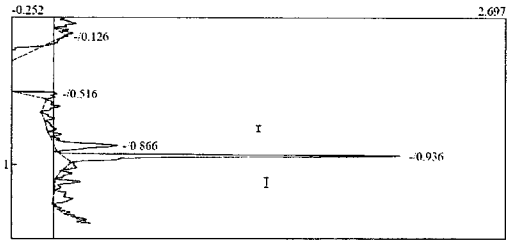
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:35:22
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 1 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

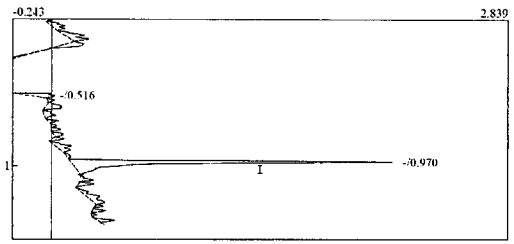
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:37:06
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 1 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 1 9:33

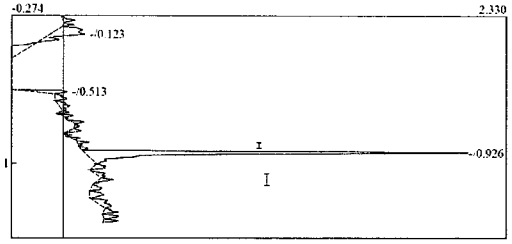
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:51:25
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 2 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

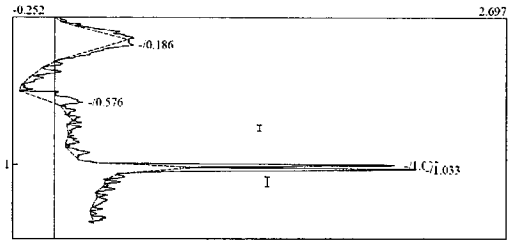
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:52:59
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 2 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

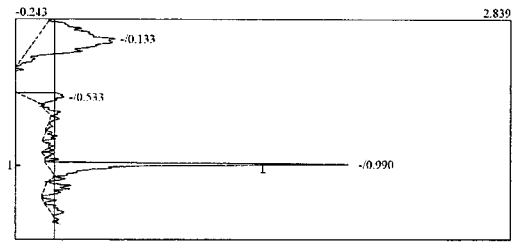
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 09:54:37
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 2 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 2 9:51

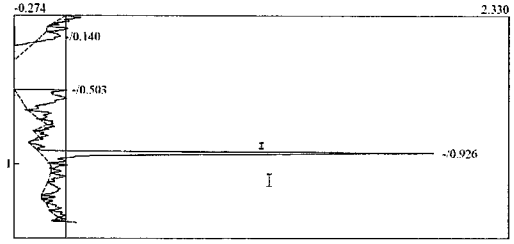
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:04:53
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 3 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

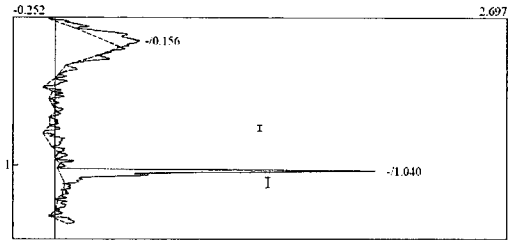
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:06:53
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 3 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

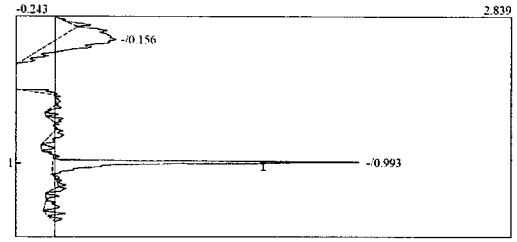
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:08:30
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 3 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 3 10:04

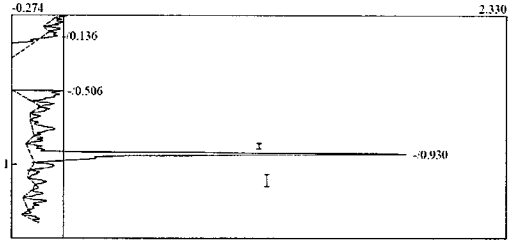
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:21:16
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 4 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

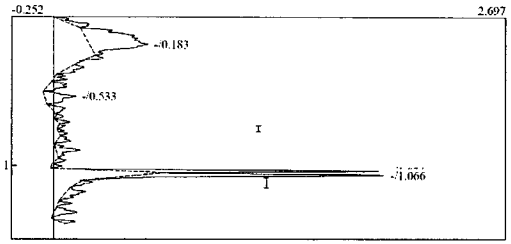
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:22:45
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 4 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

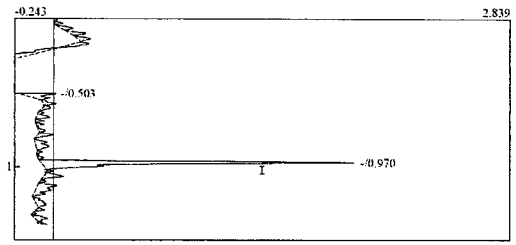
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:24:39
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 4 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 4 10:21

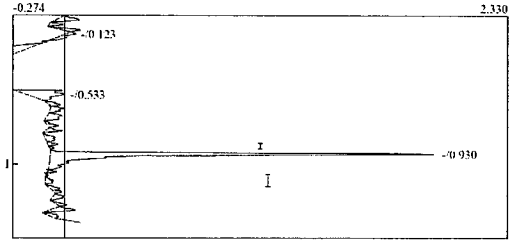
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:37:19
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 5 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

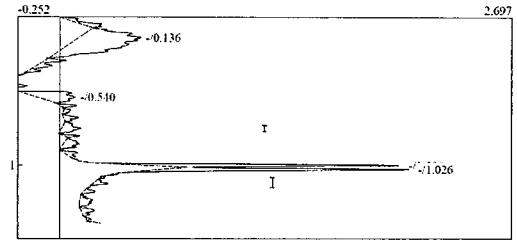
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:38:55
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 5 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

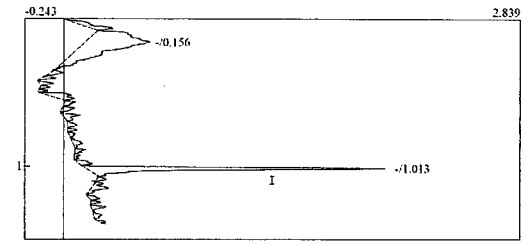
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:40:28
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 5 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 5 10:37

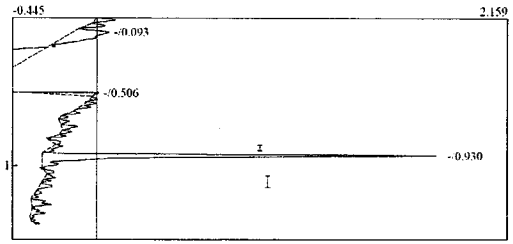
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:54:23
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 6 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

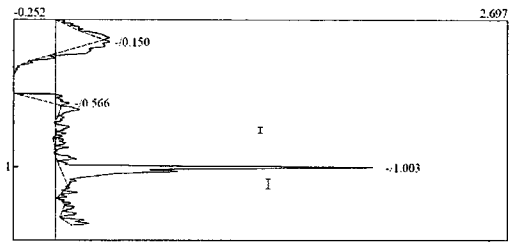
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:56:10
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 6 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

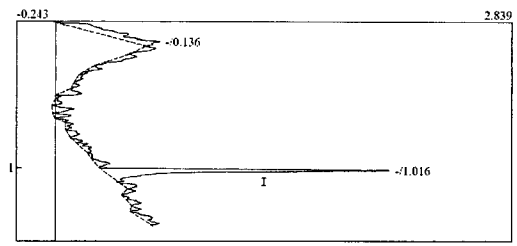
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 10:57:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 6 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 6 10:54

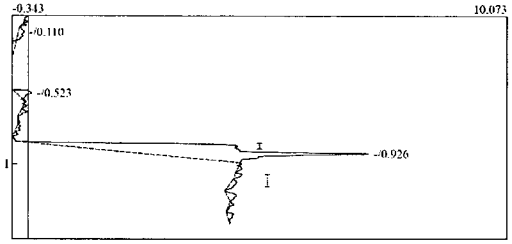
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:21:25
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 7 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

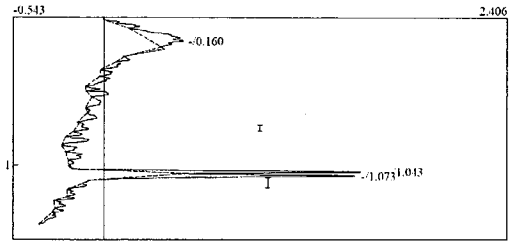
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:22:56
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 7 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

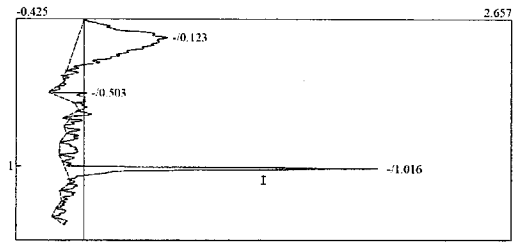
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:24:28
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 7 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 7 11:20

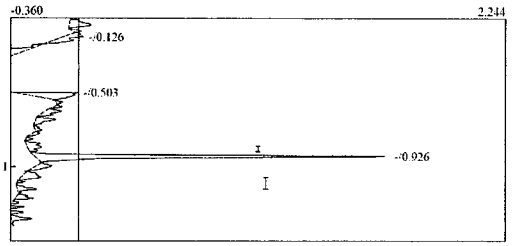
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:32:45
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 8 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

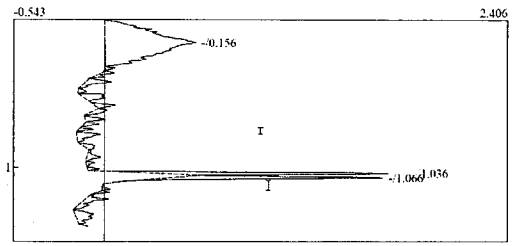
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:34:16
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 8 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

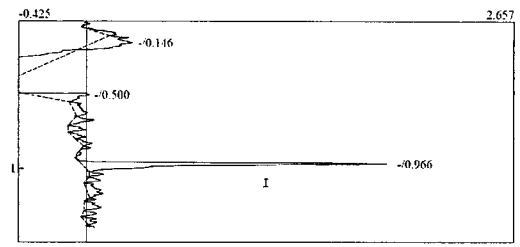
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:35:58
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 8 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 8 11:32

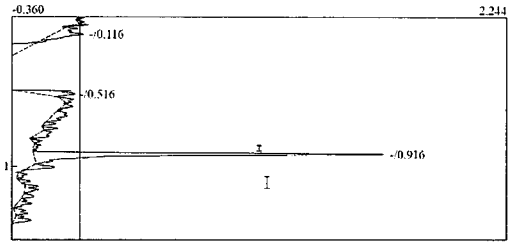
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:44:33
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 9 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

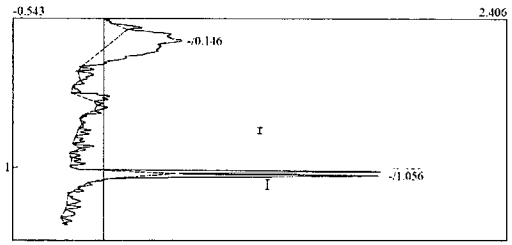
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:46:03
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 9 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

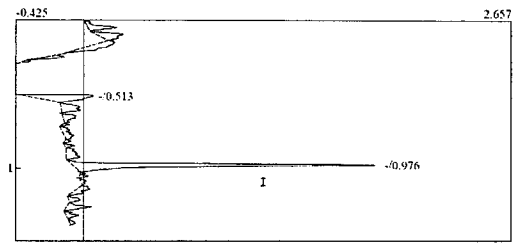
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:47:46
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 9 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 9 11:43

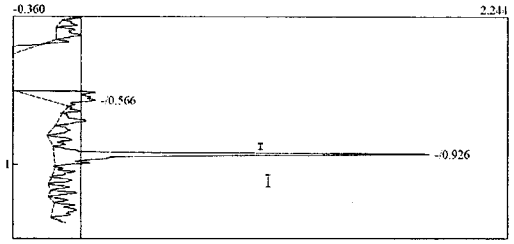
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:55:35
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 10 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

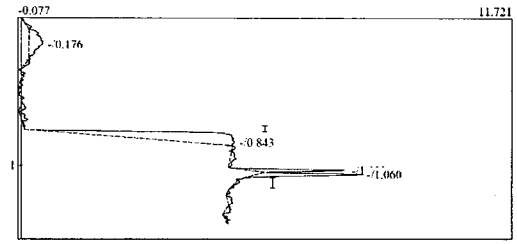
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:57:05
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 10 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

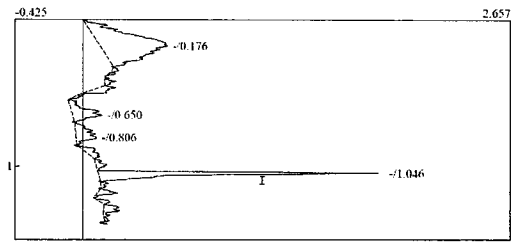
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 11:58:37
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 10 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 10 11:54

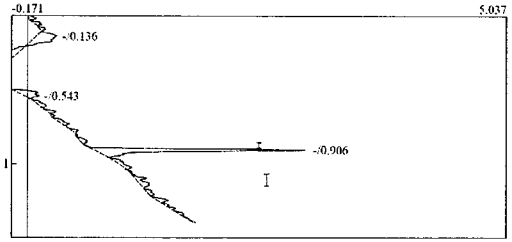
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 12:48:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 11 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

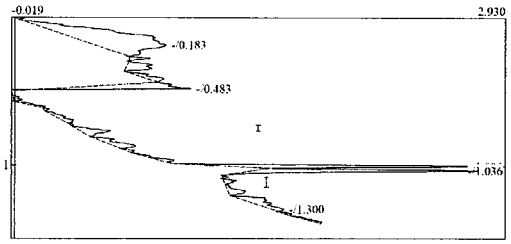
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 12:49:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 11 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

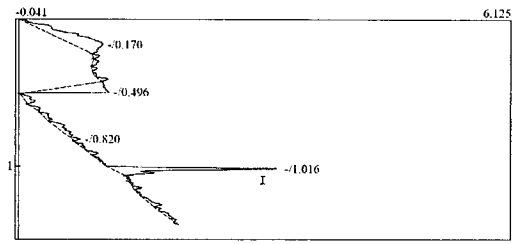
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 12:51:11
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 11 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 11 12:47

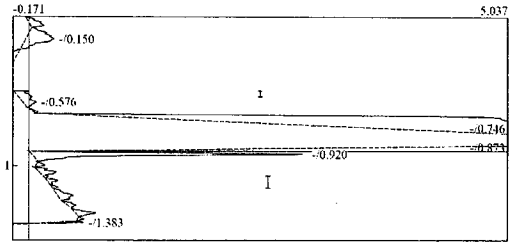
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:00:16
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 12 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

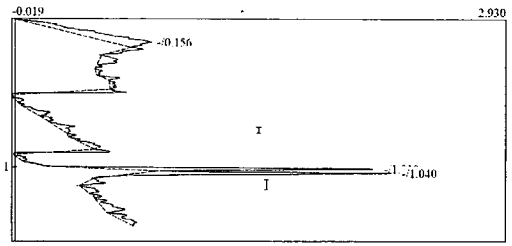
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:01:48
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 12 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

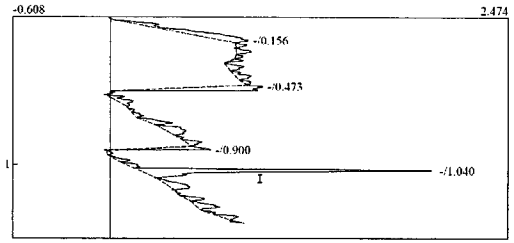
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:03:15
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 12 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 12 12:59

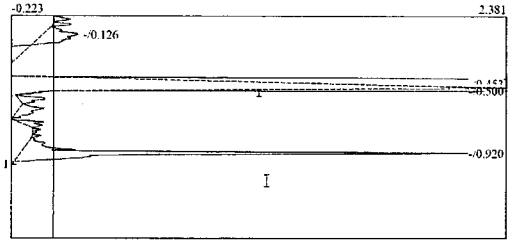
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:12:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 13 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

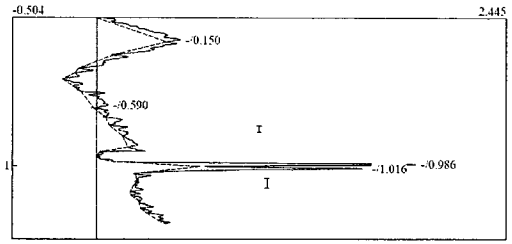
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:14:18
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 13 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

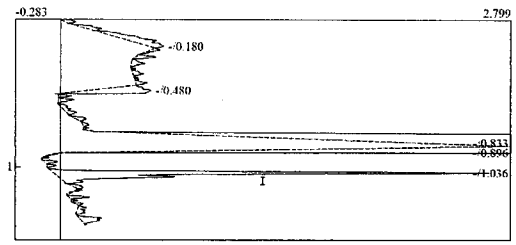
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:15:45
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 13 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 13 13:11

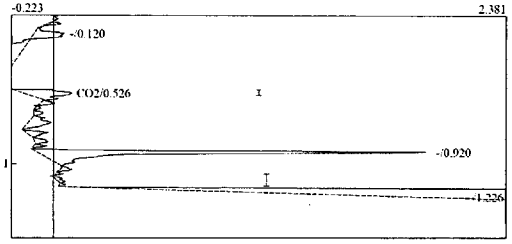
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:26:27
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 14 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| CO2 | 0.526 | 3.0424 | 0.0000 | |
| | | 3.0424 | 0.0000 | |

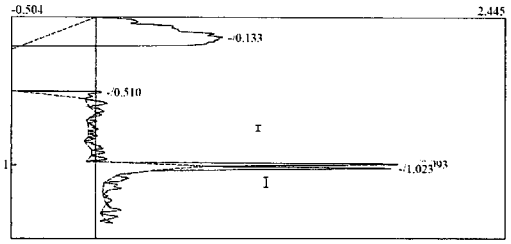
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:28:01
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 14 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

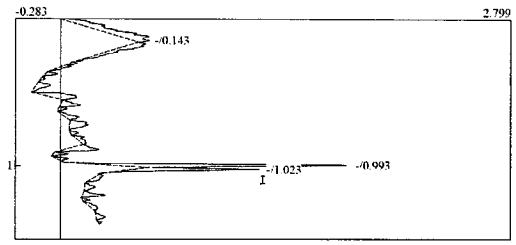
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:29:37
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push14 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 14 13:25

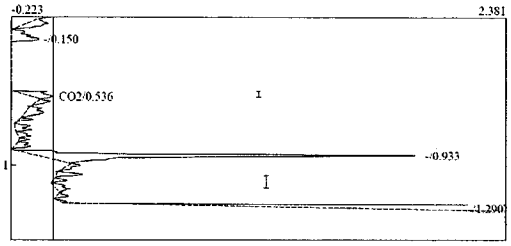
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:40:24
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 15 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| CO2 | 0.536 | 2.1310 | 0.0000 | |
| | | 2.1310 | 0.0000 | |

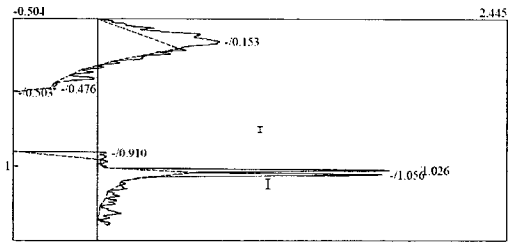
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:41:53
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 15 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

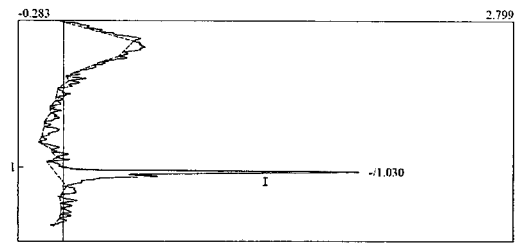
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:43:21
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 15 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 15 13:39

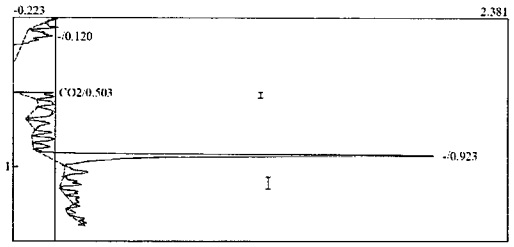
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:54:16
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 16 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| CO2 | 0.503 | 1.9276 | 0.0000 | |
| | | 1.9276 | 0.0000 | |

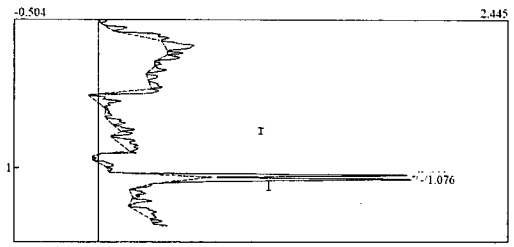
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:55:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 16 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

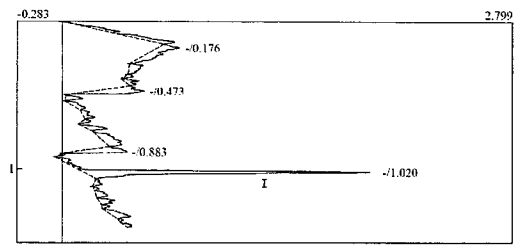
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 13:57:13
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 16 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 16 13:53

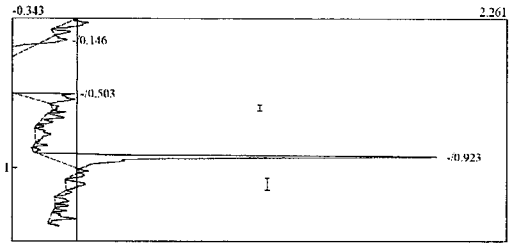
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:06:16
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 17 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

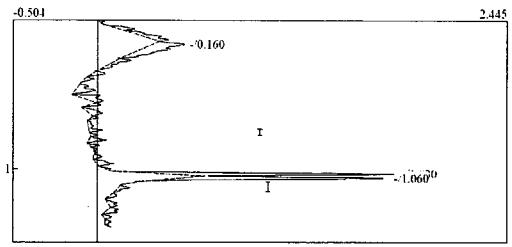
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:07:44
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 17 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

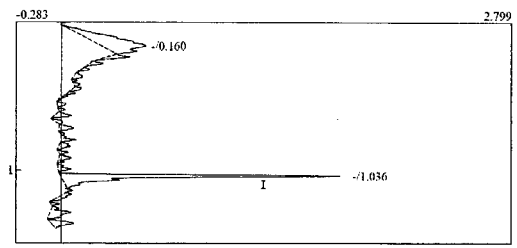
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:09:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 17 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 17 14:05

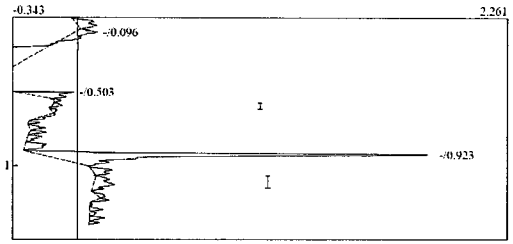
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:22:11
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 18 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

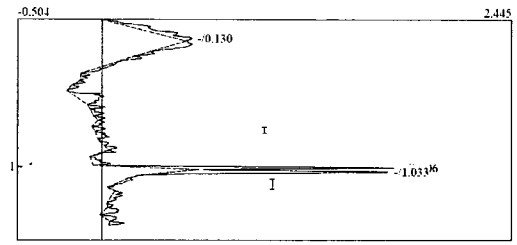
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:23:44
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 18 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

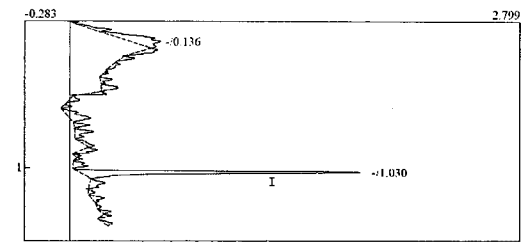
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:25:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 18 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 18 14:21

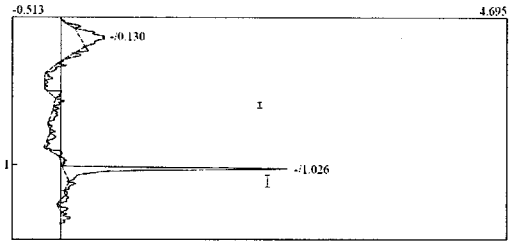
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:54:08
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 19 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

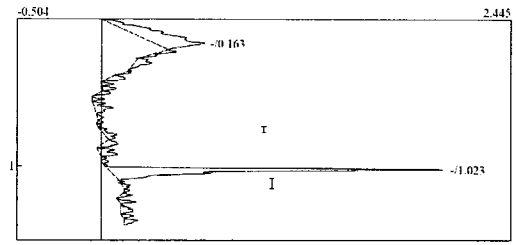
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:55:38
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 19 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

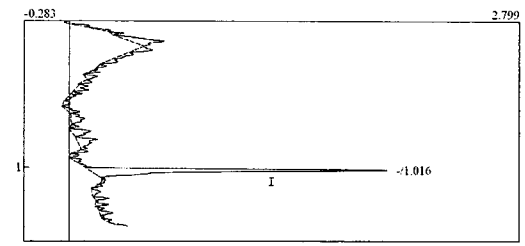
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 14:57:09
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 19 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 19 14:53

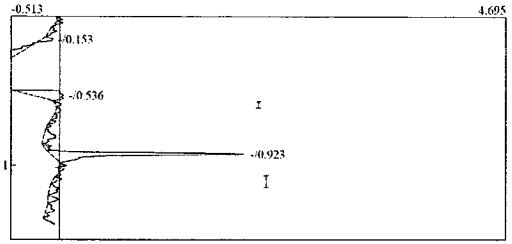
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:04:00
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 20 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

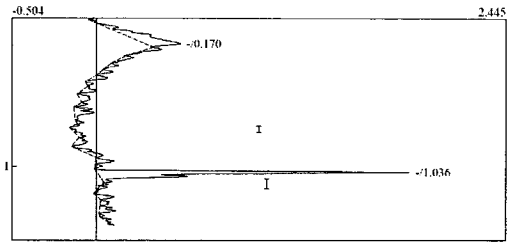
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:05:27
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 20 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

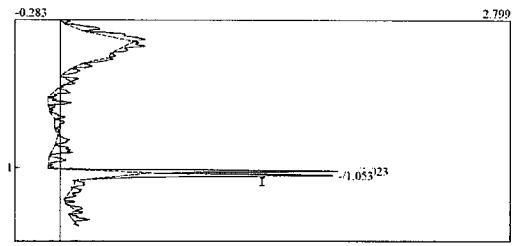
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:06:57
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 20 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 20 15:03

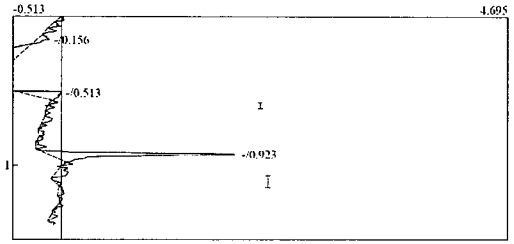
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:50:37
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 21 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

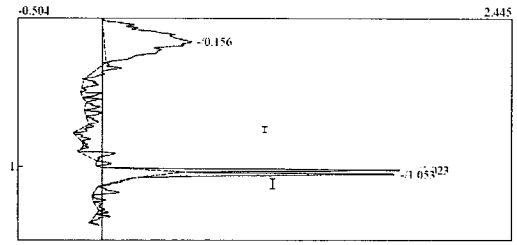
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:52:07
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 21 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

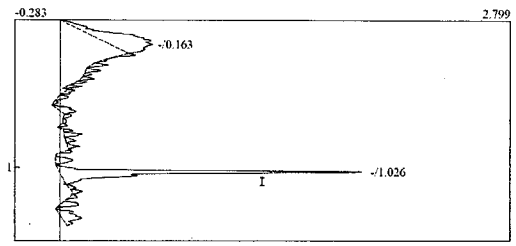
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:53:36
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 21 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 21 15:49

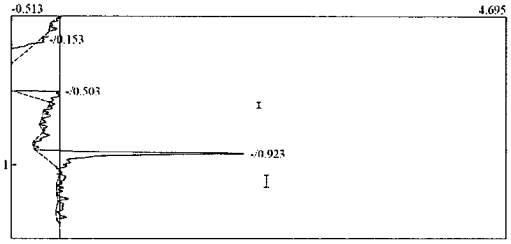
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 16:02:53
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 22 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

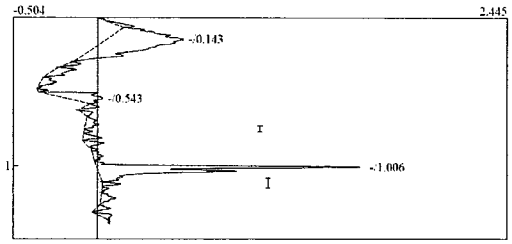
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 16:04:25
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 22 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

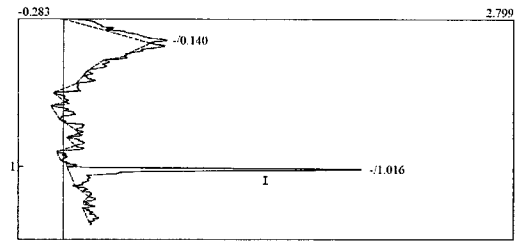
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 16:05:56
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 22 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 22 16:02

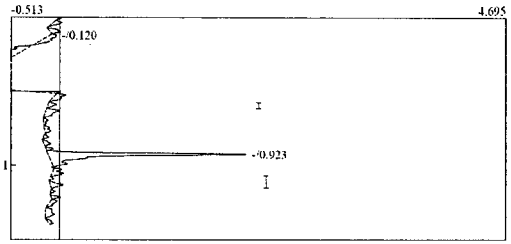
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 16:14:18
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 23 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

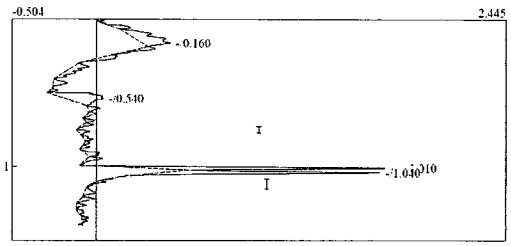
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 16:15:49
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 23 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

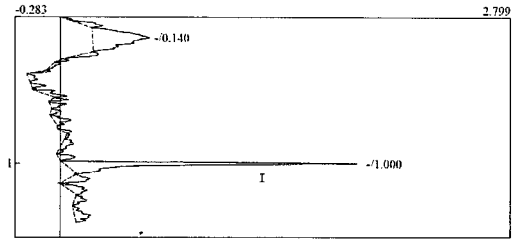
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 16:19:52
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 23 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 23 16:14

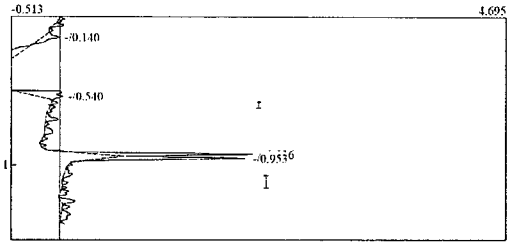
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:23:10
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 24 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

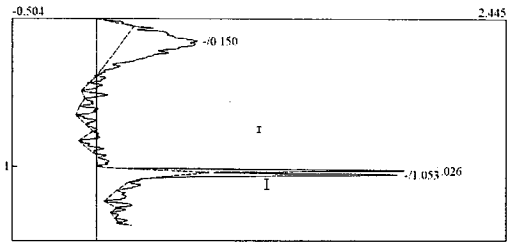
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:24:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 24 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

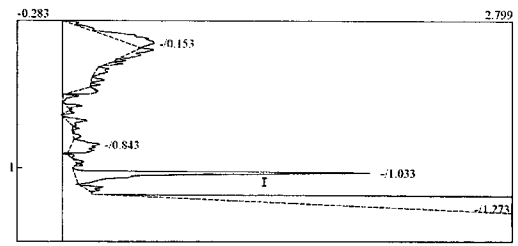
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:26:09
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 1 Push 24 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 1 Push 24 17:22

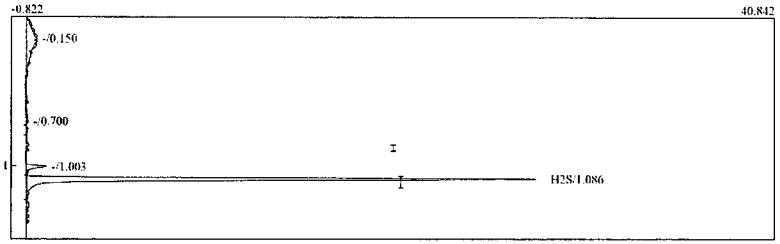
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:16:06
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run H2S low Cal Check 01
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.086 | 32.8430 |
| | | 32.8430 |

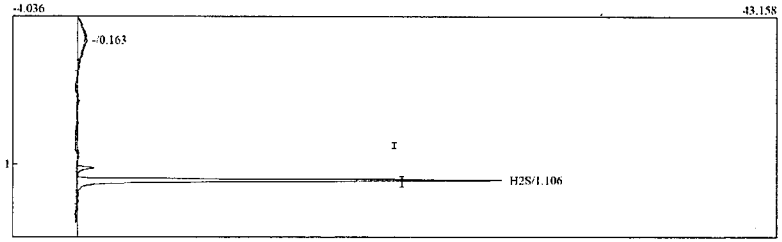
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 15:33:18
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run H2S low Cal Check 02
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area |
|---|---|---|
| H2S | 1.106 | 32.5222 |
| | | 32.5222 |

# Run 1 H2S Low Cal Check

# This page intentionally left blank

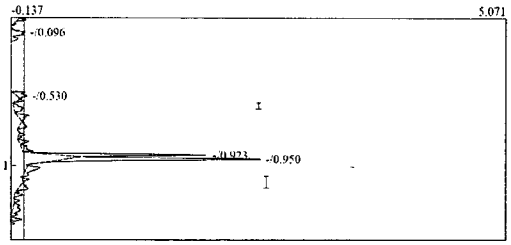
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:34:36
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 1 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

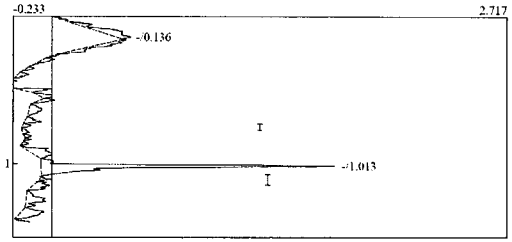
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:36:06
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 1 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

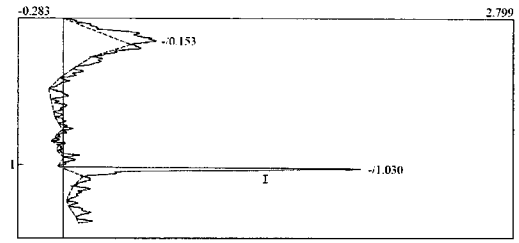
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:37:36
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 1 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 1 17:33

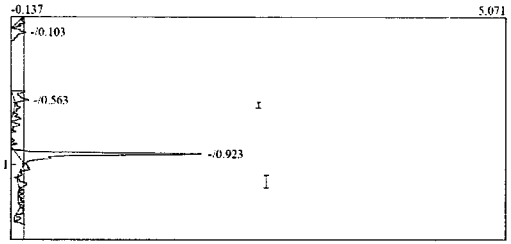
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:46:14
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 2 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

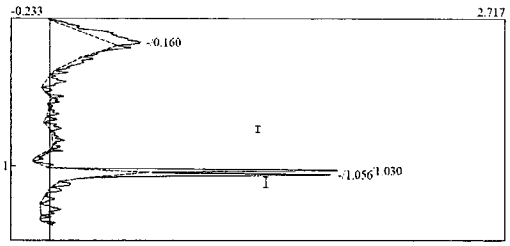
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:47:44
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 2 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

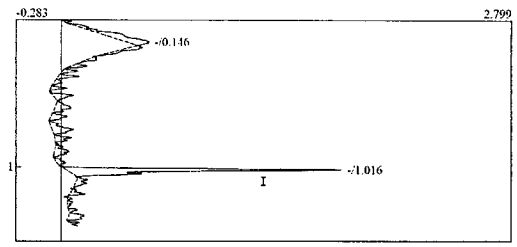
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:49:16
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 2 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 2 17:45

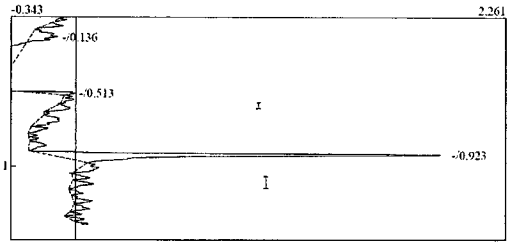
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:57:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 3 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

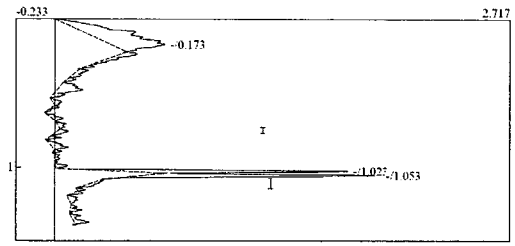
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 17:59:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 3 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

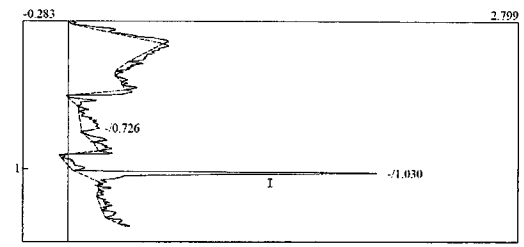
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:00:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 3 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 3 17:56

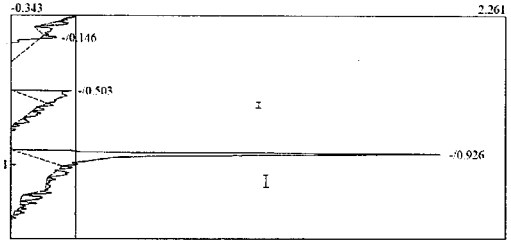
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:10:10
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 4 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

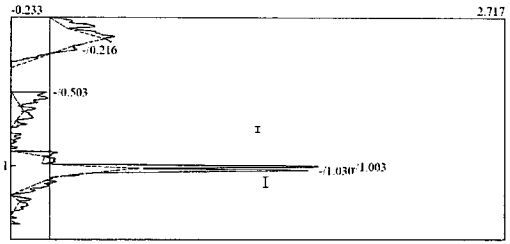
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:11:44
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 4 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

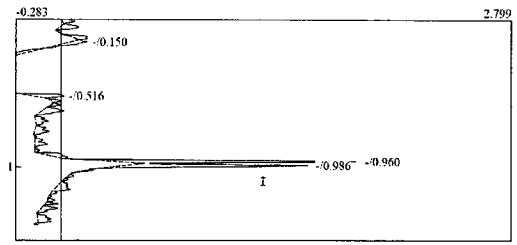
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:13:32
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 4 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 4 18:09

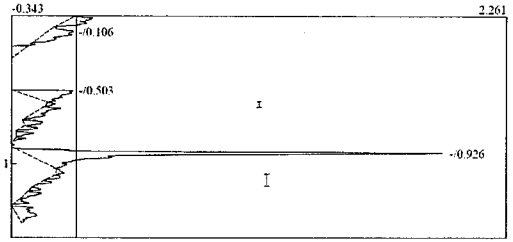
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:21:54
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 5 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

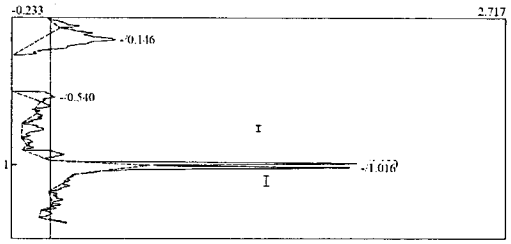
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:23:32
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 5 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

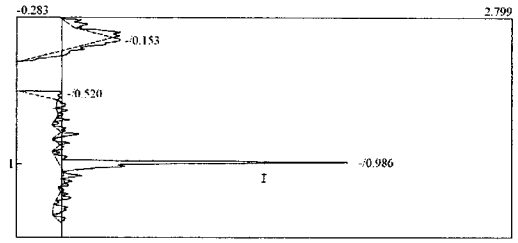
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:25:10
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 5 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 5 18:21

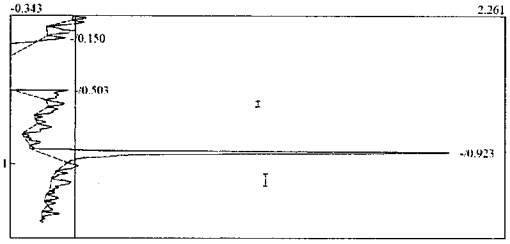
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:33:34
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 6 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

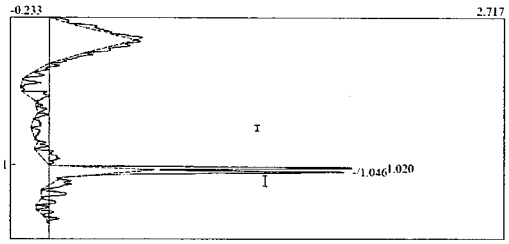
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:35:05
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 6 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

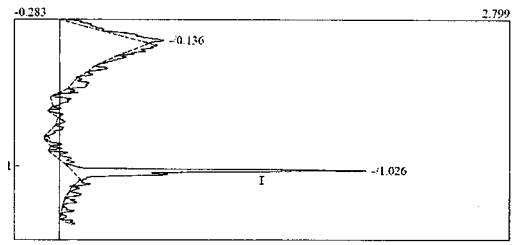
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:36:35
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 6 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 6 18:32

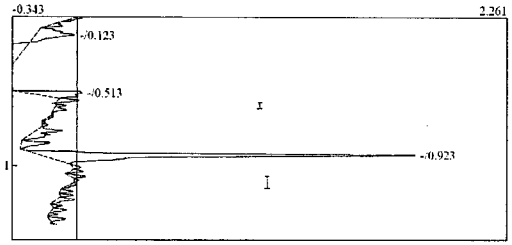
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:45:51
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 7 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

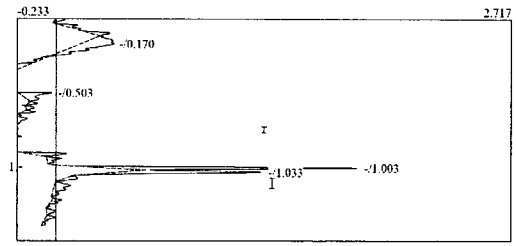
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:47:24
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 7 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

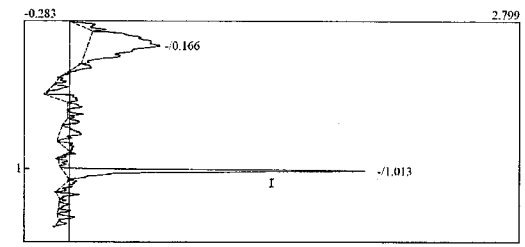
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:48:56
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 7 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 7 18:46

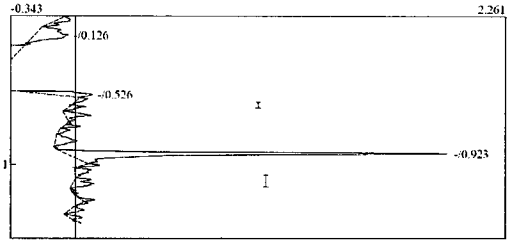
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 18:58:17
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 8 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

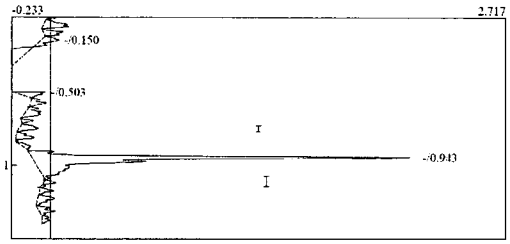
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 19:00:15
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 8 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

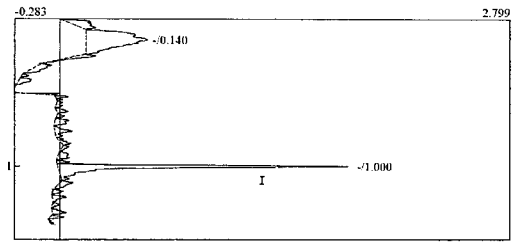
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 19:01:50
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 8 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 8 18:57

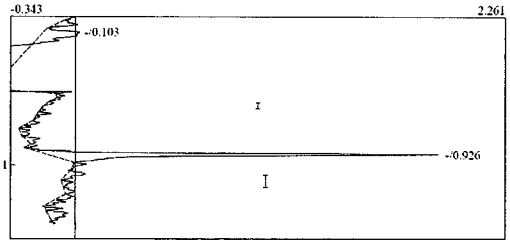
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 19:10:21
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 9 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

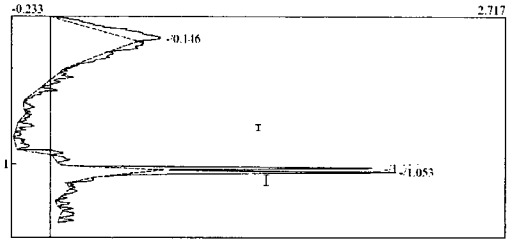
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 19:11:51
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 9 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

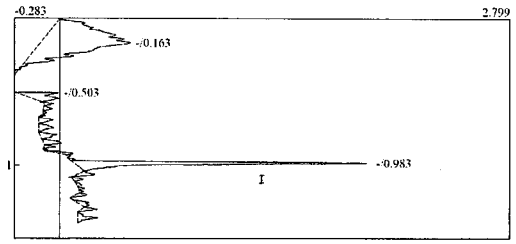
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 19:13:29
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 9 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 9 19:09

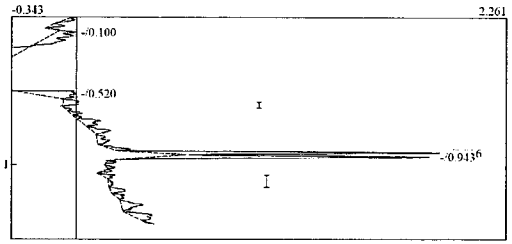
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:13:51
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 10 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

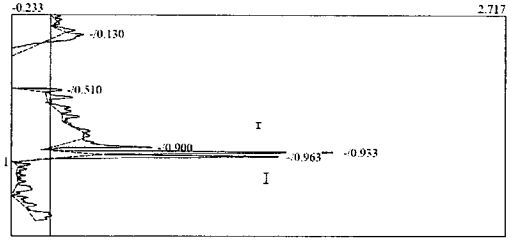
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:15:58
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 10 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

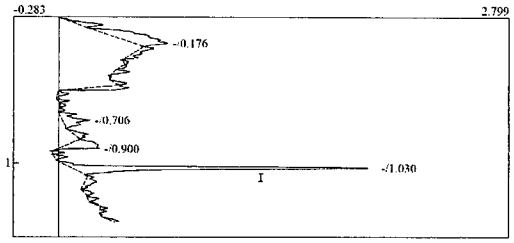
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:17:26
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 10 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 10 20:12

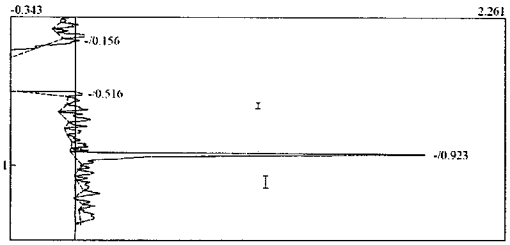
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:24:13
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 11 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

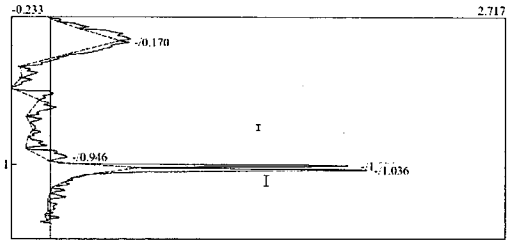
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:25:46
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 11 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

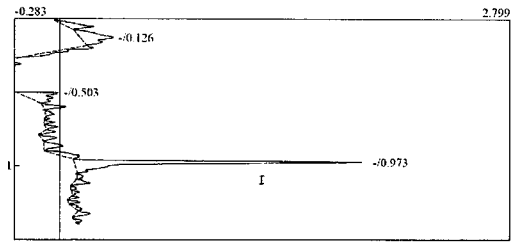
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:27:28
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 11 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 11 20:24

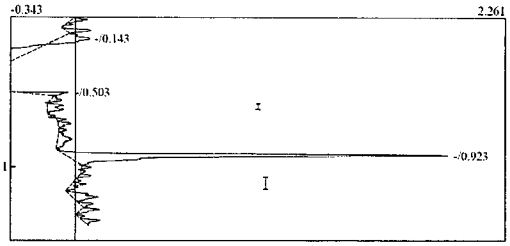
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:36:20
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 12 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

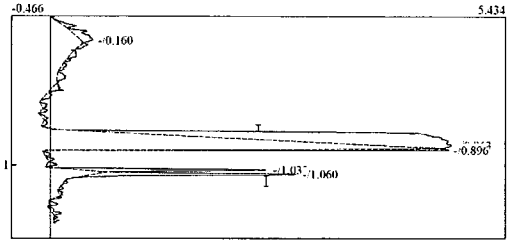
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:37:49
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 12 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

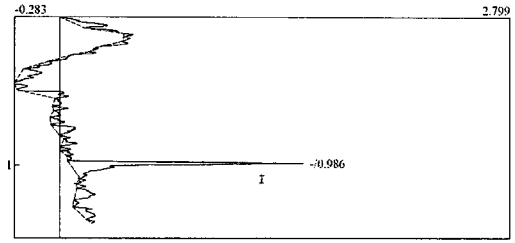
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/03/2016 20:39:26
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 12 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 12 20:36

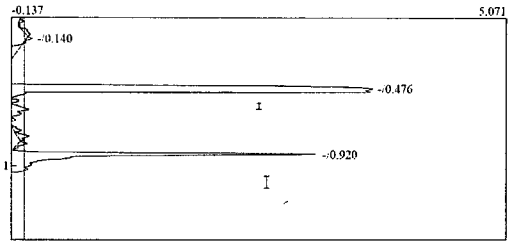
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 06:55:27
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 13 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

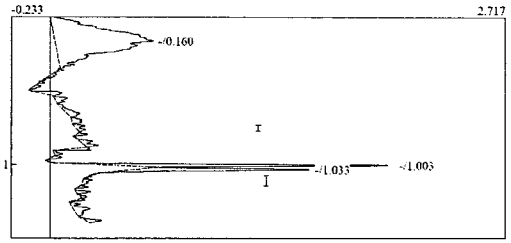
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 06:57:00
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 13 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

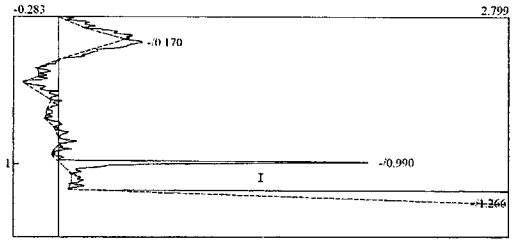
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 06:58:36
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 13 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 13 6:54

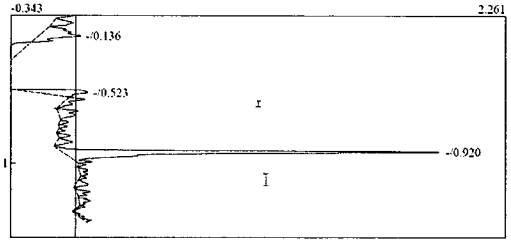
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 07:57:40
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 14 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

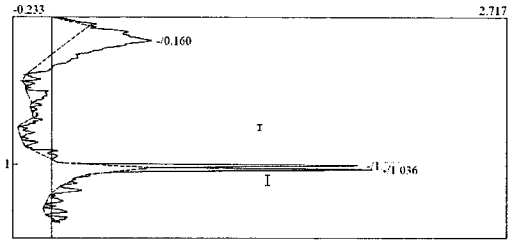
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 07:59:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 14 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

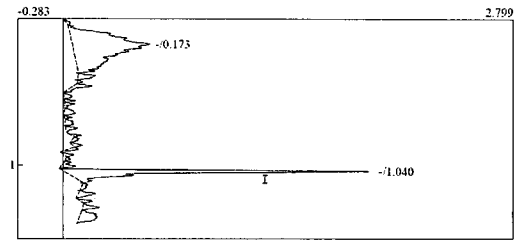
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:00:39
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 14 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 14 7:57

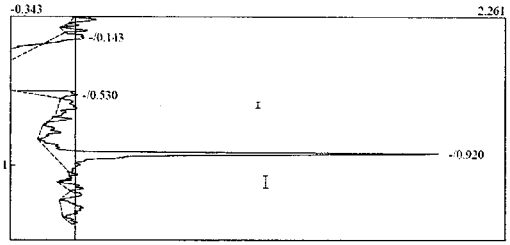
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:10:58
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 15 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

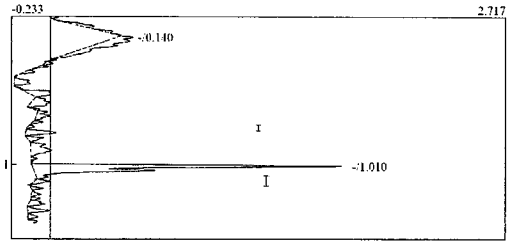
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:12:29
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 15 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

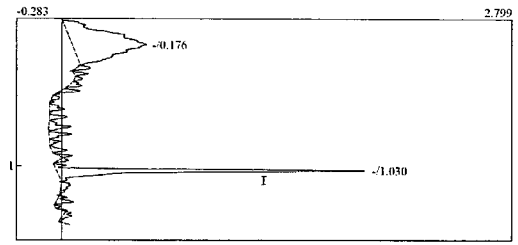
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:13:58
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 15 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 15 8:10

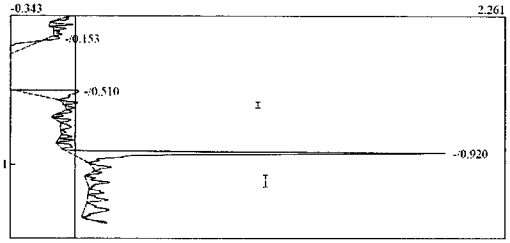
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:31:29
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 16 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

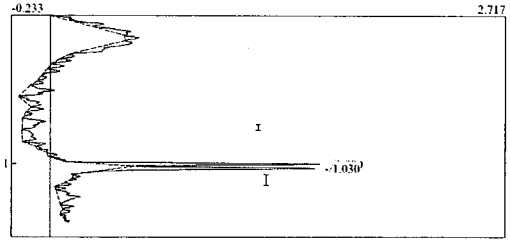
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:33:03
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 16 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

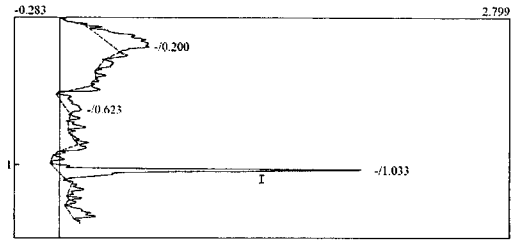
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:34:30
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 16 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 16 8:30

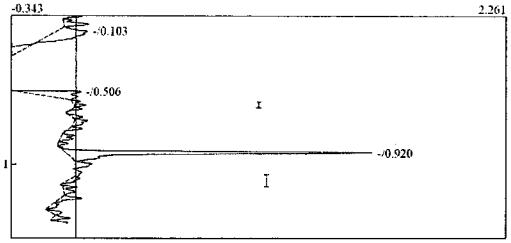
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:50:21
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 17 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

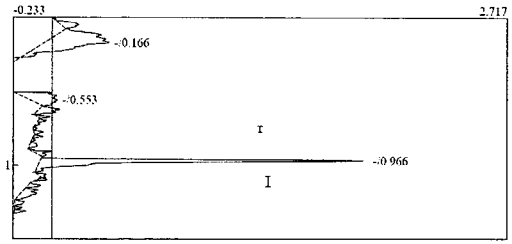
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:52:03
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 17 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

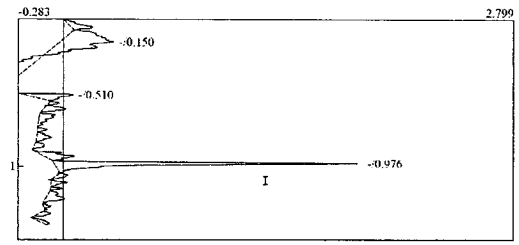
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 08:53:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 17 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 17 8:49

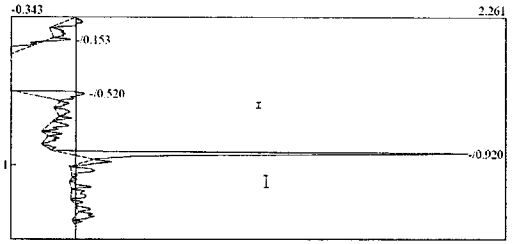
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 09:10:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 18 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

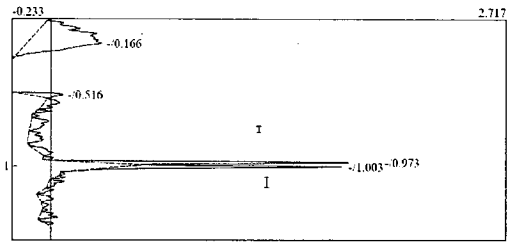
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 09:12:22
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 18 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

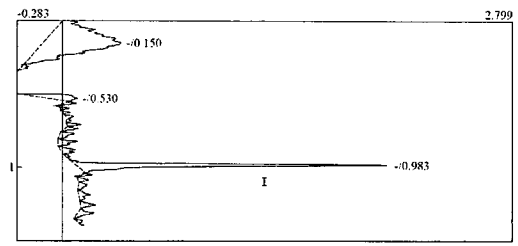
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 09:14:00
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 18 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 18 9:10

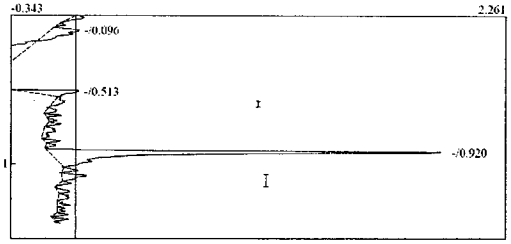
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 09:24:45
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 19 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

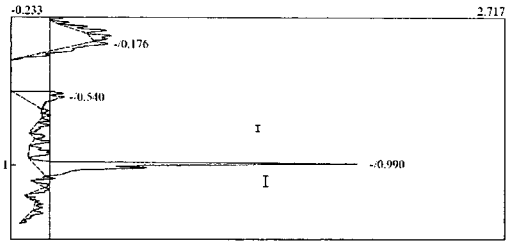
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 09:26:21
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 19 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

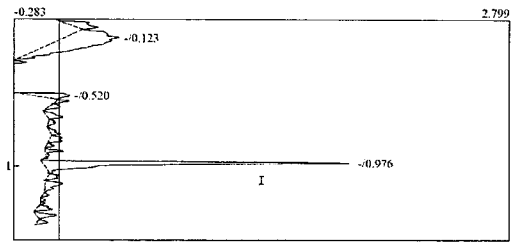
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 09:28:00
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 19 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 19 9:23

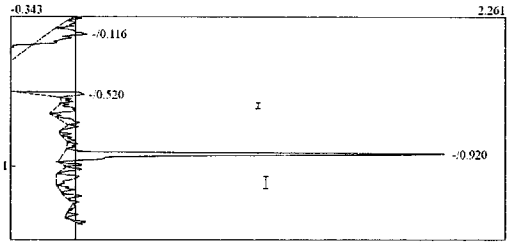
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:12:08
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 20 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

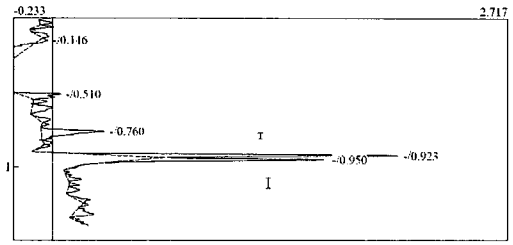
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:14:40
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 20 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

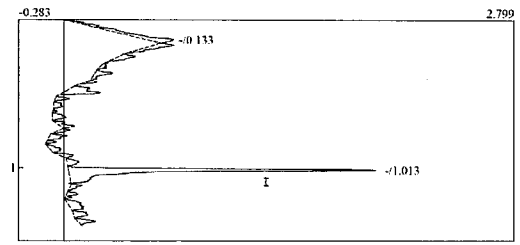
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:16:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 20 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 20 10:12

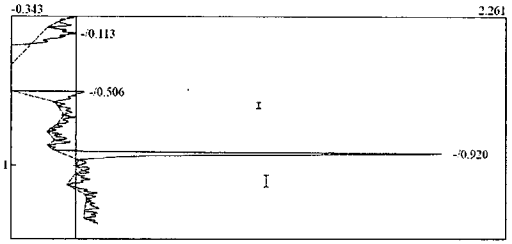
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:27:44
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 21 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

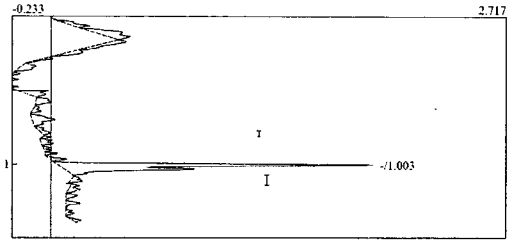
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:29:18
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 21 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

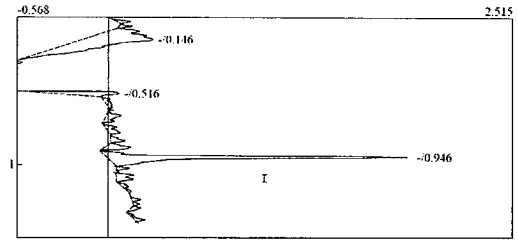
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:32:49
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 21 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 21 10:27

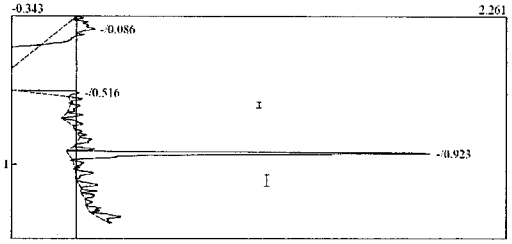
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:44:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 22 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

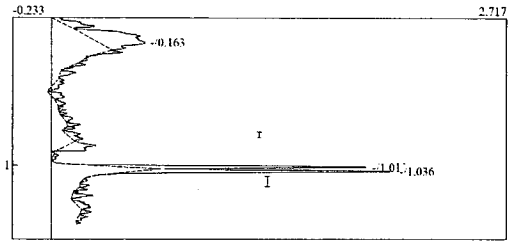
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:46:13
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 22 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

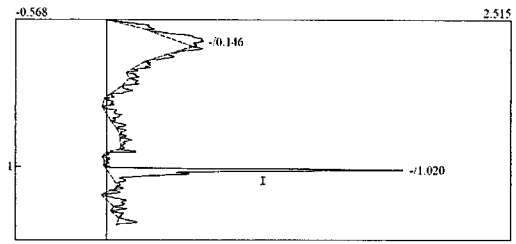
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 10:47:43
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 22 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 22 10:43

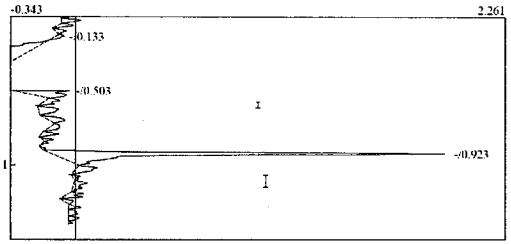
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:01:26
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 23 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

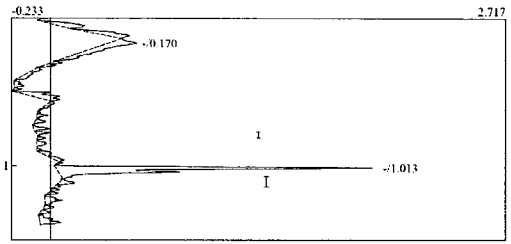
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:02:58
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 23 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

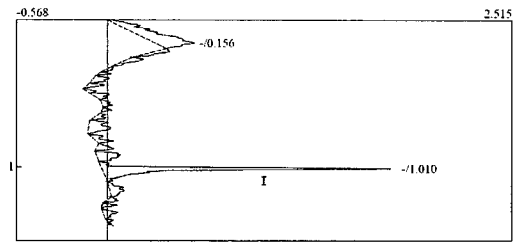
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:04:30
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 23 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 23 11:00

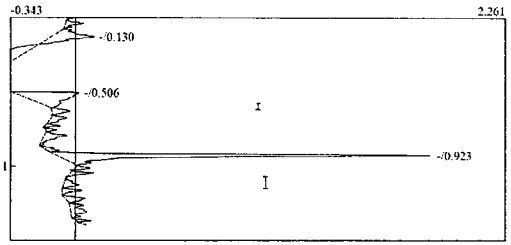
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:21:53
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 24 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

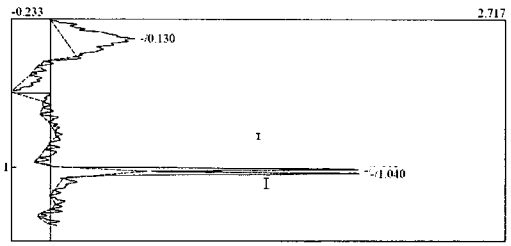
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:23:25
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 24 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

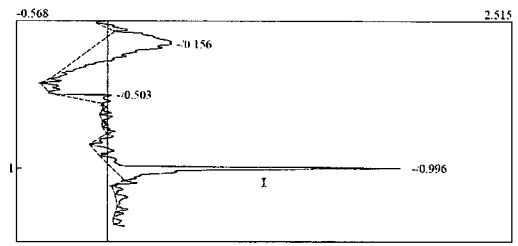
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:24:59
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Push 24 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 2 Push 24 11:21

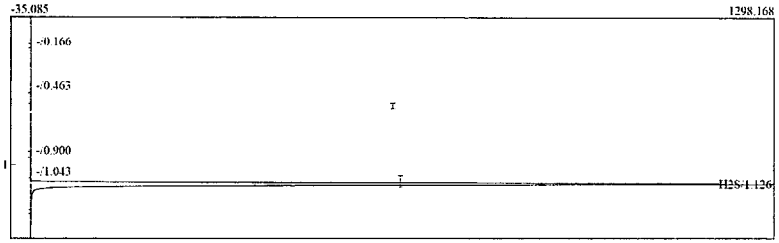
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 06:36:02
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Mid Cal Check 01
Comments: H2S - 56.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| H2S | 1.126 | 1438.9248 | 54.8559 | ppm |
| | | 1438.9248 | 54.8559 | |

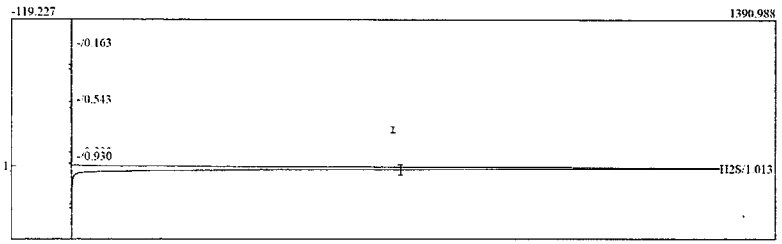
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 06:42:06
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 2 Mid Cal Check 02
Comments: H2S - 56.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| H2S | 1.013 | 1484.7413 | 56.0045 | ppm |
| | | 1484.7413 | 56.0045 | |

# PEC Stack Run 2 H2S Mid Cal Check

# This page intentionally left blank

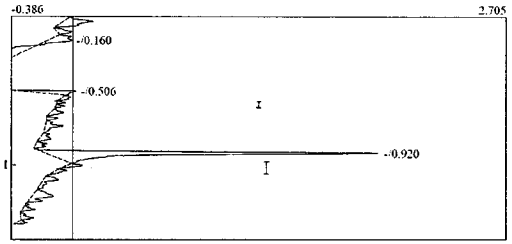
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:36:57
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 1 01
Comments:

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

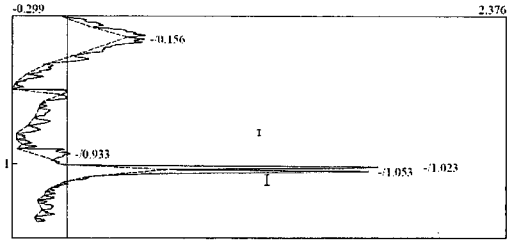
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:38:27
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 1 02
Comments:

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

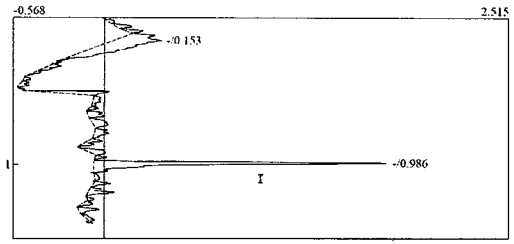
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:40:03
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 1 03
Comments:

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

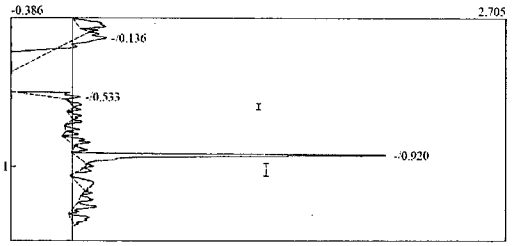
# PEC Stack Run 3 Push 1 11:36

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 11:59:49
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 2 01
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |



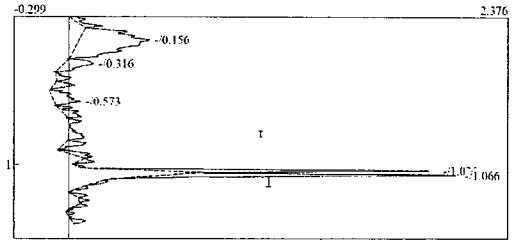

| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:01:17
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 2 02
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |



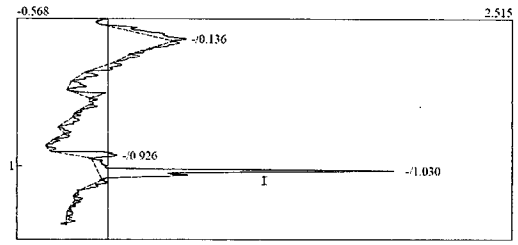

| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:02:46
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 2 03
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

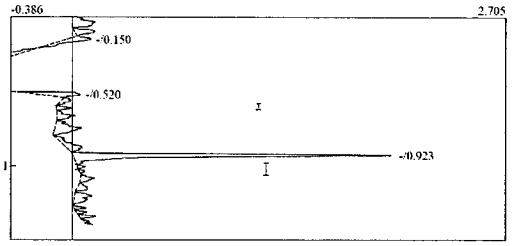
# PEC Stack Run 3 Push 2 11:59

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:13:23
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 3 01
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |



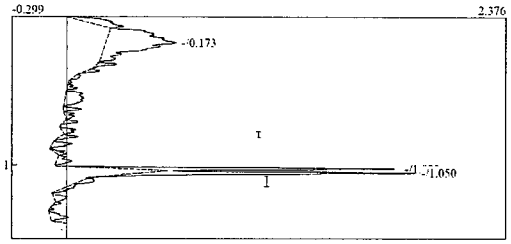

| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:14:53
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 3 02
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |



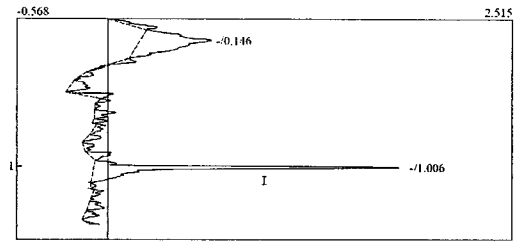

| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:16:26
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 3 03
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

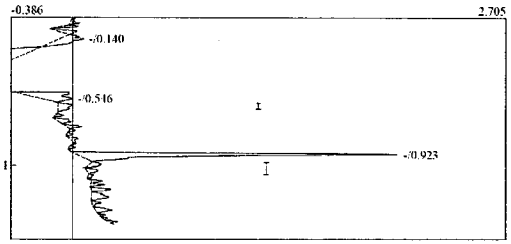
# PEC Stack Run 3 Push 3 12:12

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:32:14
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 4 01
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |



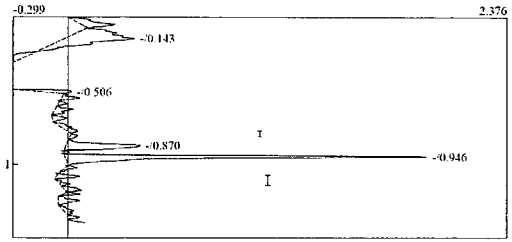

| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:36:08
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 4 02
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |



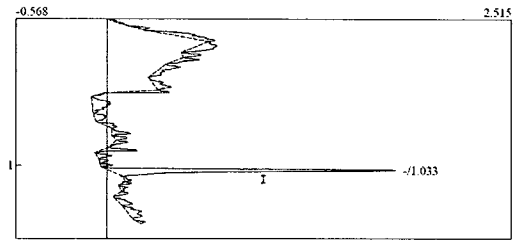

| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 12:37:38
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 4 03
Comments:
Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 4 12:31

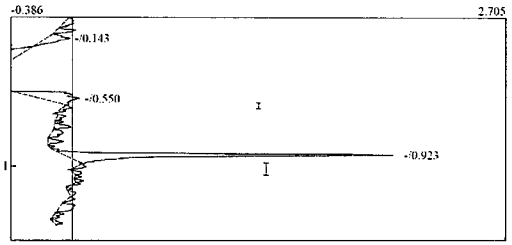
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:15:30
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 5 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

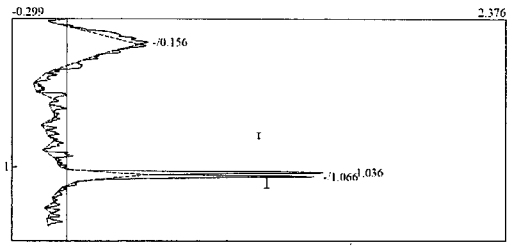
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:16:57
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 5 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

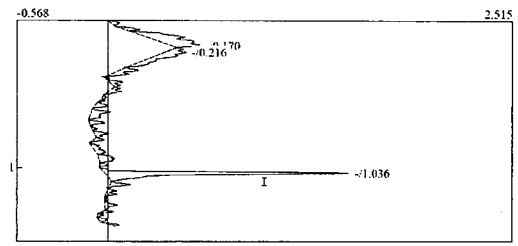
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:18:25
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 5 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 5 13:14

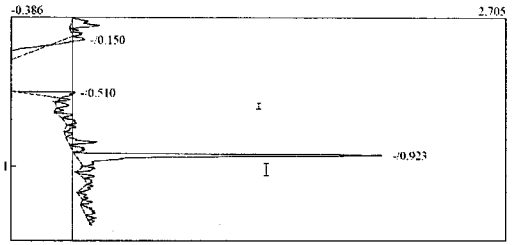
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:28:25
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 6 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

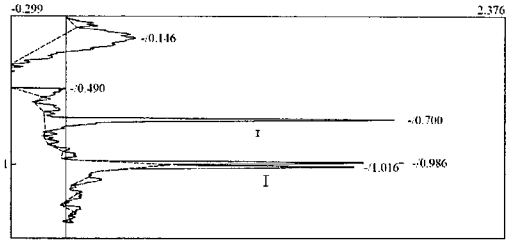
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:30:24
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 6 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

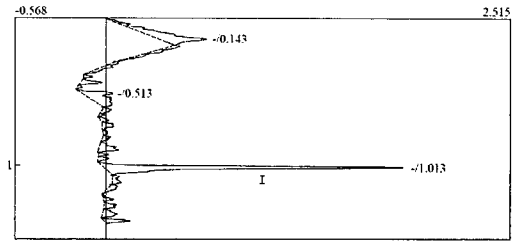
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:31:56
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 6 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 6 13:27

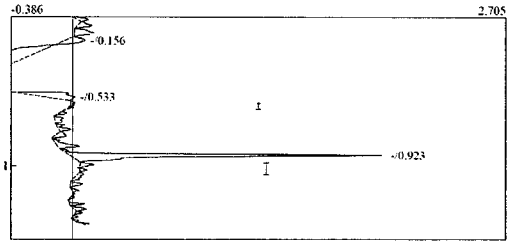
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:39:12
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 7 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

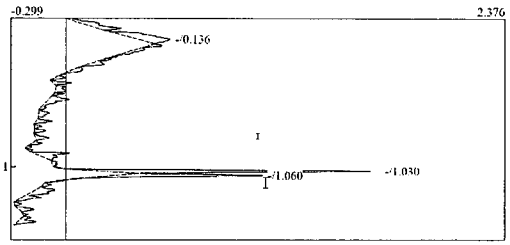
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:40:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 7 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

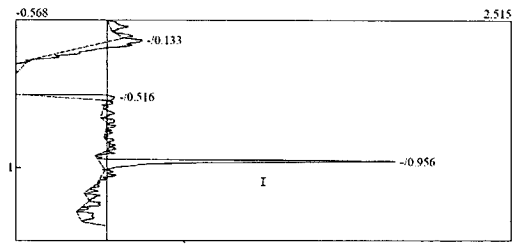
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:42:31
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 7 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 7 13:38

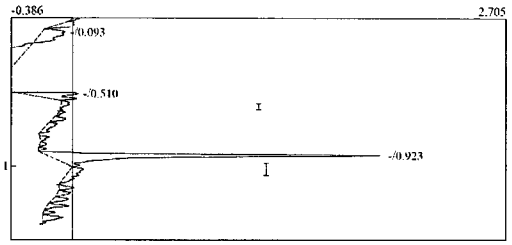
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:49:38
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 8 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

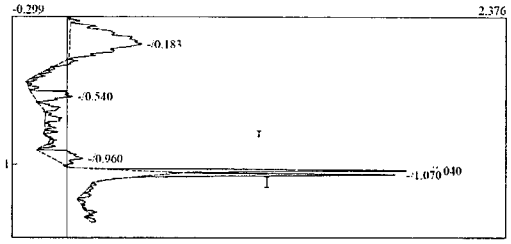
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:51:06
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 8 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

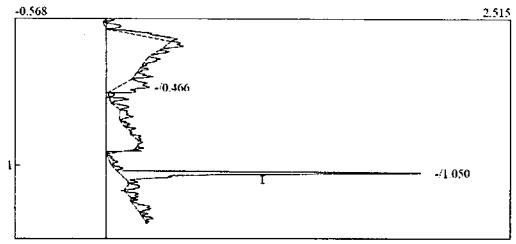
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 13:52:32
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 3 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 8 13:48

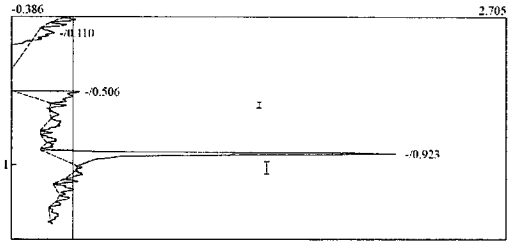
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:00:31
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 9 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

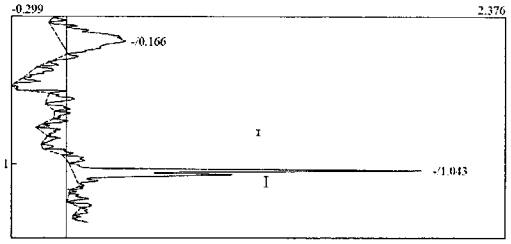
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:01:58
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 9 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

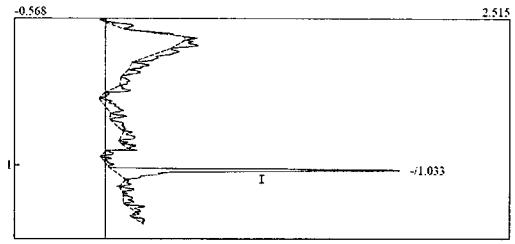
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:03:27
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 9 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 9 13:59

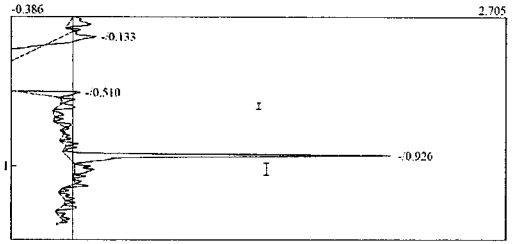
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:11:21
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 10 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

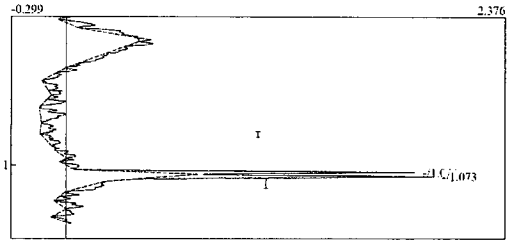
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:12:48
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 10 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

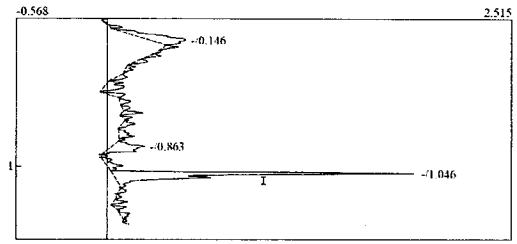
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:14:15
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 10 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 10 14:10

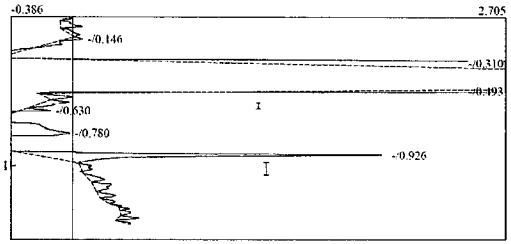
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:22:40
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 11 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

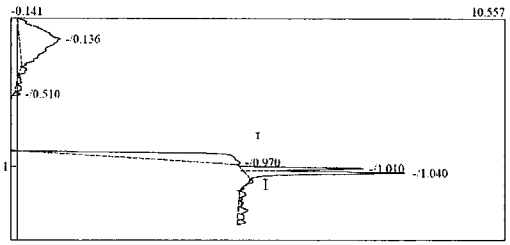
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:24:11
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 11 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

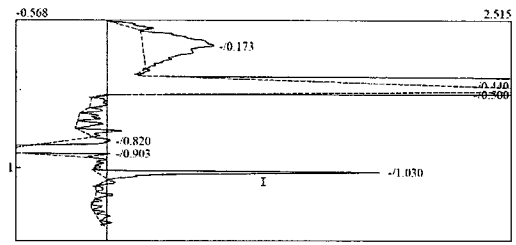
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:25:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 11 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 11 14:21

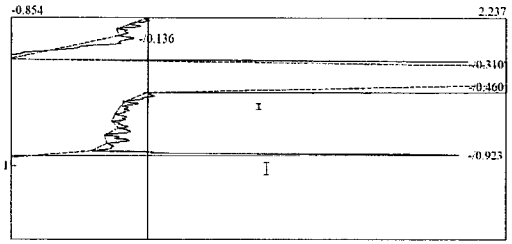
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:33:01
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 12 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

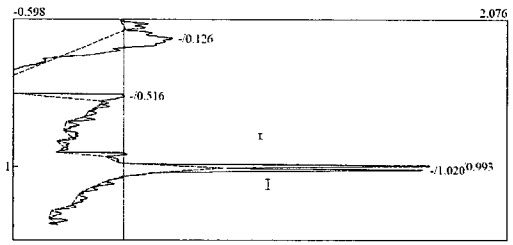
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:34:37
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 12 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

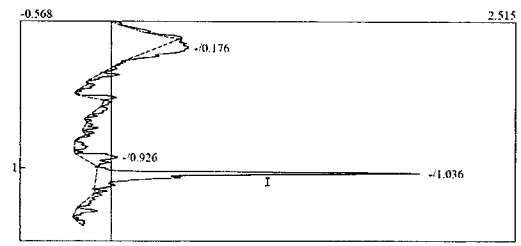
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:36:06
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 12 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 12 14:32

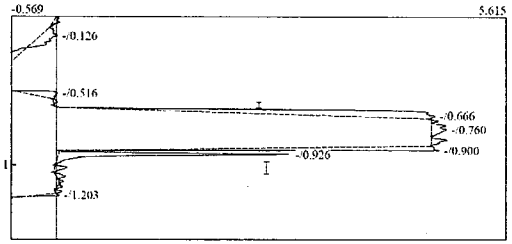
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:44:54
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 13 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

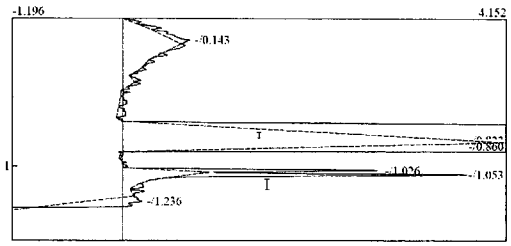
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:46:24
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 13 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

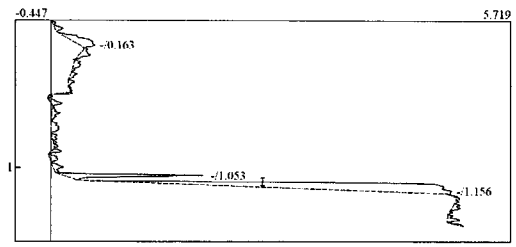
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:47:50
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 13 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 13 14:44

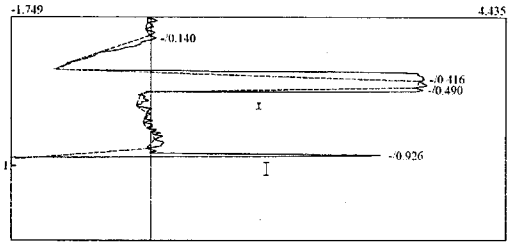
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:55:41
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 14 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

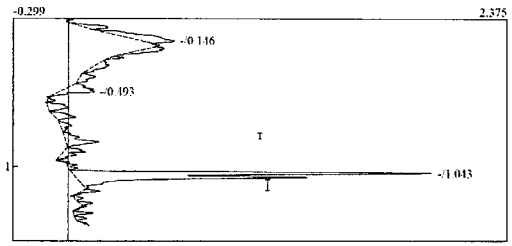
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:57:09
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 14 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

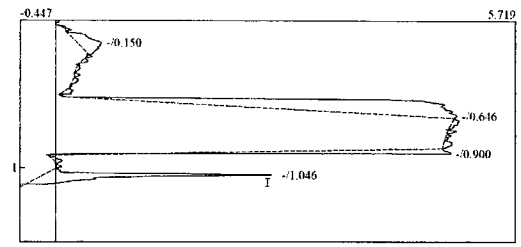
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 14:58:36
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 14 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 14 14:54

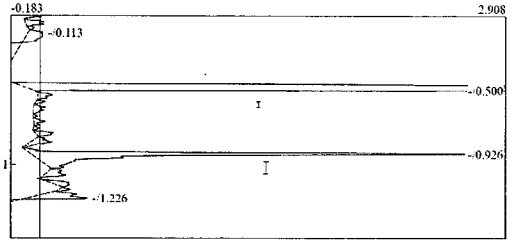
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 15:10:04
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 15 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

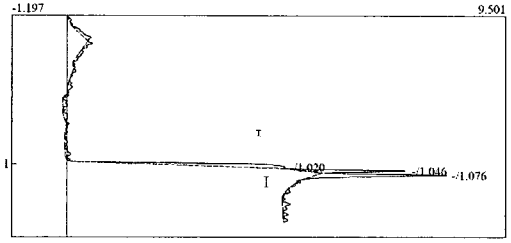
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 15:11:31
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 15 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

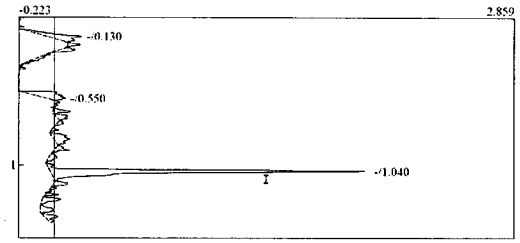
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 15:13:00
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 15 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 15 15:09

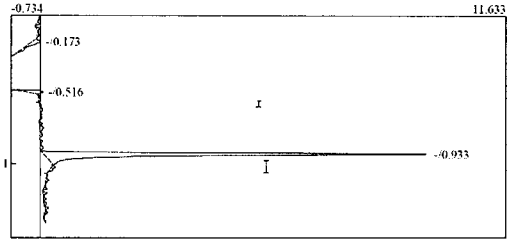
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:10:39
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 16 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

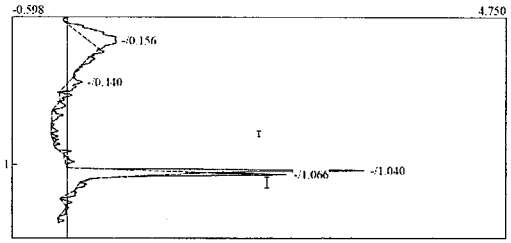
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:12:08
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 16 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

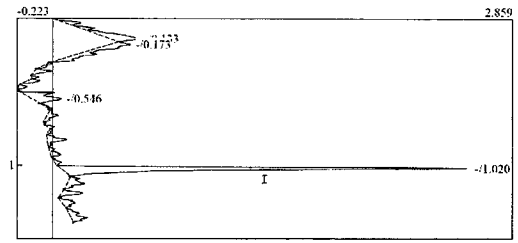
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:13:40
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 16 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 16 16:10

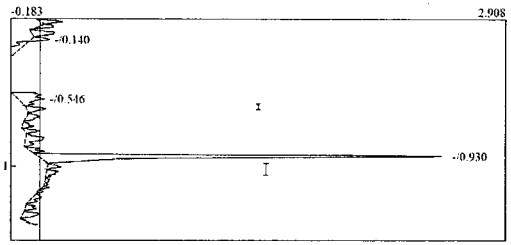
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:23:51
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 17 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

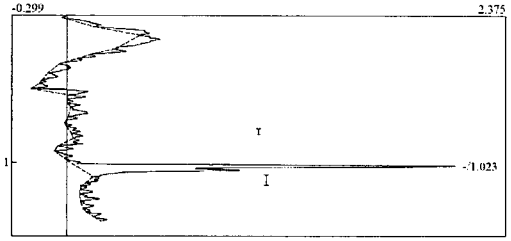
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:25:22
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 17 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

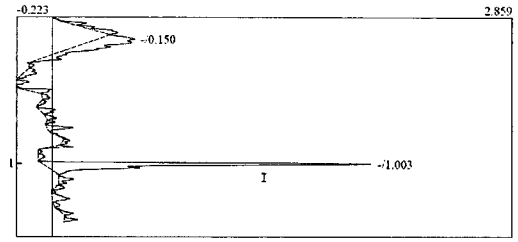
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:26:57
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 17 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 17 16:23

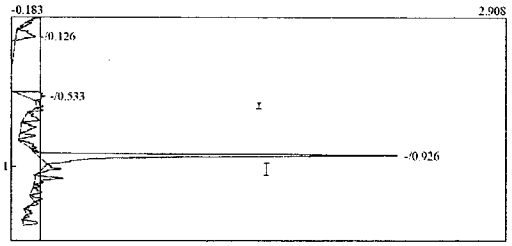
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:36:11
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 18 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

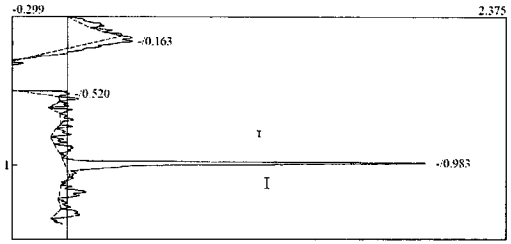
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:37:50
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 18 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

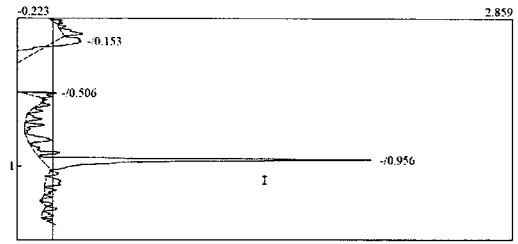
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:39:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 18 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 18 16:35

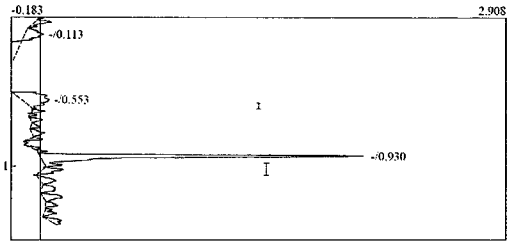
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:49:45
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 19 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

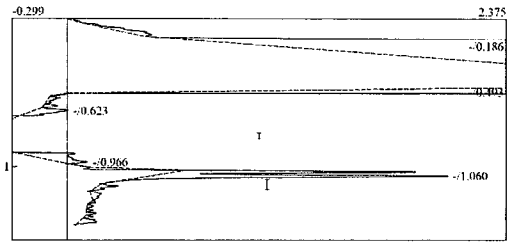
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:51:14
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 19 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

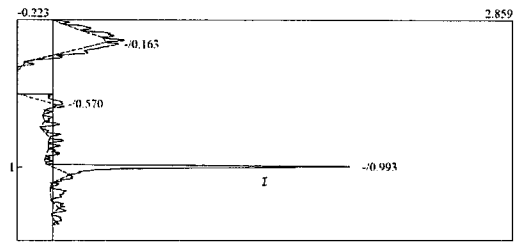
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 16:52:52
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 19 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 19 16:48

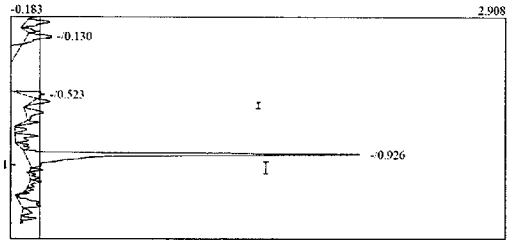
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 17:01:43
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 20 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

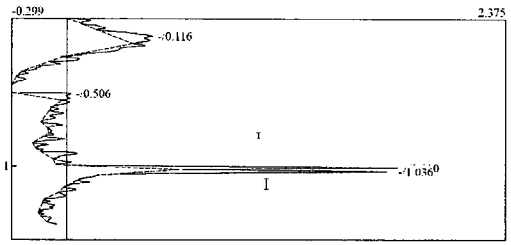
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 17:03:17
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 20 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

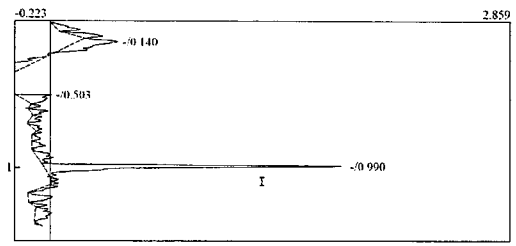
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 17:04:56
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 20 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 20 17:00

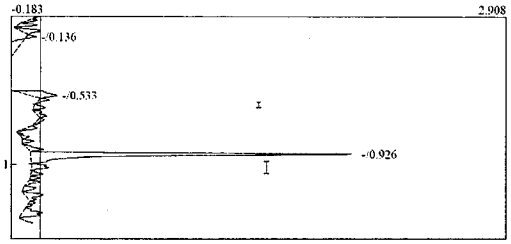
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 17:13:20
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 21 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

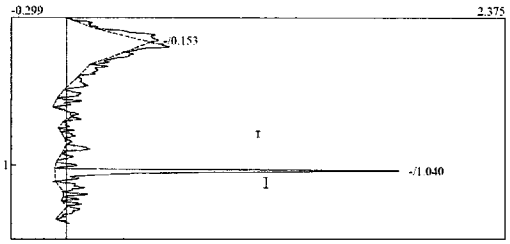
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 17:14:48
Method: Rotary Valve Injection
Description: FID-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 21 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

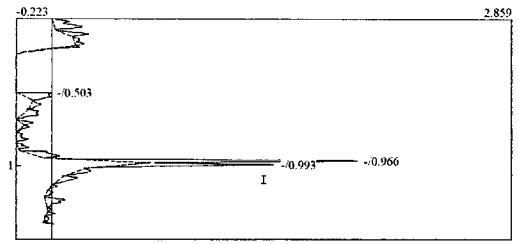
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 17:16:36
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 21 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 21 17:12

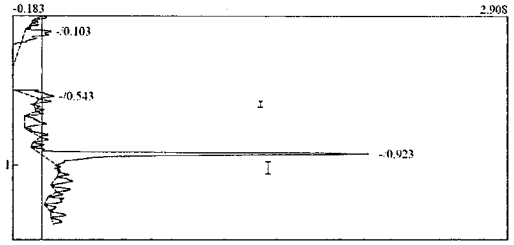
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:00:34
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 22 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

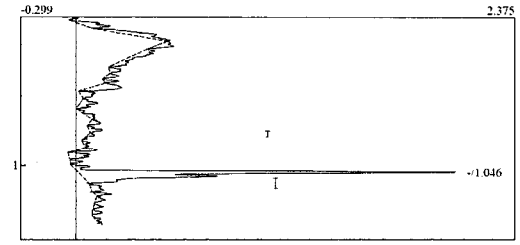
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:02:01
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 22 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

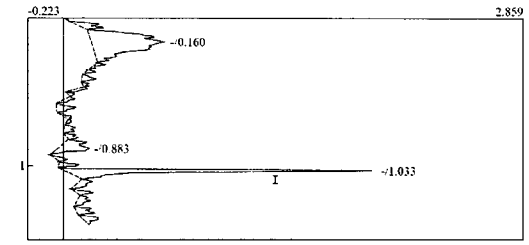
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:03:30
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 22 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 22 17:59

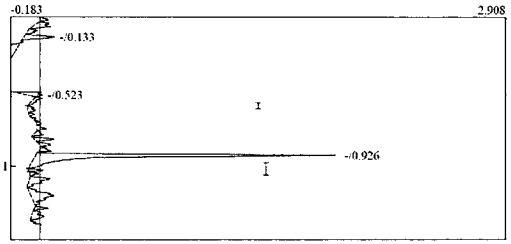
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:12:14
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 23 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

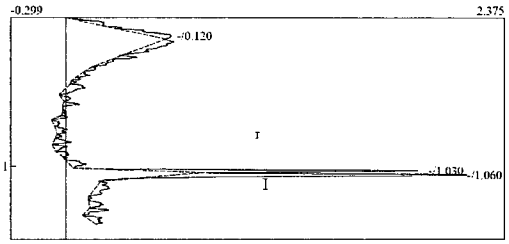
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:13:43
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 23 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

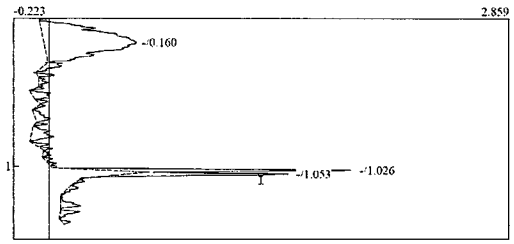
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:15:13
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 23 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 23 18:12

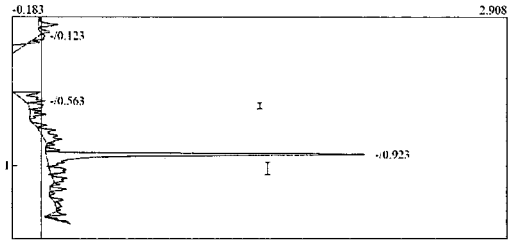
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:25:22
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 24 01

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

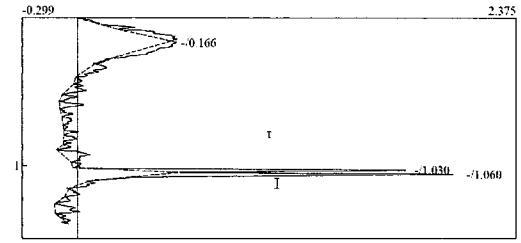
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:26:51
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 24 02

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

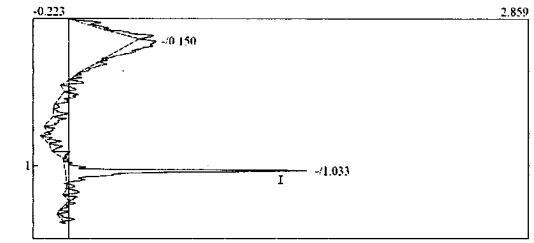
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 18:28:19
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 Push 24 03

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

# PEC Stack Run 3 Push 24 18:24

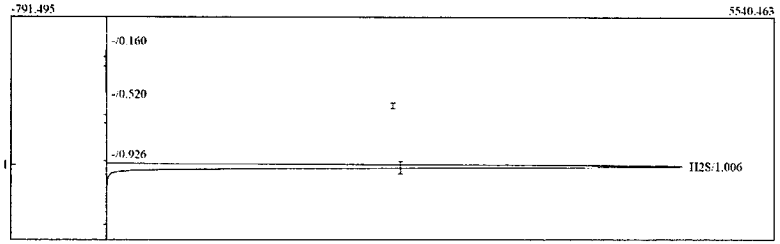
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 15:17:55
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 H2S High Cal Check 01
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| H2S | 1.006 | 7110.7552 | 148.1005 | ppm |
| | | 7110.7552 | 148.1005 | |

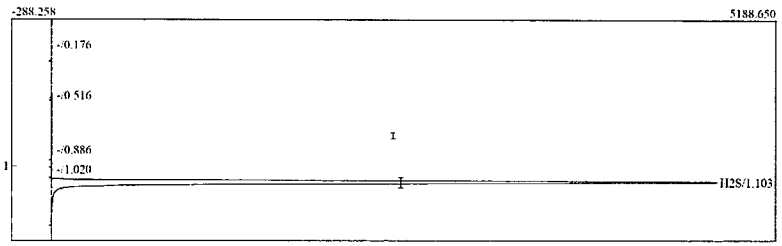
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/04/2016 15:21:42
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Run 3 H2S High Cal Check 02
Comments: H2S - 145.2 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| H2S | 1.103 | 6727.0022 | 143.2697 | ppm |
| | | 6727.0022 | 143.2697 | |

# PEC Stack Run 3 H2S High Cal Check

# APPENDIX E

# Citrate Buffer Verification Files and Nomenclature

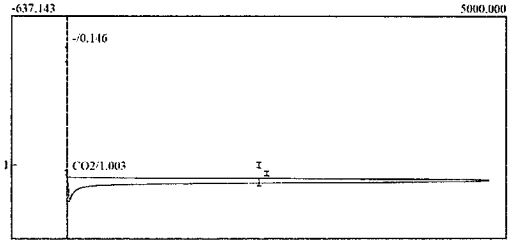
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/02/2016 16:24:01
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack SO2 Time Check
Comments: SO2 - 503 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| CO2 | 1.003 | 9449.7630 | 0.0000 | |
| | | 9449.7630 | 0.0000 | |

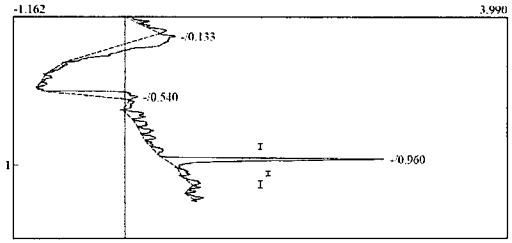
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 11/02/2016 16:29:21
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack 503 ppm SO2 Through Buffer
Comments: SO2 - 503 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| | | 0.0000 | 0.0000 | |

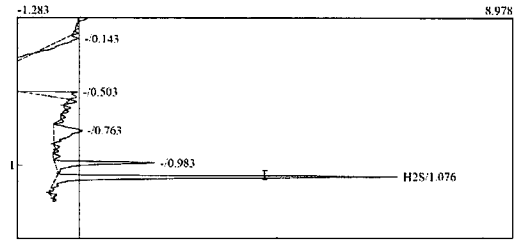
Lab name: MAQS
Client: ArcelorMittal Monessen
Client ID: 16-167
Analysis date: 10/31/2016 15:56:40
Method: Rotary Valve Injection
Description: FPD-CHANNEL 1
Column: 60 METER MXT-1
Carrier: HELIUM AT 27 PSI
Sample: PEC Stack Low Cal through Buffer
Comments: H2S - 9.994 ppm

Temperature program:

| Init temp | Hold | Ramp | Final temp |
|---|---|---|---|
| 150.00 | 1.500 | 0.000 | 150.00 |

Events:

| Time | Event |
|---|---|
| 0.050 | ZERO |
| 0.050 | G ON (ValveRotate) |
| 0.500 | ZERO |




| Component | Retention | Area | External | Units |
|---|---|---|---|---|
| H2S | 1.076 | 8.7044 | 0.0000 | ppm |
| | | 8.7044 | 0.0000 | |

# PEC Stack Buffer Verification Files

## NOMENCLATURE

| | | |
|---|---|---|
| $\sum di^2$ | - | The sum of the squares of the di values for all test runs included in RATA. |
| $\sum di$ | - | The sum of the di values for all test runs included in RATA. |
| AS | - | Applicable standard. |
| C | - | Concentration of calibration gas for line loss testing |
| Cc | - | Confidence coefficient. |
| CEMS | - | Facility continuous emissions monitoring system value |
| d | - | Average difference between CEMS and RM for one test run. |
| di | - | Difference between CEMS and RM values for one run. |
| gr/100 dscf | - | Grains per 100 dry standard cubic feet |
| $H_2S$ | - | Hydrogen Sulfide |
| k | - | Conversion factor to change ppm into gr/100 dscf |
| LL | - | Line Loss |
| LLav | - | Line Loss Average of three injections |
| MW | - | Molecular Weight |
| n | - | Number of test runs used in calculating relative accuracy. |
| $ppm_v$ | - | Parts per million on a volume basis |
| RA | | Relative accuracy. |
| RATA | - | Relative accuracy test audit. |
| RM | - | Reference method, or reference method values adjusted for line loss. |
| $RM_{AV}$ | - | Arithmetic mean of all RM values for the test runs included in the RATA. |
| $RM_{PPM}$ | - | Reference method sampling system value in parts per million |
| RMstd | - | Reference method standard |
| Sd | - | Standard deviation. |
| $t_{0.975}$ | - | T-value for number of values used in RATA. |

# Pushing Baghouse Dust, COG, and Coal Analyses

**H6K030422 Analytical Report ..... 1**

**Sample Receipt Documentation ..... 31**

**Metals ..... 36**
Sample Results ..... 37
QC Summary ..... 49
Quality Control Results ICP ..... 62
Quality Control Results Mercury ..... 75
Raw Data ICP ..... 82
Raw Data Mercury ..... 264
Miscellaneous Data ..... 278

**Sample Receipt Documentation ..... 286**

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

# ANALYTICAL REPORT

Montrose Coke ICR - Metals

Lot #: H6K030422

William Cowell

Montrose Air Quality Services
1050 William Pitt Way
Pittsburgh, PA 15238

TESTAMERICA LABORATORIES, INC.

Courtney M. Adkins
Project Manager

November 29, 2016

# ANALYTICAL METHODS SUMMARY

**H6K030422**

| PARAMETER | ANALYTICAL METHOD |
|---|---|
| Mercury in Solid Waste (Manual Cold-Vapor) | SW846 7471A |
| Trace Inductively Coupled Plasma (ICP) Metals | SW846 6010C |

**References:**

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

# SAMPLE SUMMARY

H6K030422

| WO # | SAMPLE# | CLIENT SAMPLE ID | SAMPLED DATE | SAMP TIME |
|---|---|---|---|---|
| M9G8E | 001 | O-2001 RUN #1 DUST | 10/31/16 | |
| M9G8G | 002 | O-2003 RUN #1 COAL | 10/31/16 | |
| M9G8L | 004 | O-2006 RUN #1A WATER | 10/28/16 | |
| M9G8M | 005 | O-2014 RUN #1B WATER | 10/28/16 | |
| M9G8N | 006 | O-2022 RUN #1C WATER | 10/28/16 | |
| M9G8P | 007 | O-2030 RUN #2A WATER | 10/28/16 | |
| M9G8Q | 008 | O-2038 RUN #2B WATER | 10/28/16 | |
| M9G8R | 009 | O-2046 RUN #2C WATER | 10/28/16 | |
| M9G8T | 010 | O-2054 RUN #3A WATER | 10/31/16 | |
| M9G8V | 011 | O-2062 RUN #3B WATER | 10/31/16 | |
| M9G8W | 012 | O-2070 RUN #3C WATER | 10/31/16 | |

**NOTE(S):**

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

# PROJECT NARRATIVE
## H6K030422

The results reported herein are applicable to the samples submitted for analysis only. If you have any questions about this report, please call (865) 291-3000 to speak with the TestAmerica project manager listed on the cover page.

This report shall not be reproduced except in full, without the written approval of the laboratory.

**The original chain of custody documentation is included with this report.**

**Sample Receipt**

Sample O-2005 Run # 3 Dust was received, but was marked out on the chain of custody documentation. The lab will put the sample on hold.

The water samples were received unpreserved. The laboratory processed the sample by preserving to the proper pH prior to analysis.

**Quality Control and Data Interpretation**

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

# CERTIFICATION SUMMARY

| Laboratory | Authority | Program | EPA Region | Certification ID |
|---|---|---|---|---|
| TestAmerica Knoxville | L-A-B | DoD ELAP | | L2311 |
| TestAmerica Knoxville | Arkansas DEQ | State Program | 6 | 88-0688 |
| TestAmerica Knoxville | California | State Program | 9 | 2423 |
| TestAmerica Knoxville | Colorado | State Program | 8 | N/A |
| TestAmerica Knoxville | Connecticut | State Program | 1 | PH-0223 |
| TestAmerica Knoxville | Florida | NELAC | 4 | E87177 |
| TestAmerica Knoxville | Georgia | State Program | 4 | 906 |
| TestAmerica Knoxville | Hawaii | State Program | 9 | N/A |
| TestAmerica Knoxville | Kansas | NELAC | 7 | E-10349 |
| TestAmerica Knoxville | Kentucky | State Program | 4 | 90101 |
| TestAmerica Knoxville | Louisiana DOHH | State Program | 6 | LA150004 |
| TestAmerica Knoxville | Louisiana DEQ | NELAC | 6 | 83979 |
| TestAmerica Knoxville | Maryland | State Program | 3 | 277 |
| TestAmerica Knoxville | Michigan | State Program | 5 | 9933 |
| TestAmerica Knoxville | Nevada | State Program | 9 | TN00009 |
| TestAmerica Knoxville | New Jersey | NELAC | 2 | TN001 |
| TestAmerica Knoxville | New York | NELAC | 2 | 10781 |
| TestAmerica Knoxville | North Carolina DENR | State Program | 4 | 64 |
| TestAmerica Knoxville | North Carolina DHHS | State Program | 4 | 21705 |
| TestAmerica Knoxville | Ohio | OVAP | 5 | CL0059 |
| TestAmerica Knoxville | Oklahoma | State Program | 6 | 9415 |
| TestAmerica Knoxville | Pennsylvania | NELAC | 3 | 68-00576 |
| TestAmerica Knoxville | South Carolina | State Program | 4 | 84001 |
| TestAmerica Knoxville | Tennessee | State Program | 4 | TN02014 |
| TestAmerica Knoxville | Texas | NELAC | 6 | T104704380-14-7 |
| TestAmerica Knoxville | Federal | USDA | | P330-11-00260 |
| TestAmerica Knoxville | Utah | NELAC | 8 | TN000092014-5 |
| TestAmerica Knoxville | Virginia | NELAC | 3 | 460176 |
| TestAmerica Knoxville | Virginia | State Program | 3 | 00165 |
| TestAmerica Knoxville | Washington | State Program | 10 | C593 |
| TestAmerica Knoxville | West Virginia DEP | State Program | 3 | 345 |
| TestAmerica Knoxville | West Virginia DHHR | State Program | 3 | 9955C |
| TestAmerica Knoxville | Wisconsin | State Program | 5 | 998044300 |

Accreditation may not be offered or required for all methods and analytes in this report. Please contact your project manager for the laboratory's current list of certified methods and analytes.

# QC DATA ASSOCIATION SUMMARY

**H6K030422**

Sample Preparation and Analysis Control Numbers

| SAMPLE# | MATRIX | ANALYTICAL METHOD | LEACH BATCH # | PREP BATCH # | MS RUN# |
|---|---|---|---|---|---|
| 001 | SOLID | SW846 7471A | | 6326023 | 6326018 |
| 002 | SOLID | SW846 7471A | | 6326023 | |
| 004 | WATER | SW846 6010C | | 6321044 | 6321008 |
| 005 | WATER | SW846 6010C | | 6321044 | |
| 006 | WATER | SW846 6010C | | 6321044 | |
| 007 | WATER | SW846 6010C | | 6321044 | |
| 008 | WATER | SW846 6010C | | 6321044 | |
| 009 | WATER | SW846 6010C | | 6321044 | |
| 010 | WATER | SW846 6010C | | 6321044 | |
| 011 | WATER | SW846 6010C | | 6321044 | |
| 012 | WATER | SW846 6010C | | 6321044 | |

# Sample Data Summary

**Montrose Air Quality Services LLC**

**Client Sample ID: O-2001 RUN #1 DUST**

**TOTAL Metals**

**Lot-Sample #...:** H6K030422-001 **Matrix.....:** SOLID
**Date Sampled...:** 10/31/16 **Date Received..:** 11/03/16

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6326023 | | | | | | |
| **Mercury** | **0.43** | **0.20** | **mg/kg** | **SW846 7471A** | **11/21-11/22/16** | **M9G8E1AA** |
| | | Dilution Factor: 6 | | Analysis Time..: 19:03 | MDL.....: 0.060 | |

# METHOD BLANK REPORT

## TOTAL Metals

**Client Lot #...:** H6K030422 **Matrix.....:** SOLID

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **MB Lot-Sample #:** H6K210000-023 **Prep Batch #...:** 6326023 | | | | | | |
| Mercury | ND | 0.20 | mg/kg | SW846 7471A | 11/21-11/22/16 | M9K1G1AA |
| | | Dilution Factor: 6 | | | | |
| | | Analysis Time..: 18:54 | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## LABORATORY CONTROL SAMPLE EVALUATION REPORT

### TOTAL Metals

**Client Lot #...:** H6K030422 **Matrix.....:** SOLID

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|
| **LCS Lot-Sample#:** | H6K210000-023 | **Prep Batch #...:** 6326023 | | | |
| Mercury | 96 | (80 - 120) | SW846 7471A | 11/21-11/22/16 | M9K1G1AC |
| | | Dilution Factor: 6 | Analysis Time..: 18:56 | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

# LABORATORY CONTROL SAMPLE DATA REPORT

## TOTAL Metals

**Client Lot #...:** H6K030422 **Matrix.....:** SOLID

| PARAMETER | SPIKE AMOUNT | MEASURED AMOUNT | UNITS | PERCNT RECVRY | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|
| **LCS Lot-Sample#:** H6K210000-023 **Prep Batch #...:** 6326023 | | | | | | | |
| Mercury | 5.00 | 4.78 | mg/kg | 96 | SW846 7471A | 11/21-11/22/16 | M9K1G1AC |
| | | | Dilution Factor: 6 | | Analysis Time..: 18:56 | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

# MATRIX SPIKE SAMPLE EVALUATION REPORT

## TOTAL Metals

**Client Lot #...:** H6K030422 **Matrix.....:** SOLID
**Date Sampled...:** 10/31/16 **Date Received..:** 11/03/16

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** H6K030422-001 **Prep Batch #...:** 6326023 | | | | | | | |
| Mercury | 83 | (75 - 125) | | | SW846 7471A | 11/21-11/22/16 | M9G8E1AC |
| | 93 | (75 - 125) | 9.3 | (0-20) | SW846 7471A | 11/21-11/22/16 | M9G8E1AD |
| | | Dilution Factor: 6 | | | | | |
| | | Analysis Time..: 19:05 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

# MATRIX SPIKE SAMPLE DATA REPORT

## TOTAL Metals

**Client Lot #...:** H6K030422 **Matrix.....:** SOLID
**Date Sampled...:** 10/31/16 **Date Received..:** 11/03/16

| PARAMETER | SAMPLE AMOUNT | SPIKE AMT | MEASRD AMOUNT | UNITS | PERCNT RECVRY | RPD | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** H6K030422-001 **Prep Batch #...:** 6326023 | | | | | | | | | |
| Mercury | | | | | | | | | |
| | 0.43 | 0.952 | 1.23 | mg/kg | 83 | | SW846 7471A | 11/21-11/22/16 | M9G8E1AC |
| | 0.43 | 0.984 | 1.35 | mg/kg | 93 | 9.3 | SW846 7471A | 11/21-11/22/16 | M9G8E1AD |
| | | | Dilution Factor: 6 | | | | | | |
| | | | Analysis Time..: 19:05 | | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

# MATRIX SPIKE SAMPLE DATA REPORT

## TOTAL Metals

**Client Lot #...:** H6K030422 **Matrix.....:** SOLID
**Date Sampled...:** 10/31/16 **Date Received..:** 11/03/16

| PARAMETER | SAMPLE AMOUNT | SPIKE AMT | MEASRD AMOUNT | UNITS | PERCNT RECVRY | RPD | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** H6K030422-001 **Prep Batch #...:** 6326023 | | | | | | | | | |
| Mercury | | | | | | | | | |
| | 0.43 | 0.952 | 1.23 | mg/kg | 83 | | SW846 7471A | 11/21-11/22/16 | M9G8E1AC |
| | 0.43 | 0.984 | 1.35 | mg/kg | 93 | 9.3 | SW846 7471A | 11/21-11/22/16 | M9G8E1AD |
| | | | Dilution Factor: 6 | | | | | | |
| | | | Analysis Time..: 19:05 | | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

# Sample Receipt Documentation

# Request for Analysis/Chain-of-Custody – RFA/COC #002
## Montrose Air Quality Services LLC
## Coke ICR Testing on Dust and Water Samples

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

H6KD30422

| Project Identification: | Montrose Air Quality Services Coke ICR |
|---|---|
| Client Contact: | Mr. Matthew Dallesasse (Montrose) (412) 826-3636 |
| TestAmerica Contact: | Ms. Courtney Adkins (865) 291-3019 |
| TestAmerica Project Manager: | Mr. Kevin Woodcock (865) 291-3082 |

| Laboratory Deliverable Turnaround Requirements: | |
|---|---|
| Analytical Due Date: (Review-Released Data) | 21 Days from Lab Receipt |
| Data Package Due Date: | 28 Days from Lab Receipt |
| **Media Request Form No.:** | 101416-1 |
| **Laboratory Destination:** | TestAmerica Knoxville 5815 Middlebrook Pike Knoxville, Tennessee 37921 (865) 291-3000 |
| **Courier:** | TestAmerica Courier Service |

**Analytical Testing QC Requirements:**
The Legend for Project-Specific Quality Control Testing is designated in the "QC" column as follows: "MS" = Matrix Spike, "MSD" = Matrix Spike Duplicate, "DUP" = Duplicate, "PDS" = Post Digestion Spike and "PDSD" = Post Digestion Spike Duplicate

**Project Deliverables:**
Report analytical results on Quantims R-02 and TALS Reports and in data packages. Include "Field Sample Number", "Sample Type", and "Run Number" on all Reports.

| Analytical Parameter: | Holding Time Requirements: | Preservation Requirements: |
|---|---|---|
| Metals (excluding Hg) | 180 Days to Analysis | Nitric Acid & Cool, 4°C |
| Mercury (Hg) | 28 Days to Analysis | Cool, 4°C |

| Field Sample No./ Sample Coding ID | Run No. | Sample Collection Date | Project QC Requirements | Sample Bottle/ Container | Sample Type | Analytical Specifications |
|---|---|---|---|---|---|---|
| O-2001 Run #1 Dust | 1 | ~~10/28 & 10/30~~ BC 10/28 & 10/31 2016 | MS/MSD | 250 mL Powder Jar | **Dust Sample** Mercury (Hg) Analysis | Analyze this sample for Mercury (Hg) by SW-846 Compendium Method 3051/7470. |
| O-2003 Run #1 ~~Dust~~ Coal | 2 | 10/28 & 10/31 2016 | | 250 mL Powder Jar | **Dust Sample** Mercury (Hg) Analysis | Analyze this sample for Mercury (Hg) by SW-846 Compendium Method 3051/7470. |
| ~~O-2005 Run #3~~ Dust | 3 | NA | NA | 1 Liter Narrow Mouth Nalgene/HDPE | **Dust Sample** Mercury (Hg) Analysis | Analyze this sample for Mercury (Hg) by SW-846 Compendium Method 3051/7470. |
| O-2006 Run #1A Water | 1A | 10/28/16 | MS/MSD | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2014 Run #1B Water | 1B | 10/28/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2022 Run #1C Water | 1C | 10/28/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2030 Run #2A Water | 2A | 10/28/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2038 Run #2B Water | 2B | 10/28/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |

# Request for Analysis/Chain-of-Custody – RFA/COC #002
## Montrose Air Quality Services LLC
## Coke ICR Testing on Dust and Water Samples

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

| Field Sample No./ Sample Coding ID | Run No. | Sample Collection Date | Project QC Requirements | Sample Bottle/ Container | Sample Type | Analytical Specifications |
|---|---|---|---|---|---|---|
| O-2046 Run #2C Water | 2C | 10/28/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2054 Run #3A Water | 3A | 10/31/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2062 Run #3B Water | 3B | 10/31/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |
| O-2070 Run #3C Water | 3C | 10/31/16 | | 1 Liter Narrow Mouth Nalgene/HDPE | **Water Sample** Metals Analysis | Analyze this sample for Metals by SW-846 Compendium Method 6010C. |

**Request for Analysis/Chain-of-Custody – RFA/COC #002**
**Montrose Air Quality Services LLC**
**Coke ICR Testing on Dust and Water Samples**

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

## Sample Receipt Log and Condition of the Samples Upon Receipt:

| Please fill in the following information: | Comments (Please write "NONE" if no comment applicable) |
|---|---|
| (1) Record the identities of any samples that were listed on the RFA but were not found in the sample shipment. | NONE |
| (2) Record the sample shipping cooler temperature of all coolers transporting samples listed on this RFA: | AT 0.1, 0.3, 0.1, 0.1, 0.5 CT 0.1, 0.3, 0.1, 0.1, 0.5°C |
| (3) Record any apparent sample loss/breakage. | NONE |
| (4) Record any unidentified samples transported with this shipment of samples: | 0-2005 MARKED OUT ON COC, DID RECEIVE |
| (5) Indicate if all samples were received according to the project's required specifications (i.e. no nonconformances): | HAND DELIVERED, CUSTODY SEALS INTACT RECEIVED AT PH7, SHOULD BE PH<2 |

## Custody Transfer:

| | Name | Company | Date/Time |
|---|---|---|---|
| Relinquished By: | [illegible] | Montrose | 11/2/16 9:15 |
| Accepted By: | [illegible] | TEST AMERICA | 11/2/16 12:55 |
| Relinquished By: | [illegible] | TEST AMERICA | 11/3/16 8:25 |
| Accepted By: | [illegible] | TA | 11/3/16 0825 |
| Relinquished By: | | | |
| Accepted By: | | | |
| Relinquished By: | | | |
| Accepted By: | | | |

**TESTAMERICA KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST**

**Log In Number:** 1-16K030422

| Review Items | Yes | No | NA | If No, what was the problem? |
|---|---|---|---|---|
| 1. Are the shipping containers intact? | ✓ | | ✓ | ☐ **Containers, Broken** |
| 2. Were ambient air containers received intact? | | | ✓ | ☐ Checked in lab |
| 3. The coolers/containers custody seal if present, is it intact? | ✓ | | | ☐ Yes<br>☐ NA |
| 4. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C, VOST: 10°C)<br>Thermometer ID: SC61<br>Correction factor: 0.0 | ✓ | | | ☐ **Cooler Out of Temp, Client Contacted, Proceed/Cancel**<br>☐ **Cooler Out of Temp, Same Day Receipt** |
| 5. Were all of the sample containers received intact? | ✓ | | | ☐ **Containers, Broken** |
| 6. Were samples received in appropriate containers? | ✓ | | | ☐ **Containers, Improper; Client Contacted; Proceed/Cancel** |
| 7. Do sample container labels match COC? (IDs, Dates, Times) | ✓ | | | ☐ **COC & Samples Do Not Match**<br>☐ **COC Incorrect/Incomplete**<br>☐ **COC Not Received** |
| 8. Were all of the samples listed on the COC received? | ✓ | | | ☑ **Sample Received, Not on COC**<br>☐ **Sample on COC, Not Received** |
| 9. Is the date/time of sample collection noted? | ✓ | | | ☐ **COC; No Date/Time; Client Contacted** |
| 10. Was the sampler identified on the COC? | | | ✓ | ☐ **Sampler Not Listed on COC** |
| 11. Is the client and project name/# identified? | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 12. Are tests/parameters listed for each sample? | ✓ | | | ☐ **COC No tests on COC** |
| 13. Is the matrix of the samples noted? | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 14. Was COC relinquished? (Signed/Dated/Timed) | ✓ | | | ☐ **COC Incorrect/Incomplete** |
| 15. Were samples received within holding time? | ✓ | | | ☐ **Holding Time - Receipt** |
| 16. Were samples received with correct chemical preservative (excluding Encore)? | | ✓ | | ☑ **pH Adjusted, pH Included (See box 16A)**<br>☐ **Incorrect Preservative** |
| 17. Were VOA samples received without headspace? | | | ✓ | ☐ **Headspace (VOA only)** |
| 18. Did you check for residual chlorine, if necessary? (e.g. 1613B, 1668)<br>Chlorine test strip lot number: | | | ✓ | ☐ **Residual Chlorine** |
| 19. For 1613B water samples is pH<9? | | | ✓ | ☐ If no, lab will adjust |
| 20. For rad samples was sample activity info. Provided? | | | ✓ | ☐ Project missing info |

**Comments/Actions Taken**

8.0-2005 RUN #3 DUST, MARKED OUT ON COC, DID RECEIVE, WILL PUT ON HOLD

16. RECEIVED UNPRESERVED, PRESERVED AT LAB TO PH<2, ALL WATER SAMPLES

**Labeling Verified by:** **Date:**

**pH test strip lot number:**

| | Box 16A: pH Preservation | Box 18A: Residual Chlorine |
|---|---|---|
| Preservative: | HNO3 | |
| Lot Number: | 0000050770 | |
| Exp Date: | 3-6-17 | |
| Analyst: | BKO | |
| Date: | 11-3-16 | |
| Time: | 15:45 | |

Project #: _____ PM Instructions: _____

Sample Receiving Associate: [signature] Date: 11-3-16

QA026R30.doc, 080916

# Sample Results

**Montrose Air Quality Services LLC**

**Client Sample ID: O-2001 RUN #1 DUST**

**TOTAL Metals**

**Lot-Sample #...:** H6K030422-001 **Matrix.....:** SOLID
**Date Sampled...:** 10/31/16 **Date Received..:** 11/03/16

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6326023 | | | | | | |
| **Mercury** | **0.43** | **0.20** | **mg/kg** | **SW846 7471A** | **11/21-11/22/16** | **M9G8E1AA** |
| | | Dilution Factor: 6 | | Analysis Time..: 19:03 | MDL.....: 0.060 | |

**Montrose Air Quality Services LLC**

**Client Sample ID: O-2003 RUN #1 COAL**

**TOTAL Metals**

**Lot-Sample #...:** H6K030422-002 **Matrix.....:** SOLID
**Date Sampled...:** 10/31/16 **Date Received..:** 11/03/16

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6326023 | | | | | | |
| **Mercury** | **0.17 B** | **0.20** | **mg/kg** | **SW846 7471A** | **11/21-11/22/16** | **M9G8G1AA** |
| | | Dilution Factor: 6 | | Analysis Time..: 19:13 | MDL.....: 0.060 | |

**NOTE(S):**

B Estimated result. Result is less than RL.

# This page intentionally left blank

# Gold Sorbent Trap Analysis Report

Project Number: Custom

Turn-around: Custom

Client: Air Compliance Consultant
Contact: John Wilson
Phone: 412.826.3636
Email: jwilson@montrose-env.com

Date: 12/9/2016
Analyst(s): Anna Rogalski
MDL: 0.882ng
Method: ASTM D5954

| Sample ID | Source | Description | Hg Mass (ng) | Breakthrough (%) | Hg Total (ng) | Sample Volume (L) | Gas Conc. (ng/L) | Notes |
|---|---|---|---|---|---|---|---|---|
| 183399 | ArcelorMittal | COG Sample Port | 192.9* | N/A | **N/A** | 24.146 | **N/A** | *Invalid/over calibration range |
| 183387 | ArcelorMittal | COG Sample Port | 33.8 | | | | | |
| 183405 | ArcelorMittal | COG Sample Port | 1725.0 | 0.58% | **1735.0** | 22.637 | **76.6** | |
| 183410 | ArcelorMittal | COG Sample Port | 10.0 | | | | | |
| 183409 | ArcelorMittal | COG Sample Port | 1188.0 | 1.02% | **1200.1** | 21.236 | **56.5** | |
| 183439 | ArcelorMittal | COG Sample Port | 12.1 | | | | | |
| 183473 | ArcelorMittal | Blank | 0.5 | N/A | **<MDL** | N/A | **N/A** | |
| 183396 | ArcelorMittal | Blank | 0.2 | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

*ng/L is equivalent to $\mu g/m^3$
**Non-Detect Values are underlined
***Values under the LOQ are double underlined

Method Uncertainty = +/- 10%

OHIO LUMEX

# Air Compliance Consultants

**Analyst:** Anna Rogalski
**File Name:** 161208_ALR_AirComplianceConsultants
**Analyzer #:** 1475 **Cell type:** Short
**MDL:** 0.882 ng

**Date:** 12/8/2016
**Temperature (°C):** 680
**Flow Rate (L/min):** 1.50
**SD:** 0.4

| | ID # | PF Mass (ng) | AGS Mass (ng) | Section 1 Mass (ng) | Section 2 Mass (ng) | Section 3 Mass (ng) | Section 4 Mass (ng) | Spike Level (ng) | Source: | Notes: |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 183405 | | | 1725 | | | | | COG Sample Port | |
| 2 | 183410 | | | 10.0 | | | | | COG Sample Port | |
| 3 | 183387 | | | 33.8 | | | | | COG Sample Port | |
| 4 | 183409 | | | 1188 | | | | | COG Sample Port | |
| 5 | 183439 | | | 12.1 | | | | | COG Sample Port | |
| 6 | 183473 | | | 0.5 | | | | | | |
| 7 | 183396 | | | 0.2 | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |

| Daily Calibration* | | |
|---|---|---|
| Lot # Std. | Std. (ng) | Calculated (ng) |
| K2-MEB652224 (I) | 10 | see cal. report |
| K2-MEB652224 (I) | 50 | see cal. report |
| K2-MEB652225 (I) | 100 | see cal. report |
| K2-MEB652225 (I) | 500 | see cal. report |
| K2-MEB652226 (J) | 1,000 | see cal. report |
| K2-MEB631040 B | 4,000 | see cal. report |
| | | see cal. report |
| | | see cal. report |
| | | see cal. report |
| | | see cal. report |

| Independent Calibration Verification** | | |
|---|---|---|
| Lot # Std. | Std. (ng) | Calculated (ng) |
| | | |

| Response Factor (Method 30B Only)*** | | |
|---|---|---|
| Lot # Std. | Std. (ng) | (area count/mass ) |
| | | |

Immediately report any QA/QC failures or anything suspicious to the QA/QC Manager

| Continuing Calibration Verifications**** | | |
|---|---|---|
| Lot # Std. | Std. (ng) | Calculated (ng) |
| K2-MEB652225 (I) | 500 | 515.0 |
| K2-MEB652225 (I) | 500 | 526.1 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

*Performed daily prior to analysis of sorbent traps, QAQC found in the SOP for trap analysis. If a new calibration curve is used a new bench sheet must be filled out

**Performed directly after calibration curve is verified, must come within 10% of expected value

***The chosen response factor value must fall in between the lowest point on the calibration curve and the MDL

****Must be performed between every 10 samples and between every analytical batch

*****Subject to change, for analyst convenience only

| Active Hg Standard Bank***** | | |
|---|---|---|
| Concentration (µg/mL) | Lot #/Bottle ID | Exp. Date |
| 0.1 | K2-MEB603126 B | 10/31/2017 |
| 1 | K2-MEB631041 B | 8/24/2017 |
| 10 | K2-HG650192 B | 11/10/2017 |
| 100 | K2-MEB631040 B | 10/4/2017 |
| 1000 | J2-HG02133 B | 4/28/2017 |
| | | |
| 0.1 | K2-MEB603126 A | 10/31/2017 |
| 1 | K2-MEB631041 A | 8/9/2017 |
| 10 | K2-HG650192 A | 11/10/2017 |
| 100 | K2-MEB631040 A | 7/6/2017 |
| 1000 | J2-HG02133 A | 5/24/2017 |
| | | |
| 1 (Independent) | J2-HG02137 | 4/28/2017 |
| 10 (Independent) | J2-MEB600156 | 10/31/2017 |
| 100 (Independent) | J2-MEB579072 | 4/28/2017 |
| | | |

| Pipette Identification |
|---|
| AB |

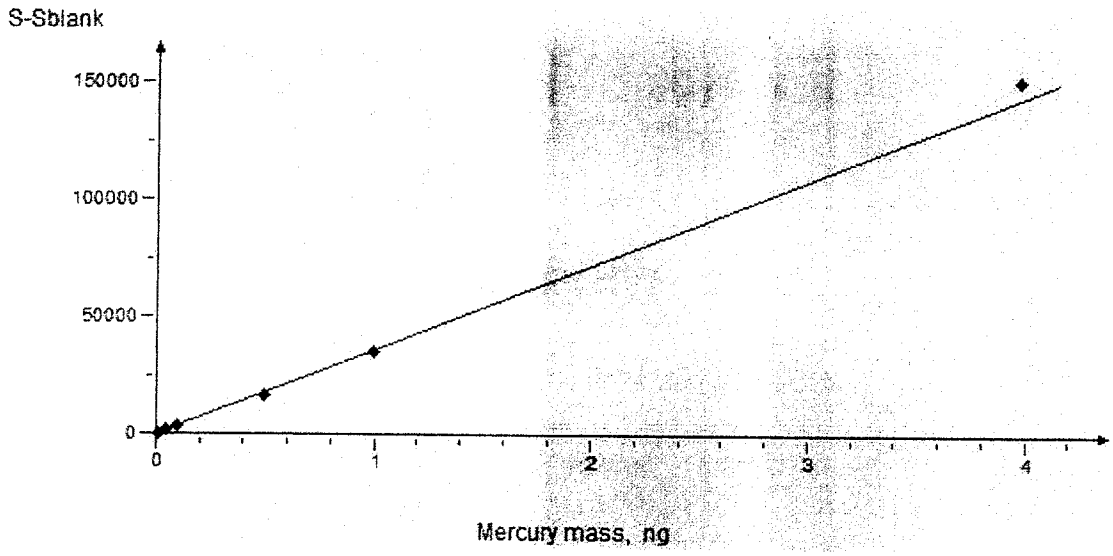
OHIO LUMEX

Analyst Signature: [signature] Date: 12/8/16

*By signing this report I confirm that the above data are true to the best of my knowledge.*

# REPORT

| | |
|---|---|
| Report created | 09.12.2016 08:56:57 |
| Instrument RA915+ | Serial number 1475 |
| Calibration created | 08.12.2016 19:12:30 |
| Calibration name | 161208_ALE_ 10-4000 Gold |




## Results

| N | Mercury mass, ng | S-Sblank | Ref.data, ng/g | Calculated, ng/g | d, % |
|---|---|---|---|---|---|
| 1 | 4.00 | 152400 | 4000.0 | 4205.5 | 5.1 |
| 2 | 1.00 | 36030 | 1000.0 | 994.6 | -0.5 |
| 3 | 0.50 | 17020 | 500.0 | 469.7 | -6.1 |
| 4 | 0.10 | 3700 | 100.0 | 102.1 | 2.1 |
| 5 | 0.05 | 1677 | 50.0 | 46.3 | -7.4 |
| 6 | 0.01 | 387 | 10.0 | 10.7 | 6.7 |

| | |
|---|---|
| Calibration | S - Sblank = a·m |
| Algorithm | WLSM |
| Correlation coefficient | 0.999842 |
| Residual standard deviation | 65.718841 |

## Air Compliance Consultants

| | | | |
|---|---|---|---|
| Analyst: | Anna Rogalski | | |
| File Name: | 161205_ALR_AirComplianceConsultants | | |
| Analyzer #: | 004 | Cell type: | Heated/Long |
| MDL: | 0.207 | ng | |

| | |
|---|---|
| Date: | 12/5/2016 |
| Temperature (°C): | 680 |
| Flow Rate (L/min): | 0.50 |
| SD: | 0.9 |

**Calibration**

| | Syringe Vol (µL) | Temperature (°C) | Area | Reference Mass (ng) | Area / ng | Calculated Mass (ng) | % Recovery |
|---|---|---|---|---|---|---|---|
| 1 | 50 | 15.0 | 460 | 0.431 | 1067 | 0.399 | -7.9% |
| 2 | 100 | 15.0 | 951 | 0.862 | 1103 | 0.826 | -4.4% |
| 3 | 250 | 15.0 | 2567 | 2.155 | 1191 | 2.229 | 3.3% |
| 4 | 500 | 15.0 | 4947 | 4.311 | 1148 | 4.296 | -0.3% |
| 5 | 1000 | 15.0 | 10000 | 8.621 | 1160 | 8.683 | 0.7% |
| 6 | 2000 | 15.0 | 21390 | 17.242 | 1241 | 18.574 | 7.2% |
| | | | | Mean: | 1152 | Cal. Coefficient: | 0.000868 |

**Sample Analysis**

| | Trap ID # | Source | Area | Mass (ng) |
|---|---|---|---|---|
| 1 | 183399 | COG Sample Port | 222100 | 192.9 |
| 2 | NOTE: Sample flooded the cell, measured mass less than true mass. Also, front | | | |
| 3 | plug of the trap was wet and slightly green | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |

**Continuing Calibration Verifications**

| | Syringe Vol (µL) | Temperature (°C) | Area | Reference Mass (ng) | Calculated Mass (ng) | % Difference |
|---|---|---|---|---|---|---|
| 1 | 250 | 15.0 | 2387 | 2.155 | 2.073 | -4.0% |
| 2 | 250 | 15.0 | 2447 | 2.155 | 2.125 | -1.4% |
| 3 | | | | | | |

Note: Tekran calibration unit was used to create calibration curve in lieu of standard calibration method

OHIO LUMEX

Immediately report any QA/QC failures or anything suspicious to the QA/QC Manager

Analyst Signature: [signature]

*By signing this report I confirm that the above data are true to the best of my knowledge.*

Date: 12/06/16

Trap ID
OL183399

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: Arcelormittal Test Location: COG sample Pad

Boiler ID: NA Trap (A) B (Circle One)

Lot Number: U-90B QA/QC Signature (Trap Maker)

Estimated Hg Captured: NA ng Sampled By: John Wilson

Test Start (Date/Time) 11/29/16 905 Leak Check Pass/Fail PASS Test End (Date/Time) 1005 Leak Check Pass/Fail PASS

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (~~cc~~/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| 11/29/16 | 905 | 60 °F | 52 °F | 0.5 LPM | 0.000 | | |
| 11/29/16 | 1005 | 60 °F | 52 °F | 0.5 LPM | | 24.146 | 24.146 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: John Wilson Date: 11/29/16

Received by: Date:

Relinquished by: Date:

Received for Laboratory by: Date: 12/06/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680°C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID
OL183387

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: Arcelor Mittal Test Location: COG Sample Port

Boiler ID: N/A Trap A (B) (Circle One)

Lot Number: U-90B QA/QC Signature (Trap Maker)

Estimated Hg Captured: NA ng Sampled By: John Wilson

Test Start (Date/Time) 905 Leak Check Pass/Fail Pass Test End (Date/Time) _____ Leak Check Pass/Fail PASS

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (cc/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| 11/29/16 | 905 | ~60°F | 52°F | 0.5 LPM | 0.000 | | |
| 11/29/16 | 1005 | ~60°F | 52°F | 0.5 LPM | | 24.146 | 24.146 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: John Wilson Date: 11/29/16

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: [illegible] Date: 12/08/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680°C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID

OL183405

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: Arcelormittal Test Location: COG Sample Port

Boiler ID: NA Trap (A) B (Circle One)

Lot Number: U-90B QA/QC Signature (Trap Maker)

Estimated Hg Captured: NA ng Sampled By:

Test Start (Date/Time) 905 Leak Check Pass/Fail PASS Test End (Date/Time) 1005 Leak Check Pass/Fail PASS

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (cc/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| 11/29/16 | 905 | 64°F | 55°F | 0.5LPM | 0.000 | | |
| 11/29/16 | 1005 | 64°F | 55°F | 0.5LPM | | 22.637 | 22.637 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: Date: 11/29/16

Received by: Date:

Relinquished by: Date:

Received for Laboratory by: Date:

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680°C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID
OL183410

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: ArcelorMittal Test Location: COG Sample Port

Boiler ID: NA Trap A (B) (Circle One)

Lot Number: U-90B QA/QC Signature (Trap Maker)

Estimated Hg Captured: NA ng Sampled By: John Wilson

Test Start (Date/Time) 905 Leak Check Pass/Fail PASS Test End (Date/Time) 1005 Leak Check Pass/Fail PASS

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (~~cc~~/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| 11/29/16 | 905 | 64°F | 55°F | 0.5 LPM | 0.000 | | |
| 11/29/16 | 1005 | 64°F | 55°F | 0.5 LPM | | 22.637 | 22.637 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: John Wilson Date: 11/29/16

Received by: Date:

Relinquished by: Date:

Received for Laboratory by: C. [illegible] Date: 12/08/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680°C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID
OL183409

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: Arcelor Mittal Test Location: COG Sample Port

Boiler ID: NA Trap (A) B (Circle One)

Lot Number: U-90B QA/QC Signature (Trap Maker)

Estimated Hg Captured: NA ng Sampled By: John Wilson

Test Start (Date/Time) 1005 Leak Check Pass/Fail PASS Test End (Date/Time) 1105 Leak Check Pass/Fail PASS

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (cc/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| ~~11/29/16~~ | ~~1100~~ | ~~65°F~~ | | | | | |
| 11/29/16 | 1005 | 65°F | 55°F | 0 SLPM | 0.000 | ~~21.236~~ TW | |
| 11/29/16 | 1105 | 65°F | 55°F | 0 SLPM | ~~0.000~~ | 21.236 | 21.236 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: Date: 11/29/16

Received by: Date:

Relinquished by: Date:

Received for Laboratory by: Date: 12/08/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680°C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID
OL183439

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: ArcelorMittal Test Location: COG Sample Port

Boiler ID: NA Trap A (B) (Circle One)

Lot Number: U-90B QA/QC Signature (Trap Maker)

Estimated Hg Captured: NA ng Sampled By: John Wilson

Test Start (Date/Time) 1005 Leak Check Pass/Fail PASS Test End (Date/Time) 1105 Leak Check Pass/Fail PASS

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (~~cc~~/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| 11/29/16 | 1005 | 65°F | 55°F | 0.5 LPM | 0.000 | | |
| 11/29/16 | 1105 | 65°F | 55°F | 0.5 LPM | | 21.236 | 21.236 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: [signature] Date: 11/29/16

Received by: Date:

Relinquished by: [signature] Date:

Received for Laboratory by: Date: 12/08/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680°C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID

OL183473

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: _____ Test Location: _____

Boiler ID: _____ Trap **A** **B** (Circle One)

Lot Number: U-90B

QA/QC Signature (Trap Maker) _____

Estimated Hg Captured: _____ ng

Sampled By: _____

Test Start (Date/Time) _____ Leak Check Pass/Fail _____

Test End (Date/Time) _____ Leak Check Pass/Fail _____

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (cc/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: 12/08/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680˚C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

Trap ID

OL183396

OHIO LUMEX

Gold Coated Bead
Sorbent Trap Chain of Custody

Plant/Source: _____ Test Location: _____

Boiler ID: _____ Trap **A** **B** (Circle One)

Lot Number: U-90B

QA/QC Signature (Trap Maker) _____

Estimated Hg Captured: _____ ng

Sampled By: _____

Test Start (Date/Time) _____ Leak Check Pass/Fail _____

Test End (Date/Time) _____ Leak Check Pass/Fail _____

| Date | Time | Duct Temp (ºF or ºC) | Sorbent Trap Temp (ºF or ºC) | Flow Rate (cc/min) | Dry Gas Meter Liters Initial | Dry Gas Meter Liters Final | Total Volume Pulled |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total/Average | | | | | | | |

Chain of Custody

Relinquished by Tech.: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: 12/08/16

**Make sure all of your sampling conditions prevent moisture condensation in the trap media. Moisture condensation is a major cause of breakthrough and spike loss in sorbent traps and should be prevented at all costs.**
**Heat treated (680˚C) and sealed to achieve zero mercury background.**
**Handle with gloves only.**

Ohio Lumex Co., Inc. 30350 Bruce Industrial Pkwy Solon, OH 44139 USA
**Phone: 888-876-2611 mail@ohiolumex.com**

Best Before: October 2019

**Montrose Air Quality Services LLC**

**Client Sample ID: O-2001 RUN #1 DUST**

**GC/MS Semivolatiles**

| | | | | | |
|---|---|---|---|---|---|
| **Lot-Sample #...:** | H6L290407-001 | **Work Order #...:** | M9P351AA | **Matrix.....:** | SOLID |
| **Date Sampled...:** | 10/31/16 | **Date Received..:** | 11/03/2016 | | |
| **Prep Date.....:** | 01/04/17 | **Analysis Date..:** | 01/11/2017 | | |
| **Prep Batch #...:** | 7004010 | | | | |
| **Dilution Factor:** | 30 | **Method.....:** | KNOX ID-0016 | | |

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | MDL |
|---|---|---|---|---|
| **Acenaphthene** | **62** | **30** | ng/g | 6.3 |
| **Acenaphthylene** | **570** | **30** | ng/g | 1.9 |
| **Anthracene** | **230** | **30** | ng/g | 5.7 |
| **Benzo(a)anthracene** | **520** | **30** | ng/g | 8.7 |
| **Benzo(b)fluoranthene** | **2700** | **30** | ng/g | 7.5 |
| **Benzo(k)fluoranthene** | **820** | **30** | ng/g | 6.6 |
| **Benzo(ghi)perylene** | **680** | **30** | ng/g | 4.5 |
| **Benzo(a)pyrene** | **330** | **30** | ng/g | 5.7 |
| **Chrysene** | **2200** | **30** | ng/g | 6.0 |
| **Dibenz(a,h)anthracene** | **120** | **30** | ng/g | 2.1 |
| **Fluorene** | **1300** | **30** | ng/g | 14 |
| **Indeno(1,2,3-cd)pyrene** | **1100** | **30** | ng/g | 5.1 |
| **Perylene** | **54** | **30** | ng/g | 3.6 |
| **Pyrene** | **1200** | **60** | ng/g | 33 |

| Internal Standard | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| Fluorene d-10 | 87 | (30 - 120) |
| 2-Methylnaphthalene-d10 | 76 | (30 - 120) |
| Acenaphthylene-d8 | 65 | (30 - 120) |
| Anthracene-d10 | 51 | (30 - 120) |
| Fluoranthene-d10 | 104 | (30 - 120) |
| Chrysene-d12 | 74 | (30 - 120) |
| Benzo(b)fluoranthene-d12 | 55 | (30 - 120) |
| Benzo(k)fluoranthene-d12 | 48 | (30 - 120) |
| Benzo(a)pyrene-d12 | 17 * | (30 - 120) |
| Perylene-d12 | 30 | (30 - 120) |
| Indeno(1,2,3-cd)pyrene-d12 | 14 * | (30 - 120) |
| Dibenz(ah)anthracene-d14 | 46 | (30 - 120) |
| Benzo(ghi)perylene-d12 | 17 * | (30 - 120) |

**NOTE(S):**

* Surrogate recovery is outside stated control limits.

**Montrose Air Quality Services LLC**

**Client Sample ID: O-2001 RUN #1 DUST**

**GC/MS Semivolatiles**

| | | | | | |
|---|---|---|---|---|---|
| **Lot-Sample #...:** | H6L290407-001 | **Work Order #...:** | M9P352AA | **Matrix.....:** | SOLID |
| **Date Sampled...:** | 10/31/16 | **Date Received..:** | 11/03/2016 | | |
| **Prep Date.....:** | 01/04/17 | **Analysis Date..:** | 01/11/2017 | | |
| **Prep Batch #...:** | 7004010 | | | | |
| **Dilution Factor:** | 200 | **Method.....:** | KNOX ID-0016 | | |

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | MDL |
|---|---|---|---|---|
| **Fluoranthene** | **8600 B** | **200** | ng/g | 72 |
| **Naphthalene** | **14000** | **4000** | ng/g | 1100 |
| **Phenanthrene** | **15000** | **400** | ng/g | 320 |

| Internal Standard | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| Naphthalene-d8 | 94 | (30 - 120) |
| Phenanthrene-d10 | 97 | (30 - 120) |
| Fluoranthene-d10 | 103 | (30 - 120) |

**NOTE(S):**

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

**METHOD BLANK REPORT**

**GC/MS Semivolatiles**

**Client Lot #...:** H6L290407
**MB Lot-Sample #:** H7A040000-010 **Work Order #...:** M9P8K1AA **Matrix.....:** SOLID

**Prep Date.....:** 01/04/17 **Analysis Date..:** 01/11/2017
**Prep Batch #...:** 7004010
**Dilution Factor:** 1 **Method.....:** KNOX ID-0016

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | MDL |
|---|---|---|---|---|
| Acenaphthene | ND | 1.0 | ng/g | 0.21 |
| Acenaphthylene | ND | 1.0 | ng/g | 0.063 |
| Anthracene | ND | 1.0 | ng/g | 0.19 |
| Benzo(a)anthracene | ND | 1.0 | ng/g | 0.29 |
| Benzo(b)fluoranthene | ND | 1.0 | ng/g | 0.25 |
| Benzo(k)fluoranthene | ND | 1.0 | ng/g | 0.22 |
| Benzo(ghi)perylene | ND | 1.0 | ng/g | 0.15 |
| Benzo(a)pyrene | ND | 1.0 | ng/g | 0.19 |
| Chrysene | ND | 1.0 | ng/g | 0.20 |
| Dibenz(a,h)anthracene | ND | 1.0 | ng/g | 0.070 |
| **Fluoranthene** | **0.43 J** | **1.0** | ng/g | 0.36 |
| Fluorene | ND | 1.0 | ng/g | 0.47 |
| Indeno(1,2,3-cd)pyrene | ND | 1.0 | ng/g | 0.17 |
| Naphthalene | ND | 20 | ng/g | 5.3 |
| Perylene | ND | 1.0 | ng/g | 0.12 |
| Phenanthrene | ND | 2.0 | ng/g | 1.6 |
| Pyrene | ND | 2.0 | ng/g | 1.1 |

| Internal Standard | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| Fluorene d-10 | 90 | (30 - 120) |
| Naphthalene-d8 | 89 | (30 - 120) |
| 2-Methylnaphthalene-d10 | 90 | (30 - 120) |
| Acenaphthylene-d8 | 85 | (30 - 120) |
| Phenanthrene-d10 | 86 | (30 - 120) |
| Anthracene-d10 | 84 | (30 - 120) |
| Fluoranthene-d10 | 95 | (30 - 120) |
| Chrysene-d12 | 97 | (30 - 120) |
| Benzo(b)fluoranthene-d12 | 97 | (30 - 120) |
| Benzo(k)fluoranthene-d12 | 89 | (30 - 120) |
| Benzo(a)pyrene-d12 | 83 | (30 - 120) |
| Perylene-d12 | 82 | (30 - 120) |
| Indeno(1,2,3-cd)pyrene-d12 | 89 | (30 - 120) |
| Dibenz(ah)anthracene-d14 | 86 | (30 - 120) |
| Benzo(ghi)perylene-d12 | 89 | (30 - 120) |

**NOTE(S):**

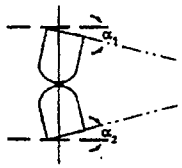
J Estimated result. Result is less than RL.

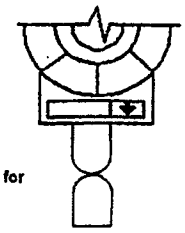
# REPORT - APPENDIX D

# Quality Assurance/Quality Control Data

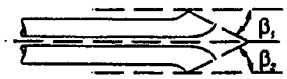
MONTROSE ENVIRONMENTAL

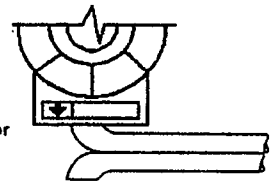
# Montrose Air Quality Services (MAQS)
# Type S Pitot Tube Inspection Data Sheet



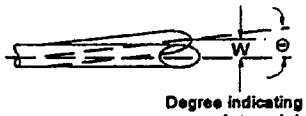



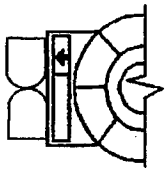
Degree indicating level position for determining $\alpha_1$ and $\alpha_2$.



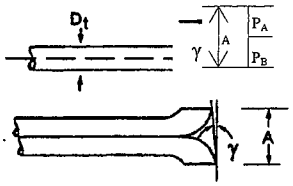



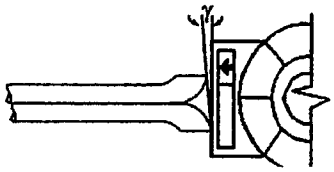
Degree indicating level position for determining $\beta_1$ and $\beta_2$.



Degree indicating level position for determining Θ.



Degree indicating level position for determining γ then calculate Z.

| *Allowable Range/Parameter* | | *Pre-Test Value* | *Post-Test Value* |
|---|---|---|---|
| Level and perpendicular? | | Y☑ N☐ | Y☑ N☐ |
| Obstruction? | | Y☐ N☑ | Y☐ N☑ |
| Damaged? | | Y☐ N☑ | Y☐ N☑ |
| α1 | (-10° < α1 < + 10°) | 0 | 0 |
| α2 | (-10° < α2 < + 10°) | 0 | 0 |
| β1 | (-5° < β1 < + 5°) | 0 | 0 |
| β2 | (-5° < β2 < + 5°) | 0 | 0 |
| γ | (-2° < α1 < + 2°) | 0 | 0 |
| θ | (-1° < α1 < + 1°) | 0 | 0 |
| A | (for 1/4 " OD, 0.526 to 0.750 for 3/8" OD, 0.788 to 1.125) | 0.900 | 0.900 |
| Z = | A tan γ (≤ 0.125") | 0 | 0 |
| W = | A tan θ (≤ 0.03125") | 0 | 0 |
| $P_A$ | (for 1/4 " OD, 0.263 to 0.375 for 3/8" OD, 0.394 to 0.563) | 0.450 | 0.450 |
| $P_B$ | (for 1/4 " OD, 0.263 to 0.375 for 3/8" OD, 0.394 to 0.563) | 0.450 | 0.450 |
| $P_A$ - $P_B$ | (-0.063 to 0.063") | 0.000 | 0.000 |
| $P_A/D_t$ | (1.05 to 1.50) | 1.20 | 1.20 |
| $P_B/D_t$ | (1.05 to 1.50) | 1.20 | 1.20 |
| $D_T$ | (3/16" ≤ $D_t$ ≤ 3/8") | 3/8" | 3/8" |

***Certification:***

I certify that the Type S Pitot Tube/Probe ID# 7-9 calibrated by Caliper ID # CAL-017 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a Pitot tube calibration factor $C_P$ of 0.84.

***Checked by:*** _____ 10/28/16
(Signature / Date)

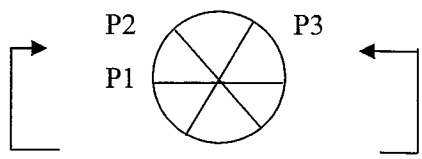
# Montrose Air Quality Services (MAQS)
# Nozzle Calibration Data Sheet

MONTROSE ENVIRONMENTAL

| Date | Calibrated By | Nozzle ID # | Nozzle Diameter (inches) | | | Hi-Lo | $D_{avg}$ |
|---|---|---|---|---|---|---|---|
| | | | D1 | D2 | D3 | Delta D | |
| 10/28/16 | JW | 0.255 | 0.255 | 0.255 | 0.256 | 0.001 | 0.255 |
| 11/1/16 | JW | 0.155 | 0.155 | 0.155 | 0.155 | 0.001 | 0.155 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Where:

D1, D2, D3 = Three different nozzle diameters at 60 degrees to each other, each measured to the nearest 0.001 in.



MEASUREMENT PLANE

Delta D = Maximum distance between any two diameters, must be ≤ 0.004 in.

$D_{avg}$ = (D1 + D2 + D3) / 3

**INSTRUCTIONS:**

1. Inspect the nozzle for nicks, dents and corrosion. If these are found, they should be corrected before calibration.
2. Place a reference mark on the nozzle. Place the nozzle at the center of figure aligned with point P1. Measure and record D1.
3. Rotate the nozzle so that the reference mark is aligned with point P2. Measure and record D2.
4. Rotate the nozzle so that the reference mark is aligned with point P3. Measure and record D3.
5. Calculate Delta D and $D_{avg}$.

11/1/16

***Checked by:*** _____ 10/28/16 Calibrated by Caliper ID# CAL-017
(Signature / Date)

MONTROSE ENVIRONMENTAL

# Montrose Air Quality Services (MAQS)
# Thermocouple Calibration Data Sheet
# ALT-011

***Thermocouple ID:*** 7-9

***Standard Used ID:*** CTC-1

***EMF Meter ID*** 1618

**Post Test**

| Temperature Range | Reference Thermometer (°F) | Thermocouple Thermometer (°F) | Temperature Difference (F°) |
|---|---|---|---|
| Ambient Temp. | 70 | 70 | 0.0 |

**Criteria are:**
The temperature difference within 2.0 F° of Reference Standard.
*Emission Measurement Center, Approved Alternative Method (ALT-011)*

***Checked by:*** 11/4/16
(Signature / Date)

| | Previous Cal | New Cal | % Difference |
|---|---|---|---|
| Y | 1.002 | 1.003 | 0.078 |
| dH | 1.944 | 1.971 | 1.384 |

Air Compliance Consultants, Inc.
EPA Method 5
Meter Box Calibration
Pre-Test Orifice Method
English Meter Box Units, English K' Factor
Apex Orifices

Model #: C-5000
Serial #: 1618

Date: ——————> 04/07/16 60.00
Barometric Pressure: ——> 28.46 (in. Hg)
Theoretical Critical Vacuum:—> 13.42 (in. Hg)

| Jenco 765 NIST Traceability | | |
|---|---|---|
| NIST 161999 | Jenco 765 | % Difference |
| 0 | 0 | 0.00% |
| 400 | 398 | 0.50% |
| 800 | 803 | 0.38% |
| 1200 | 1200 | 0.00% |
| 1600 | 1601 | 0.06% |
| 1900 | 1901 | 0.05% |

!!!!!!!!
IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units. (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
!!!!!!!!

| DRY GAS METER READINGS | | | | | | | | | -CRITICAL ORIFICE READINGS- | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Volume | Volume | Volume | Initial Temps. | | Final Temps. | | Orifice | K' Orifice | Actual | Ambient Temperature | | |
| dH (in H2O) | Time (min) | Initial (cu ft) | Final (cu ft) | Total (cu ft) | Inlet (deg F) | Outlet (deg F) | Inlet (deg F) | Outlet (deg F) | Serial# (number) | Coefficient (see above) | Vacuum (in Hg) | Initial (deg F) | Final (deg F) | Average (deg F) |
| 0.26 | 18.00 | 601.680 | 607.125 | 5.445 | 68.0 | 68.0 | 71.0 | 69.0 | 40 | 0.2337 | 23.0 | 67.0 | 67.0 | 67.0 |
| 0.57 | 15.00 | 617.658 | 624.314 | 6.656 | 73.0 | 70.0 | 74.0 | 71.0 | 48 | 0.3408 | 22.0 | 68.0 | 68.0 | 68.0 |
| 1.10 | 15.00 | 592.863 | 601.680 | 8.817 | 69.0 | 68.0 | 69.0 | 68.0 | 55 | 0.4507 | 20.0 | 70.0 | 67.0 | 68.5 |
| 1.90 | 10.00 | 624.314 | 632.172 | 7.858 | 73.0 | 71.0 | 75.0 | 72.0 | 63 | 0.6027 | 18.5 | 68.0 | 68.0 | 68.0 |
| 3.50 | 10.00 | 607.125 | 617.658 | 10.533 | 70.0 | 69.0 | 74.0 | 73.0 | 73 | 0.8099 | 16.5 | 67.0 | 69.0 | 68.0 |

RESULTS

| DRY GAS METER VOLUME CORRECTED | |
|---|---|
| Vm(std) (cu ft) | Vm(std) (liters) |
| 5.171 | 146.4 |
| 6.290 | 178.1 |
| 8.399 | 237.9 |
| 7.441 | 210.7 |
| 10.039 | 284.3 |

| ORIFICE | | |
|---|---|---|
| VOLUME CORRECTED | | VOLUME NOMINAL |
| Vcr(std) (cu ft) | Vcr(std) (liters) | Vcr (cu ft) |
| 5.215 | 147.7 | 5.474 |
| 6.332 | 179.3 | 6.659 |
| 8.369 | 237.0 | 8.811 |
| 7.465 | 211.4 | 7.851 |
| 10.031 | 284.1 | 10.550 |

| DRY GAS METER CALIBRATION FACTOR | |
|---|---|
| Y Value (number) | Variation (number) |
| 1.009 | 0.006 |
| 1.007 | 0.004 |
| 0.996 | -0.006 |
| 1.003 | 0.000 |
| 0.999 | -0.004 |
| Avg Y--> 1.003 | |

| ORIFICE CALIBRATION FACTOR | | |
|---|---|---|
| dH@ | | |
| Value (in H2O) | Value (mm H2O) | Variation (in H2O) |
| 1.824 | 46.34 | -0.147 |
| 1.884 | 47.86 | -0.087 |
| 2.095 | 53.22 | 0.124 |
| 2.005 | 50.92 | 0.034 |
| 2.047 | 51.99 | 0.076 |
| Avg dH@--> 1.971 | 50.07 | |

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED: TMullen

Date: 4/7/16

MONTROSE AIR QUALITY SERVICES

| Alternative Method 5 Post-Test Calibration Check | | | |
|---|---|---|---|
| Client: | ArcelorMittal | | |
| Facility: | Monessen, PA | | |
| Source ID: | Pushing Baghouse | | |
| Project Number: | 16-167 | | |
| Date: | Oct. 25-26, 2016 | | |
| Control Box ID: | 1618 | | |
| | **Run 1** | **Run 2** | **Run 3** |
| **Data Input** | | | |
| Test time (min) | 180 | 180 | 180 |
| Volume Dry Gas Metered (dacf) | 151.667 | 169.192 | 166.674 |
| Meter Temperature (F) | 62.5 | 60.7 | 67.2 |
| Barometric Pressure (in. Hg) | 29.44 | 29.52 | 29.19 |
| Orifice Pressure Drop (in. $H_2O$) | 2.05 | 2.93 | 2.71 |
| Dry Gas Molecular Weight (lb/lb mol) | 28.94 | 28.94 | 28.93 |
| Original Meter Correction Value | 1.003 | 1.003 | 1.003 |
| Meter $DH_@$ (in. $H_2O$) | 1.971 | 1.971 | 1.971 |
| **Calculated Values** | | | |
| Dry Gas Meter Calibration check value (Yqa) | **0.940** | **0.970** | **0.959** |
| Percent Difference (%) | **-6.28%** | **-3.26%** | **-4.36%** |
| **Results** | | | |
| Average Dry Gas Meter Calibration Check Value (Yqa) | **0.957** | | |
| Original Meter Correction Value (Y orig) | **1.003** | | |
| Percent Difference (%) | **-4.63%** | **Pass** | |

Test conducted in accordance with EMC ALT-009 - Allowable ±5%

Yqa=(time/dacf)*(sqrt((0.0319*(Tm+460))/(DH@*(Pbar+(DHavg/13.6)))*(29/Md))*SQRT(Dhavg))

# This page intentionally left blank

$O_2$ Interference Test

| | |
|---|---|
| Analyzer: | Servomex |
| Date: | 12/19/05 |
| Analyzer Range: | 0 to 25 percent |
| Serial #: | 3858 |

| Test Gas | Gas Cylinder Concentration ($ppm_v$) | $O_2$ Analyzer Response (%) | Difference Percent of Span |
|---|---|---|---|
| Nitric Oxide | 25.3 | 0.0 | 0.00% |
| Sulfur Dioxide | 51.4 | 0.0 | 0.00% |
| Carbon Monoxide | 62.2 | 0.0 | 0.00% |
| Carbon Dioxide | | | |
| | Total Difference Response | | 0.00% |

Notes: $CO_2$ interference is not evaluated due to $O_2$ / $CO_2$ cylinder mixture.
Servomex instrument specifications indicate no interferences with infrared analysis
Acceptance criteria requires the sum of analyzer responses to be less than 2 percent
Performed in accordance with 40 CFR, Part 60, Appendix A, USEPA
Method 3A, Section 6.2 and Method 20, Section 5.4

| | |
|---|---|
| $CO_2$ | Carbon Dioxide |
| $O_2$ | Oxygen |
| % | Percent |
| $ppm_v$ | Parts per million by volume |
| USEPA | United States Environmental Protection Agency |

$CO_2$ Interference Test

| | |
|---|---|
| Analyzer: | Servomex |
| Date: | 12/19/05 |
| Analyzer Range: | 0 to 25 percent |
| Serial #: | 3858 |

| Test Gas | Gas Cylinder Concentration ($ppm_v$) | $CO_2$ Analyzer Response (%) | Difference Percent of Span |
|---|---|---|---|
| Nitric Oxide | 25.3 | 0.0 | 0.00% |
| Sulfur Dioxide | 51.4 | 0.0 | 0.00% |
| Carbon Monoxide | 62.2 | 0.0 | 0.00% |
| Oxygen | | | |
| | Total Difference Response | | 0.00% |

Notes: $O_2$ interference is not evaluated due to $O_2$ / $CO_2$ cylinder mixture.
Servomex instrument specifications indicate no interferences with infrared analysis
Acceptance criteria requires the sum of analyzer responses to be less than 2 percent
Performed in accordance with 40 CFR, Part 60, Appendix A, USEPA
Method 3A, Section 6.2 and Method 20, Section 5.4

| | |
|---|---|
| $CO_2$ | Carbon Dioxide |
| $O_2$ | Oxygen |
| % | Percent |
| $ppm_v$ | Parts per million by volume |
| USEPA | United States Environmental Protection Agency |

# This page intentionally left blank

# LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

## Certificate of Analysis
## Primary Standard

| | |
|---|---|
| Customer | Horizon Engineering (Portland, OR) |
| Date | June 29, 2016 |
| Delivery Receipt | DR-62191 |
| Product: | 100.0 ppm Hydrogen Cyanide, 5.00 ppm Sulfur Hexafluoride/Nitrogen |

### Mixture Specifications

Cylinder Number: EB-0074795

| Components | Requested | Actual |
|---|---|---|
| Hydrogen Cyanide | 100.0 ppm | 100.1 ppm |
| Sulfur Hexafluoride | 5.00 ppm | 5.04 ppm |
| Nitrogen | Balance | Balance |

| Traceability Information | Traceability Type | Traceable to |
|---|---|---|
| Blending Process: | Gravimetric | Mole Percent |
| Blend Tolerance: | Weight | NIST |
| Analytical Tolerance: | Gas Standard | NIST |
| Traceability Certificate: | 822/266926-02 | |

| Cylinder Data | |
|---|---|
| Cylinder Outlet: | CGA 350 (SS) |
| Cylinder Volume: | 126 Cubic Feet |
| Cylinder Pressure: | 1800 psig, 70°F |
| Analytical Tolerance: | +/- 1.0% |
| Expiration Date: | June 29, 2017 |

Certified by: Cole Dylewski

Cole Dylewski

"UNMATCHED EXCELLENCE"

2048 APEX COURT, APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM
APOPKA, FL • PASADENA, TX

Airgas

**Airgas USA, LLC**
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

# CERTIFICATE OF ANALYSIS
## Grade of Product: EPA Protocol

| | | | |
|---|---|---|---|
| Customer: | MONTROSE ENVIRONMENTAL GROUP | | |
| Part Number: | E03NI80E15A0138 | Reference Number: | 32-400717405-1 |
| Cylinder Number: | CC210754 | Cylinder Volume: | 150.9 CF |
| Laboratory: | MIC - Royal Oak-32 (SAP) - MI | Cylinder Pressure: | 2015 PSIG |
| PGVP Number: | B62016 | Valve Outlet: | 590 |
| Gas Code: | CO2,O2,BALN | Certification Date: | May 17, 2016 |

**Expiration Date: May 17, 2024**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

### ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|---|---|---|---|---|---|
| CARBON DIOXIDE | 10.00 % | 10.15 % | G1 | +/- 0.9% NIST Traceable | 05/17/2016 |
| OXYGEN | 10.00 % | 10.01 % | G1 | +/- 1.0% NIST Traceable | 05/17/2016 |
| NITROGEN | Balance | | | | |

### CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|---|---|---|---|---|---|
| NTRM | 12061341 | CC360799 | 11.002 % CARBON DIOXIDE/NITROGEN | +/-0.6% | Jan 11, 2018 |
| NTRM | 09060222 | CC263070 | 9.961 % OXYGEN/NITROGEN | +/- 0.3% | Nov 08, 2018 |

### ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|---|---|---|
| CO2 SIEMENS ULTRAMAT 6 E/N 173 | Nondispersive Infrared(NDIR) | Apr 28, 2016 |
| O2 FS, SIEMENS OXYMAT 6 E/N 182 | Paramagnetic | May 17, 2016 |

**Triad Data Available Upon Request**

**Approved for Release**

Airgas

**Airgas USA, LLC**
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

# CERTIFICATE OF ANALYSIS
## Grade of Product: EPA Protocol

| | | | |
|---|---|---|---|
| Customer: | MONTROSE ENVIRONMENTAL GROUP | | |
| Part Number: | E03NI60E15A0286 | Reference Number: | 32-400717404-1 |
| Cylinder Number: | XC034406B | Cylinder Volume: | 159.6 CF |
| Laboratory: | MIC - Royal Oak-32 (SAP) - MI | Cylinder Pressure: | 2015 PSIG |
| PGVP Number: | B62016 | Valve Outlet: | 590 |
| Gas Code: | CO2,O2,BALN | Certification Date: | May 17, 2016 |

**Expiration Date: May 17, 2024**

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

### ANALYTICAL RESULTS

| Component | Requested Concentration | Actual Concentration | Protocol Method | Total Relative Uncertainty | Assay Dates |
|---|---|---|---|---|---|
| CARBON DIOXIDE | 20.00 % | 19.79 % | G1 | +/- 1.1% NIST Traceable | 05/17/2016 |
| OXYGEN | 20.00 % | 20.03 % | G1 | +/- 1.0% NIST Traceable | 05/17/2016 |
| NITROGEN | Balance | | | | |

### CALIBRATION STANDARDS

| Type | Lot ID | Cylinder No | Concentration | Uncertainty | Expiration Date |
|---|---|---|---|---|---|
| NTRM | 13060812 | CC416634 | 24.04 % CARBON DIOXIDE/NITROGEN | +/- 0.6% | May 16, 2019 |
| NTRM | 09061422 | CC273738 | 22.53 % OXYGEN/NITROGEN | +/-0.4% | Mar 08, 2019 |

### ANALYTICAL EQUIPMENT

| Instrument/Make/Model | Analytical Principle | Last Multipoint Calibration |
|---|---|---|
| CO2 SIEMENS ULTRAMAT 6 E/N 173 | Nondispersive Infrared(NDIR) | Apr 28, 2016 |
| O2 FS, SIEMENS OXYMAT 6 E/N 182 | Paramagnetic | May 17, 2016 |

**Triad Data Available Upon Request**

**Approved for Release**

Airgas

**Airgas, Inc.**
600 Union Landing Road
Cinnaminson, NJ 08077
856-829-7878 Fax: 856-829-6576
Airgas.com

# CERTIFICATE OF ANALYSIS

## Grade of Product: PRIMARY STANDARD

| | | | |
|---|---|---|---|
| Part Number: | X03NI99P15A00B1 | Reference Number: | 82-124518003-1 |
| Cylinder Number: | CC222025 | Cylinder Volume: | 144.0 CF |
| Laboratory: | ASG - Riverton - NJ | Cylinder Pressure: | 2000 PSIG |
| Analysis Date: | Nov 03, 2015 | Valve Outlet: | 330 |
| Lot Number: | 82-124518003-1 | | |

Primary Standard Gas Mixtures are traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

## ANALYTICAL RESULTS

| Component | Req Conc | Actual Concentration (Mole %) | Analytical Uncertainty |
|---|---|---|---|
| SULFUR HEXAFLUORIDE | 5.000 PPM | 5.229 PPM | +/- 1% |
| HYDROGEN CHLORIDE | 45.00 PPM | 44.63 PPM | +/- 2% |
| NITROGEN | Balance | | |

Approved for Release

# This page intentionally left blank

| Montrose Minimum Detection Limits for FTIR Compounds | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Exhaust Stack |
| **Date** | Nov. 1, 2016 | **Analyte** | HCL, HF, HCN |

| Scan | Date | Time | HF ($ppm_{wv}$) | HCN ($ppm_{wv}$) |
|---|---|---|---|---|
| 3 | 10/12/2016 | 11:23:35 AM | 0.046 | -0.293 |
| 4 | 10/12/2016 | 11:24:35 AM | 0.047 | -0.547 |
| 5 | 10/12/2016 | 11:25:34AM | 0.048 | -0.112 |
| 6 | 10/12/2016 | 11:26:34 AM | 0.048 | -0.202 |
| 7 | 10/12/2016 | 11:27:33 AM | 0.048 | -0.248 |
| 8 | 10/12/2016 | 11:28:33 AM | 0.045 | -0.279 |
| 9 | 10/12/2016 | 11:29:33 AM | 0.049 | -0.224 |
| Averages | | | 0.047 | -0.272 |
| Standard Deviation | | | 0.001 | 0.135 |
| Calculated MDL (3 x SD, or average) | | | 0.047 | 0.41 |
| MDL Used | | | 0.047 | 0.41 |

| Montrose Raw Spike Recovery Data | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Exhaust Stack |
| **Date** | Nov. 1, 2016 | **Analyte** | HCl |

| Data Point | Scan # | Date | Time | Analyte, Direct (ppmwv) | SF6, Direct (ppmwv) |
|---|---|---|---|---|---|
| 1 | 88 | 10/12/2016 | 11:44:36 AM | 42.84 | 5.20 |
| 2 | 89 | 10/12/2016 | 11:44:51 AM | 42.94 | 5.20 |
| 3 | 90 | 10/12/2016 | 11:45:06 AM | 42.77 | 5.20 |
| 4 | 91 | 10/12/2016 | 11:45:21 AM | 42.80 | 5.22 |
| 5 | 92 | 10/12/2016 | 11:45:36 AM | 42.87 | 5.21 |
| **AVERAGES** | | | | **42.84** | **5.21** |

| Data Point | Scan # | Date | Time | Analyte, Native (ppmwv) | Scan # | Date | Time | Analyte, Spiked (ppmwv) | $SF_6$, Spiked (ppmwv) |
|---|---|---|---|---|---|---|---|---|---|
| **SPIKE 1** | | | | | | | | | |
| 1 | 125 | 10/12/2016 | 12:04:23 PM | -0.06 | 176 | 10/12/2016 | 12:24:37PM | 3.36 | 0.48 |
| 2 | 126 | 10/12/2016 | 12:04:39 PM | -0.11 | 177 | 10/12/2016 | 12:24:52 PM | 3.42 | 0.47 |
| 3 | 127 | 10/12/2016 | 12:04:54 PM | -0.13 | 178 | 10/12/2016 | 12:25:07 PM | 3.43 | 0.47 |
| 4 | 128 | 10/12/2016 | 12:05:09 PM | 0.03 | 179 | 10/12/2016 | 12:25:22 PM | 3.32 | 0.47 |
| 5 | 129 | 10/12/2016 | 12:05:24 PM | -0.11 | 180 | 10/12/2016 | 12:25:37 PM | 3.34 | 0.47 |
| **AVERAGES** | | | | **-0.08** | | | | **3.37** | **0.472** |

# FTIR Spike Recovery Check

| | |
|---|---|
| **Client** | ArcelorMittal |
| **Project No** | 16-167 |
| **Plant** | Monessen, PA |
| **Unit** | Pushing Baghouse |
| **Operation** | Normal |
| **Date** | Nov. 1, 2016 |
| **Tester(s)** | BC, JW, TM, CB |

| Calibration Gas | Conc. | Tank ID | Conc. Units | Response Time (sec) |
|---|---|---|---|---|
| **HCl** | 44.63 | CC222025 | ppmdv | 300 |
| **$SF_6$** | 5.229 | | ppmdv | |

| **Spike 1** | | | **% of Standard** | **Pass/Fail** |
|---|---|---|---|---|
| Direct Ethylene Standard Concentration | $ppm_{wv}$ | 42.84 | 96% | Pass |
| Direct $SF_6$ Standard Concentration | $ppm_{wv}$ | 5.207 | 100% | Pass |
| Native Concentration of Analyte | $ppm_{wv}$ | -0.08 | | |
| Concentration of SF6, Spiked | $ppm_{wv}$ | 0.472 | | |
| Concentration of Analyte, Spiked | $ppm_{wv}$ | 3.37 | | |
| Dilution factor (%) | | 9.06 | $\leq 10\%$ | Pass |
| Predicted Spiked Analyte Concentration | | 3.81 | | |
| Spike Recovery (%) | | 88.60 | $70 \leq \% \leq 130$ | Pass |

| Montrose Raw Spike Recovery Data | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Exhaust Stack |
| **Date** | Nov. 1, 2016 | **Analyte** | HCN |

| Data Point | Scan # | Date | Time | Analyte, Direct (ppmwv) | SF6, Direct (ppmwv) |
|---|---|---|---|---|---|
| 1 | 104 | 10/12/2016 | 11:57:25 AM | 95.27 | 5.06 |
| 2 | 105 | 10/12/2016 | 11:57:40 AM | 95.30 | 5.06 |
| 3 | 106 | 10/12/2016 | 11:57:54 AM | 95.27 | 5.06 |
| 4 | 107 | 10/12/2016 | 11:58:09 AM | 95.37 | 5.05 |
| 5 | 108 | 10/12/2016 | 11:58:24 AM | 95.27 | 5.05 |
| **AVERAGES** | | | | **95.29** | **5.06** |

| Data Point | Scan # | Date | Time | Analyte, Native (ppmwv) | Scan # | Date | Time | Analyte, Spiked (ppmwv) | $SF_6$, Spiked (ppmwv) |
|---|---|---|---|---|---|---|---|---|---|
| **SPIKE 1** | | | | | | | | | |
| 1 | 194 | 10/12/2016 | 12:36:32 PM | -0.12 | 213 | 10/12/2016 | 12:51:20 PM | 7.07 | 0.41 |
| 2 | 195 | 10/12/2016 | 12:36:46 PM | -0.15 | 214 | 10/12/2016 | 12:51:34 PM | 7.09 | 0.41 |
| 3 | 196 | 10/12/2016 | 12:37:01 PM | -0.22 | 215 | 10/12/2016 | 12:51:49 PM | 7.14 | 0.41 |
| 4 | 197 | 10/12/2016 | 12:37:16 PM | -0.15 | 216 | 10/12/2016 | 12:52:04 PM | 6.89 | 0.41 |
| 5 | 198 | 10/12/2016 | 12:37:31 PM | -0.16 | 217 | 10/12/2016 | 12:52:19 PM | 7.06 | 0.41 |
| **AVERAGES** | | | | **-0.16** | | | | **7.05** | **0.413** |

# FTIR Spike Recovery Check

| | |
|---|---|
| **Client** | ArcelorMittal |
| **Project No** | 16-167 |
| **Plant** | Monessen, PA |
| **Unit** | Pushing Baghouse |
| **Operation** | Normal |
| **Date** | Nov. 1, 2016 |
| **Tester(s)** | BC, JW, TM, CB |

| **Calibration Gas** | **Conc.** | **Tank ID** | **Conc. Units** | **Response Time (sec)** |
|---|---|---|---|---|
| **HCN** | 100.10 | EB0074795 | ppmdv | 50 |
| **$SF_6$** | 5.04 | | ppmdv | |

| **Spike 1** | | | **% of Standard** | **Pass/Fail** |
|---|---|---|---|---|
| Direct Hydrogen Cyanide Concentration | $ppm_{wv}$ | 95.29 | 95% | Pass |
| Direct $SF_6$ Concentration | $ppm_{wv}$ | 5.056 | 100% | Pass |
| Native Concentration of Analyte | $ppm_{wv}$ | -0.16 | | |
| Concentration of SF6, Spiked | $ppm_{wv}$ | 0.413 | | |
| Concentration of Analyte, Spiked | $ppm_{wv}$ | 7.05 | | |
| | | | **Allowable** | |
| Dilution factor (%) | | 8.18 | $\leq 10\%$ | Pass |
| Predicted Spiked Analyte Concentration | | 7.65 | | |
| Spike Recovery (%) | | 92.20 | $70 \leq \% \leq 130$ | Pass |

| Montrose Raw CTS Data | | | |
|---|---|---|---|
| **Client** | ArcelorMittal | **Unit** | Pushing Baghouse |
| **Project No** | 16-167 | **Operation** | Normal |
| **Plant** | Monessen, PA | **Location** | Exhaust Stack |
| **Date** | Nov. 1, 2016 | **Analyte** | HCN |

| Data Point | Date | Time | Analyte,Calibration Gas (ppmwv) |
|---|---|---|---|
| **Pre Test Internal** | | | |
| 1 | 10/12/2016 | 11:57:25 AM | 95.27 |
| 2 | 10/12/2016 | 11:57:40 AM | 95.30 |
| 3 | 10/12/2016 | 11:57:54 AM | 95.27 |
| 4 | 10/12/2016 | 11:58:09 AM | 95.37 |
| 5 | 10/12/2016 | 11:58:24 AM | 95.27 |
| **AVERAGES** | | | **95.29** |
| **Pre Test External** | | | |
| 1 | 11/1/2016 | 2:01:16 PM | 94.29 |
| 2 | 11/1/2016 | 2:02:16 PM | 94.56 |
| 3 | 11/1/2016 | 2:03:16 PM | 94.71 |
| **AVERAGES** | | | **94.52** |
| **Post Test 1 External** | | | |
| 1 | 11/2/2016 | 7:45:33 AM | 94.80 |
| 2 | 11/2/2016 | 7:46:33 AM | 95.03 |
| 3 | 11/2/2016 | 7:47:33 AM | 94.96 |
| **AVERAGES** | | | **94.93** |
| **Post Test 2 External** | | | |
| 1 | 11/2/2016 | 7:22:28 PM | 94.79 |
| 2 | 11/2/2016 | 7:23:28 PM | 94.95 |
| 3 | 11/2/2016 | 7:24:28 PM | 94.86 |
| **AVERAGES** | | | **94.87** |
| **Post Test 3 External** | | | |
| 1 | 11/3/2016 | 10:44:25 AM | 95.24 |
| 2 | 11/3/2016 | 10:45:24 AM | 95.12 |
| 3 | 11/3/2016 | 10:46:23 AM | 95.35 |
| **AVERAGES** | | | **95.23** |

## Montrose FTIR Stability Check Data (Calibration Transfer Standard - CTS)

| | |
|---|---|
| **Client** | ArcelorMittal |
| **Project No** | 16-167 |
| **Plant** | Monessen, PA |
| **Unit** | Pushing Baghouse |
| **Operation** | Normal |
| **Tester(s)** | Nov. 1, 2016 |
| **Date** | BC, JW, TM, CB |

| Calibration Transfer Standard Gas | Concentration | Concentration Units | Tank ID |
|---|---|---|---|
| HCN | 100.10 | $ppm_{dv}$ | EB0074795 |
| SF6 | 5.04 | $ppm_{dv}$ | |

| | CTS Concentration of Analyte ($ppm_{dv}$) | Difference From Cylinder Value (%) | Pass/Fail |
|---|---|---|---|
| **Internal** | 95.29 | -4.80 | Pass |
| | **CTS Concentration of Analyte ($ppm_{dv}$)** | **Difference From Direct Value (%)** | **Pass/Fail** |
| **External** | 94.52 | -0.81 | Pass |
| **Post Run 1** | 94.93 | -0.38 | Pass |
| **Post Run 2** | 94.87 | -0.45 | Pass |
| **Post Run 3** | 95.23 | -0.06 | Pass |
| | | Allowable +/- 5% | |

# This page intentionally left blank

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## WILLIAM P. COWELL

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS***

ISSUED THIS 7TH DAY OF JANUARY 2014 AND EFFECTIVE UNTIL JANUARY 6TH, 2019

*Peter R. Westlip, QSTI/QSTO Review Board*

*Peter S. Pakalnis, QSTI/QSTO Review Board*

*Theresa Lowe, QSTI/QSTO Review Board*

*C. David Bagwell, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills , QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

APPLICATION NO. 2009-336

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## WILLIAM P. COWELL

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS***

ISSUED THIS 7TH DAY OF JANUARY 2014 AND EFFECTIVE UNTIL JANUARY 6TH, 2019

*Peter R. Westlin, QSTI/QSTO Review Board*

*Peter S. Pakalnis, QSTI/QSTO Review Board*

*Theresa Lowe, QSTI/QSTO Review Board*

*C. David Bagwell, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills , QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

APPLICATION NO. 2009-336

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## JOSHUA S. VARNER

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS***

ISSUED THIS 12TH DAY OF FEBRUARY 2013 AND EFFECTIVE UNTIL FEBRUARY 11TH, 2018

*Peter R. Westlin, QSTI/QSTO Review Board*

*C. David Bagwell, QSTI/QSTO Review Board*

*Peter S. Pakalnis, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills , QSTI/QSTO Review Board*

*LeRoy Owens, QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

**APPLICATION NO. 2008-173**

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## JOSHUA S. VARNER

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS***

ISSUED THIS 12TH DAY OF FEBRUARY 2013 AND EFFECTIVE UNTIL FEBRUARY 11TH, 2018

*Peter R. Westlin, QSTI/QSTO Review Board*

*Peter S. Pakalnis, QSTI/QSTO Review Board*

*LeRoy Owens, QSTI/QSTO Review Board*

*C. David Bagwell, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills, QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

**APPLICATION NO. 2008-173**

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## JOHN E. WILSON

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS***

ISSUED THIS 20TH DAY OF MARCH 2013 AND EFFECTIVE UNTIL MARCH 19TH, 2018

*Peter R. Westlin, QSTI/QSTO Review Board*

*Peter S. Pakalnis, QSTI/QSTO Review Board*

*C. David Barnwell, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills , QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

**APPLICATION NO. 2013-768**

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## JOHN E. WILSON

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS***

ISSUED THIS 20TH DAY OF MARCH 2013 AND EFFECTIVE UNTIL MARCH 19TH, 2018

*Peter R. Westlin, QSTI/QSTO Review Board*

*Peter S. Pakainis, QSTI/QSTO Review Board*

*C. David Bagwell, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills , QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

**APPLICATION NO. 2013-768**

# SOURCE EVALUATION SOCIETY

## Qualified Source Testing Individual

LET IT BE KNOWN THAT

## JOHN E. WILSON

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

***HAZARDOUS METALS MEASUREMENT SAMPLING METHODS***

ISSUED THIS 20TH DAY OF MARCH 2013 AND EFFECTIVE UNTIL MARCH 19TH, 2018

*Peter R. Westlin, QSTI/QSTO Review Board*

*Peter S. Pakalnis, QSTI/QSTO Review Board*

*C. David Bagwell, QSTI/QSTO Review Board*

*Karen D. Kajiya-Mills , QSTI/QSTO Review Board*

*Glenn C. England, QSTI/QSTO Review Board*

**APPLICATION NO. 2013-768**

OPACITAIR

OpacitAir Smoke School, LLC

certifies that

**CHRISTOPHER BURKOVICH of MONTROSE AIR QUALITY SERVICES**

Has met all of the requirements of EPA Reference Method 9 & 22

and is qualified as a Visible Emissions Observer.

Date: AUGUST 22 ,2016

Valid for 6 months after above date.

James Hudson

James Hudson, President

© 2015 Great Papers

# REPORT - APPENDIX E

## Sample Calculations

# Method 5

**Montrose SAMPLE CALCULATIONS**
**Particulate Matter Test Results**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**October 28, 2016**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | ml | Tstandard | 68 | F |
| Vi | 0.0 | ml | Pstandard | 760 | mm Hg |
| Wf | 4,319.4 | g | K1method 4 | 0.04707 | scf/ml |
| Wi | 4,282.9 | g | K2method 4 | 0.04715 | scf/g |
| Vm | 118.341 | 0.000 | K1method 5 | 17.64 | R/in. Hg |
| Vm | 0.000 | 0.000 | K4method 5 | 0.0945 | |
| Yd | 1.0030 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.34 | in. Hg | Kp | 85.49 | |
| dHavg | 3.24 | in. H2O | | | |
| Tm | 61.9 | F | $\pi$ | 3.141593 | |
| O2 | 20.03 | % dv | Ds (or L) | 72.00 | inches |
| CO2 | 0.90 | % dv | Stack Width (W) | 0.00 | inches |
| Pg | 0.10 | in. H2O | Dn | 0.255 | inches |
| Cp | 0.84 | | Time | 120 | minutes |
| $(dP)^{1/2}$avg | 0.864 | in. H2O^1/2 | Tsavg | 126.8 | F |
| $F_d$ | NA | dscf/MMBtu | | | |
| Push Duration | 2.5 | minutes/push | | | |
| Push Frequency | 3.54 | pushes/hour | | | |

**Particulate Data**

| | | |
|---|---|---|
| Acetone Wash Volume (Vaw) | 100 | ml |
| Acetone Wash Weight Gain | 5.3 | mg |
| Front Half Filter Particulate | 2.6 | mg |

1. Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

| | | |
|---|---|---|
| K1method 4= | 0.04707 | scf/ml |
| Vf= | 0.0 | ml |
| Vi= | 0.0 | ml |
| Vwc(std)= | 0.000 | scf |

2. Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

| | | |
|---|---|---|
| K2method 4= | 0.04715 | scf/g |
| Wf= | 4,319.4 | g |
| Wi= | 4,282.9 | g |
| Vwsg(std)= | 1.721 | scf |

3. Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

| | | |
|---|---|---|
| Vwc(std)= | 0.000 | scf |
| Vwsg(std)= | 1.721 | scf |
| Vw(std)= | 1.721 | scf |

4. Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

| | | |
|---|---|---|
| Volume metered in dacf= | 118.341 | 0.000 |
| Volume metered in dry actual liters= | 0.000 | 0.000 |
| Vm= | 118.341 dacf | |

$Vm(m^3)$ = Vm * (1 $m^3$ / 35.3145 cf)

| | |
|---|---|
| Vm= | 118.341 dacf |
| $Vm(m^3)$= | 3.351 dacm |

5. Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

| | |
|---|---|
| K1method 5= | 17.64 R/in. Hg |
| Vm= | 118.341 dacf |
| Yd= | 1.0030 |
| Pbar= | 29.34 in. Hg |
| dHavg= | 3.24 in. H2O |
| Tm= | 61.9 F |
| Vm(std)= | 118.652 dscf |

$Vm(std)m^3$ = Vm(std) * (1 $m^3$ / 35.3145 cf)

| | |
|---|---|
| Vm(std)= | 118.652 dscf |
| $Vm(std)m^3$= | 3.360 dscm |

6. Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

| | |
|---|---|
| Tsavg= | 126.8 F |
| T= | 586.5 R |
| C8= | -1.044040E+04 |
| C9= | -1.1294650E+01 |
| C10= | -2.702236E-02 |
| C11= | 1.289036E-05 |
| C12= | -2.478068E-09 |
| C13= | 6.545967E+00 |
| $SP_{H2O@Tsavg}$= | 4.16 in. Hg |
| Ps= | 29.35 in. Hg |
| Bws= | 0.1418 vol. fraction |

Bws = Vw(std) / (Vm(std) + Vw(std))

| | |
|---|---|
| Vw(std)= | 1.721 scf |
| Vm(std)= | 118.652 dscf |
| Bws= | 0.0143 vol. fraction |
| Bws used= | 0.0143 vol. fraction |

7. Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | |
|---|---|
| CO2= | 0.90 % dv |
| O2= | 20.03 % dv |
| CO + N2= | 79.07 % dv |

8. Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.90 | % dv |
| O2= | 20.03 | % dv |
| CO + N2= | 79.07 | % dv |
| Md= | 28.95 | lb/lb-mole |

9. Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

| | | |
|---|---|---|
| Md= | 28.95 | lb/lb-mole |
| Bws= | 0.0143 | vol. fraction |
| Ms= | 28.79 | lb/lb-mole |

10. Stack Pressure

Ps = Pbar + Pg/13.6

| | | |
|---|---|---|
| Pbar= | 29.34 | in. Hg |
| Pg= | 0.10 | in. H2O |
| Ps= | 29.35 | in. Hg |

11. Average Stack Gas Velocity

Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2

| | | |
|---|---|---|
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8641 | in. H2O^1/2 |
| Tsavg= | 126.8 | F |
| Ps= | 29.35 | in. Hg |
| Ms= | 28.79 | lb/lb-mole |
| Vs= | 51.72 | ft/s |

12. Area of the Stack

If W = 0, the stack is circular.

Circular

As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2

| | | |
|---|---|---|
| PI= | 3.1416 | |
| Ds= | 72.00 | inches |
| As= | 28.27 | ft2 |

Rectangular

As = L * W * (1 ft / 12 in.)^2

| | | |
|---|---|---|
| L= | 0.00 | inches |
| W= | 0.00 | inches |
| As= | 0.00 | ft2 |

13. Stack Gas Flow Rate, Actual

Qacfm = Vs * As * 60

| | | |
|---|---|---|
| Vs= | 51.72 | ft/s |
| As= | 28.27 | ft2 |
| Qacfm= | 87,735 | acfm |

Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Qacfm= | 87,735 | acfm |
| Qacm/min= | 2,484 | acm/min |

14. Stack Gas Flow Rate, Standard

Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard)

| | | |
|---|---|---|
| Qacfm= | 87,735 | acfm |
| Tstandard= | 68 | F |
| Tsavg= | 126.8 | F |
| Ps= | 29.35 | in. Hg |
| Pstandard= | 29.92 | in. Hg |
| Qscfm= | 77,429 | scfm |

Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Qscfm= | 77,429 | scfm |
| Qscm/min= | 2,193 | scm/min |

15. Stack Gas Flow Rate, Dry Standard

Qdscfm = Qscfm * (1 - Bws)

| | | |
|---|---|---|
| Qscfm= | 77,429 | scfm |
| Bws= | 0.0143 | vol. fraction |
| Qdscfm= | 76,322 | dscfm |

Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Qdscfm= | 76,322 | dscfm |
| Qdscm/min= | 2,161 | dscm/min |

16. Area of the Nozzle

An = PI * (Dn)^2 / 4 * (1 ft / 12 in.)^2

| | | |
|---|---|---|
| PI= | 3.141593 | |
| Dn= | 0.255 | inches |
| An= | 0.000355 | ft2 |

17. Percent Isokinetic

I = K4method 5 * (Tsavg + 460) * Vm(std) / ( Ps * Vs * An * Theta * (1 - Bws) )

| | | |
|---|---|---|
| K4method5= | 0.0945 | |
| Tsavg= | 126.8 | F |
| Vm(std)= | 118.652 | dscf |
| Ps= | 29.35 | in. Hg |
| Vs= | 51.72 | ft/s |
| An= | 0.000355 | ft2 |
| Theta= | 120 | minutes |
| Bws= | 0.0143 | vol. fraction |
| I= | 103.34 | % |

18. Total Weight of Particulate

$m_n$ = acetone wash weight gain - Wa + condensible + filter weight gain

| | | | |
|---|---|---|---|
| Acetone wash weight gain - Wa= | 5.3000 | mg | With a minimum allowable value of 0 |
| Filter weight gain= | 2.6000 | mg | With a minimum allowable value of 0 |
| $m_n$= | 7.9000 | mg | |

19. Emission Concentration (mg/DSCM)

Particulate(gr/dscf) = ($m_n$ / Vm(std))

| | | |
|---|---|---|
| $m_n$= | 7.9000 | mg |
| Vm(std)= | 3.360 | dscm |
| Particulate(mg/dscm)= | 2.35 | mg/dscm |

20. Emission Rate (lb/hr)

Particulate(lb/hr) = Particulate(mg/dscm) * Qdscm/min * (Push Duration*Push Frequency) * (1lb/453593 mg)

| | | |
|---|---|---|
| Particulate(mg/dscm)= | 2.35 | mg/dscm |
| Qdscfm= | 2,161 | dscm/min |
| Push Duration= | 2.5 | minutes/push |
| Push Frequency= | 3.54 | pushes/hour |
| Particulate(lb/hr)= | 0.099 | lb/hr |

# Method 29

**Montrose SAMPLE CALCULATIONS**
**Metals Testing Results**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**October 28, 2016**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | ml | Tstandard | 68 | F |
| Vi | 0.0 | ml | Pstandard | 760 | mm Hg |
| Wf | 4,319.4 | g | K1method 4 | 0.04707 | scf/ml |
| Wi | 4,282.9 | g | K2method 4 | 0.04715 | scf/g |
| | 118.341 | dacf | K1method 5 | 17.64 | R/in. Hg |
| | 0.000 | dry actual liters | K4method 5 | 0.0945 | |
| Yd | 1.0030 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.34 | in. Hg | Kp | 85.49 | |
| dHavg | 3.24 | in. H2O | | | |
| Tm | 61.9 | F | π | 3.141593 | |
| O2 | 20.03 | % dv | Ds (or L) | 72.00 | inches |
| CO2 | 0.90 | % dv | Stack Width (W) | 0.00 | inches |
| Pg | 0.10 | in. H2O | Dn | 0.255 | inches |
| Cp | 0.84 | | Time | 120 | minutes |
| $(dP)^{1/2}$avg | 0.864 | in. H2O^1/2 | Tsavg | 126.8 | F |
| $F_d$ | NA | dscf/MMBtu | Pushing Frequency | 3.54 | pushes/hour |
| | | | Push Duration | 2.50 | minutes/push |

Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

| | | |
|---|---|---|
| K1method 4= | 0.04707 | scf/ml |
| Vf= | 0.0 | ml |
| Vi= | 0.0 | ml |
| Vwc(std)= | 0.000 | scf |

Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

| | | |
|---|---|---|
| K2method 4= | 0.04715 | scf/g |
| Wf= | 4,319.4 | g |
| Wi= | 4,282.9 | g |
| Vwsg(std)= | 1.721 | scf |

Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

| | | |
|---|---|---|
| Vwc(std)= | 0.000 | scf |
| Vwsg(std)= | 1.721 | scf |
| Vw(std)= | 1.721 | scf |

Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

| | | |
|---|---|---|
| Volume metered in dacf= | 118.341 | dacf |
| Volume metered in dry actual liters= | 0.000 | dry actual liters |
| Vm= | 118.341 | dacf |

$Vm(m^3)$ = Vm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Vm= | 118.341 | dacf |
| $Vm(m^3)$= | 3.351 | dacm |

Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

| | | |
|---|---|---|
| K1method 5= | 17.64 | R/in. Hg |
| Vm= | 118.341 | dacf |
| Yd= | 1.0030 | |
| Pbar= | 29.34 | in. Hg |
| dHavg= | 3.24 | in. H2O |
| Tm= | 61.9 | F |
| Vm(std)= | 118.652 | dscf |

$Vm(std)m^3 = Vm(std) * (1\ m^3 / 35.3145\ cf)$

| | | |
|---|---|---|
| Vm(std)= | 118.652 | dscf |
| $Vm(std)m^3$= | 3.360 | dscm |

Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

| | | |
|---|---|---|
| Tsavg= | 126.8 | F |
| T= | 586.5 | R |
| C8= | -1.044040E+04 | |
| C9= | -1.1294650E+01 | |
| C10= | -2.702236E-02 | |
| C11= | 1.289036E-05 | |
| C12= | -2.478068E-09 | |
| C13= | 6.545967E+00 | |
| $SP_{H2O@Tsavg}$= | 4.16 | in. Hg |
| Ps= | 29.35 | in. Hg |
| Bws= | 0.1418 | vol. fraction |

Bws = Vw(std) / (Vm(std) + Vw(std))

| | | |
|---|---|---|
| Vw(std)= | 1.721 | scf |
| Vm(std)= | 118.652 | dscf |
| Bws= | 0.0143 | vol. fraction |
| Bws used= | 0.0143 | vol. fraction |

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | | |
|---|---|---|
| CO2= | 0.90 | % dv |
| O2= | 20.03 | % dv |
| CO + N2= | 79.07 | % dv |

Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.90 | % dv |
| O2= | 20.03 | % dv |
| CO + N2= | 79.07 | % dv |
| Md= | 28.95 | lb/lb-mole |

Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

| | | |
|---|---|---|
| Md= | 28.95 | lb/lb-mole |
| Bws= | 0.0143 | vol. fraction |
| Ms= | 28.79 | lb/lb-mole |

Stack Pressure

Ps = Pbar + Pg/13.6

| | | |
|---|---|---|
| Pbar= | 29.34 | in. Hg |
| Pg= | 0.10 | in. H2O |
| Ps= | 29.35 | in. Hg |

Average Stack Gas Velocity

Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2

| | | |
|---|---|---|
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8641 | in. H2O^1/2 |
| Tsavg= | 126.8 | F |
| Ps= | 29.35 | in. Hg |
| Ms= | 28.79 | lb/lb-mole |
| Vs= | 51.72 | ft/s |

Area of the Stack

If W = 0, the stack is circular.

Circular

As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2

| | | |
|---|---|---|
| PI= | 3.141593 | |
| Ds= | 72.00 | inches |
| As= | 28.27 | ft2 |

Rectangular

As = L * W * (1 ft / 12 in.)^2

| | | |
|---|---|---|
| L= | 0.00 | inches |
| W= | 0.00 | inches |
| As= | 0.00 | ft2 |

Stack Gas Flow Rate, Actual

Qacfm = Vs * As * 60

| | | |
|---|---|---|
| Vs= | 51.72 | ft/s |
| As= | 28.27 | ft2 |
| Qacfm= | 87,735 | acfm |

Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Qacfm= | 87,735 | acfm |
| Qacm/min= | 2,484 | acm/min |

Stack Gas Flow Rate, Standard

Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard)

| | | |
|---|---|---|
| Qacfm= | 87,735 | acfm |
| Tstandard= | 68 | F |
| Tsavg= | 126.8 | F |
| Ps= | 29.35 | in. Hg |
| Pstandard= | 29.92 | in. Hg |
| Qscfm= | 77,429 | scfm |

Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Qscfm= | 77,429 | scfm |
| Qscm/min= | 2,193 | scm/min |

Stack Gas Flow Rate, Dry Standard

Qdscfm = Qscfm * (1 - Bws)

| | | |
|---|---|---|
| Qscfm= | 77,429 | scfm |
| Bws= | 0.0143 | vol. fraction |
| Qdscfm= | 76,322 | dscfm |

Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Qdscfm= | 76,322 | dscfm |
| Qdscm/min= | 2,161 | dscm/min |

Area of the Nozzle

An = PI * (Dn)^2 / 4 * (1 ft / 12 in.)^2

| | | |
|---|---|---|
| PI= | 3.141593 | |
| Dn= | 0.255 | inches |
| An= | 0.000355 | ft2 |

Percent Isokinetic

I = K4method 5 * (Tsavg + 460) * Vm(std) / ( Ps * Vs * An * Theta * (1 - Bws) )

| | | |
|---|---|---|
| K4method5= | 0.0945 | |
| Tsavg= | 126.8 | F |
| Vm(std)= | 118.652 | dscf |
| Ps= | 29.35 | in. Hg |
| Vs= | 51.72 | ft/s |
| An= | 0.000355 | ft2 |
| Theta= | 120 | minutes |
| Bws= | 0.0143 | vol. fraction |
| I= | 103.34 | % |

18. Mercury Emission Concentration - Fraction 1B (mg/DSCM)

EC=(Emission mass 1B)/Vmstd/1000 (ug/mg)

| | | |
|---|---|---|
| Emission Mass= | 0.165 | ug |
| Vm(std)$m^3$= | 3.360 | dscm |
| EC= | 4.91E-05 | mg/dscm |

19. Mercury Emission Rate (lb/hr)

E=(EC)* Qdscm/min *(Pushing Frequency*Push Duration)*(1 lb/453593 mg)

| | | |
|---|---|---|
| EC= | 4.91E-05 | mg/dscm |
| Qdscm/min= | 2,161 | dscm/min |
| Pushing Rate= | 3.54 | pushes/hour |
| Push Duration | 2.50 | minutes/push |
| E= | 2.07E-06 | lb/hr |

# Methods 0010/23

**ACCI SAMPLE CALCULATIONS**
**Semi-vols Test Results**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | ml | Tstandard | 68 | F |
| Vi | 0.0 | ml | Pstandard | 760 | mm Hg |
| Wf | 3,196.2 | g | K1method 4 | 0.04706 | scf/ml |
| Wi | 3,143.1 | g | K2method 4 | 0.04715 | scf/g |
| Vm | 151.667 | dacf | K1method 5 | 17.64 | R/in. Hg |
| Vm | 0.000 | dry actual liters | K4method 5 | 0.0945 | |
| Yd | 1.003 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.44 | in. Hg | Kp | 85.49 | |
| dHavg | 2.05 | in. H2O | $p_a$ | 0.0 | 0 |
| Tm | 62.5 | F | $\pi$ | 3.141593 | |
| O2 | 19.86 | % dv | Ds (or L) | 72.00 | inches |
| CO2 | 0.93 | % dv | Stack Width (W) | 0.00 | inches |
| Pg | 0.10 | in. H2O | Dn | 0.255 | inches |
| Cp | 0.84 | | Time | 180 | minutes |
| $(dP)^{1/2}$avg | 0.828 | in. H2O^1/2 | Tsavg | 115.6 | F |
| $F_d$ | 0 | dscf/MMBtu | | | |
| TEF Adjusted Total | 3.20 | ng | 12378-PeCDD | 0.5 | TEF |
| Push Duration | 2.50 | minutes/push | | | |
| Push Frequency | 3.31 | pushes/hour | | | |

Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

| | | |
|---|---|---|
| K1method 4= | 0.04706 | scf/ml |
| Vf= | 0.0 | ml |
| Vi= | 0.0 | ml |
| Vwc(std)= | 0.000 | scf |

Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

| | | |
|---|---|---|
| K2method 4= | 0.04715 | scf/g |
| Wf= | 3,196.2 | g |
| Wi= | 3,143.1 | g |
| Vwsg(std)= | 2.504 | scf |

Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

| | | |
|---|---|---|
| Vwc(std)= | 0.000 | scf |
| Vwsg(std)= | 2.504 | scf |
| Vw(std)= | 2.504 | scf |

Volume of Gas Metered

Vm = Volume metered in dacf + Volume metered in dry actual liters * (1 cf / 28.317 liters)

| | | |
|---|---|---|
| Volume metered in dacf= | 151.667 | dacf |
| Volume metered in dry actual liters= | 0.000 | dry actual liters |
| Vm= | 151.667 | dacf |

$Vm(m^3)$ = Vm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Vm= | 151.667 | dacf |
| $Vm(m^3)$= | 4.295 | dacm |

Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

| | | |
|---|---|---|
| K1method 5= | 17.64 | R/in. Hg |
| Vm= | 151.667 | dacf |
| Yd= | 1.0030 | |
| Pbar= | 29.44 | in. Hg |
| dHavg= | 2.05 | in. H2O |
| Tm= | 62.5 | F |
| Vm(std)= | 151.974 | dscf |

$Vm(std)m^3 = Vm(std) * (1\ m^3 / 35.3145\ cf)$

| | | |
|---|---|---|
| Vm(std)= | 151.974 | dscf |
| $Vm(std)m^3$= | 4.303 | dscm |

Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

| | | |
|---|---|---|
| Tsavg= | 115.6 | F |
| T= | 575.3 | R |
| C8= | -1.044040E+04 | |
| C9= | -1.1294650E+01 | |
| C10= | -2.702236E-02 | |
| C11= | 1.289036E-05 | |
| C12= | -2.478068E-09 | |
| C13= | 6.545967E+00 | |
| $SP_{H2O@Tsavg}$= | 3.05 | in. Hg |
| Ps= | 29.45 | in. Hg |
| Bws= | 0.1036 | vol. fraction |

Bws = Vw(std) / (Vm(std) + Vw(std))

| | | |
|---|---|---|
| Vw(std)= | 2.504 | scf |
| Vm(std)= | 151.974 | dscf |
| Bws= | 0.0162 | vol. fraction |
| Bws used= | 0.0162 | vol. fraction |

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | | |
|---|---|---|
| CO2= | 0.93 | % dv |
| O2= | 19.86 | % dv |
| CO + N2= | 79.21 | % dv |

Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.93 | % dv |
| O2= | 19.86 | % dv |
| CO + N2= | 79.21 | % dv |
| Md= | 28.94 | lb/lb-mole |

Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

| | | |
|---|---|---|
| Md= | 28.94 | lb/lb-mole |
| Bws= | 0.0162 | vol. fraction |
| Ms= | 28.77 | lb/lb-mole |

Stack Pressure

| | | |
|---|---|---|
| Ps = Pbar + Pg/13.6 | | |
| Pbar= | 29.44 | in. Hg |
| Pg= | 0.10 | in. H2O |
| Ps= | 29.45 | in. Hg |

Average Stack Gas Velocity

| | | |
|---|---|---|
| Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2 | | |
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8277 | in. H2O^1/2 |
| Tsavg= | 115.6 | F |
| Ps= | 29.45 | in. Hg |
| Ms= | 28.77 | lb/lb-mole |
| Vs= | 48.99 | ft/s |

Area of the Stack

If W = 0, the stack is circular.

Circular

| | | |
|---|---|---|
| As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2 | | |
| PI= | 3.141593 | |
| Ds= | 72.00 | inches |
| As= | 28.27 | ft2 |

Rectangular

| | | |
|---|---|---|
| As = L * W * (1 ft / 12 in.)^2 | | |
| L= | 0.00 | inches |
| W= | 0.00 | inches |
| As= | 0.00 | ft2 |

Stack Gas Flow Rate, Actual

| | | |
|---|---|---|
| Qacfm = Vs * As * 60 | | |
| Vs= | 48.99 | ft/s |
| As= | 28.27 | ft2 |
| Qacfm= | 83,117 | acfm |
| Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf) | | |
| Qacfm= | 83,117 | acfm |
| Qacm/min= | 2,354 | acm/min |

Stack Gas Flow Rate, Standard

| | | |
|---|---|---|
| Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard) | | |
| Qacfm= | 83,117 | acfm |
| Tstandard= | 68 | F |
| Tsavg= | 115.6 | F |
| Ps= | 29.45 | in. Hg |
| Pstandard= | 29.92 | in. Hg |
| Qscfm= | 75,040 | scfm |
| Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qscfm= | 75,040 | scfm |
| Qscm/min= | 2,125 | scm/min |

Stack Gas Flow Rate, Dry Standard

| | | |
|---|---|---|
| Qdscfm = Qscfm * (1 - Bws) | | |
| Qscfm= | 75,040 | scfm |
| Bws= | 0.0162 | vol. fraction |
| Qdscfm= | 73,823 | dscfm |
| | | |
| Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qdscfm= | 73,823 | dscfm |
| Qdscm/min= | 2,090 | dscm/min |

Area of the Nozzle

| | | |
|---|---|---|
| An = PI * (Dn)^2 / 4 * (1 ft / 12 in.)^2 | | |
| PI= | 3.141593 | |
| Dn= | 0.255 | inches |
| An= | 0.000355 | ft2 |

Percent Isokinetic

| | | |
|---|---|---|
| I = K4method 5 * (Tsavg + 460) * Vm(std) / ( Ps * Vs * An * Theta * (1 - Bws) ) | | |
| K4method5= | 0.0945 | |
| Tsavg= | 115.6 | F |
| Vm(std)= | 151.974 | dscf |
| Ps= | 29.45 | in. Hg |
| Vs= | 48.99 | ft/s |
| An= | 0.000355 | ft2 |
| Theta= | 180 | minutes |
| Bws= | 0.0162 | vol. fraction |
| I= | 91.2 | % |

1,2,3,7,8-Pentachlorodibenzo-p-Dioxin TEF Adjusted Amount

| | | | |
|---|---|---|---|
| | 1,2,3,7,8-Pentachlorodibenzo-p-Dioxin Adj Amt = TEFcompound * Mass Detected * (1 ng / 1000 pg) | | |
| TEF compound | 1,2,3,7,8-PCDD = | 0.5 | TEF |
| | Mass Detected = | 3.20 | Pg |
| | PCDD/PCDF Adj Amt = | 0.0016 | ng |

PCDD/PCDF Emission Concentration (ng/m3) [1,2,3,7,8-Pentachlorodibenzo-p-Dioxin]

| | | |
|---|---|---|
| $ng/m^3$ = PCDD/PCDF Total Mass Collected /Vm(std)$m^{3/1000\ ng/ug}$ | | |
| Total Adjusted Mass Collected = | 0.0016 | ng |
| Vm(std)$m^3$ = | 4.303 | dscm |
| $ng/m^3$ | 3.72E-07 | $ug/m^3$ |

PCDD/PCDF Emission Rate (lb/hr) [1,2,3,7,8-Pentachlorodibenzo-p-Dioxin]

| | | |
|---|---|---|
| lb/hr = $ng/m^3$ * Qdscm/min * Pushing Rate * Push Frequency *2.20462e-9 ug/lb | | |
| $ng/m^3$ = | 3.72E-07 | ug/m3 |
| Qdscm/min = | 2,090 | dscm/min |
| Push Duration = | 2.50 | minutes/push |
| Push Frequency= | 3.31 | pushes/hour |
| lb/hr = | 1.42E-11 | lb/hr |

# Method 316

**ACCI SAMPLE CALCULATIONS**
**Formaldehyde Test Results**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**Nov. 1-2, 2016**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | 0 | Tstandard | 68 | F |
| Vi | 0.0 | 0 | Pstandard | 760 | mm Hg |
| Wf | 2,796.9 | ml | K1method 4 | 0.04706 | scf/ml |
| Wi | 2,769.7 | ml | K2method 4 | 0.04715 | scf/g |
| Vm | 46.103 | dacf | K1method 5 | 17.64 | R/in. Hg |
| | | | K4method 5 | 0.0945 | |
| Yd | 1.0030 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.33 | in. Hg | Kp | 85.49 | |
| dHavg | 0.44 | in. H2O | | | |
| Tm | 73.4 | F | $\pi$ | 3.141593 | |
| O2 | 20.09 | % dv | Ds (or L) | 72.00 | in. Hg |
| CO2 | 0.63 | % dv | Stack Width (W) | 0.00 | in. H2O |
| Pg | 0.11 | in. H2O | Dn | 0.155 | inches |
| Cp | 0.84 | | Time | 120 | in. H2O |
| $(dP)^{1/2}$avg | 0.860 | in. H2O^1/2 | Tsavg | 131.9 | F |
| $F_d$ | NA | dscf/MMBtu | An | 0.0001 | ft2 |
| Push Duration | 2.5 | minutes/push | | | |
| Push Frequency | 3.32 | pushes/hour | | | |

Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

| | | |
|---|---|---|
| K1method 4= | 0.04706 scf/ml | |
| Vf= | 0.0 | 0.0 |
| Vi= | 0.0 | 0.0 |
| Vwc(std)= | 0.000 scf | |

Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

| | |
|---|---|
| K2method 4= | 0.04715 scf/g |
| Wf= | 2,796.9 ml |
| Wi= | 2,769.7 ml |
| Vwsg(std)= | 1.282 scf |

Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

| | |
|---|---|
| Vwc(std)= | 0.000 scf |
| Vwsg(std)= | 1.282 scf |
| Vw(std)= | 1.282 scf |

Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

| | | | |
|---|---|---|---|
| Volume metered in dacf= | | 46.103 dacf | |
| Volume metered in dry actual liters= | | 0.000 | 0.000 |
| Vm= | 46.103 dacf | | |

$Vm(m^3)$ = Vm * (1 $m^3$ / 35.3145 cf)

| | |
|---|---|
| Vm= | 46.103 dacf |
| $Vm(m^3)$= | 1.305 dacm |

Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

| | | |
|---|---|---|
| K1method 5= | 17.64 | R/in. Hg |
| Vm= | 46.103 | dacf |
| Yd= | 1.0030 | |
| Pbar= | 29.33 | in. Hg |
| dHavg= | 0.44 | in. H2O |
| Tm= | 73.4 | F |
| Vm(std)= | 44.901 | dscf |

$Vm(std)m^3 = Vm(std) * (1\ m^3 / 35.3145\ cf)$

| | | |
|---|---|---|
| Vm(std)= | 44.901 | dscf |
| $Vm(std)m^3$= | 1.271 | dscm |

Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

| | | |
|---|---|---|
| Tsavg= | 131.9 | F |
| T= | 591.5 | R |
| C8= | -1.044040E+04 | |
| C9= | -1.1294650E+01 | |
| C10= | -2.702236E-02 | |
| C11= | 1.289036E-05 | |
| C12= | -2.478068E-09 | |
| C13= | 6.545967E+00 | |
| $SP_{H2O@Tsavg}$= | 4.76 | in. Hg |
| Ps= | 29.34 | in. Hg |
| Bws= | 0.1623 | vol. fraction |

Bws = Vw(std) / (Vm(std) + Vw(std))

| | | |
|---|---|---|
| Vw(std)= | 1.282 | scf |
| Vm(std)= | 44.901 | dscf |
| Bws= | 0.0278 | vol. fraction |
| Bws used= | 0.0278 | vol. fraction |

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | | |
|---|---|---|
| CO2= | 0.63 | % dv |
| O2= | 20.09 | % dv |
| CO + N2= | 79.28 | % dv |

Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.63 | % dv |
| O2= | 20.09 | % dv |
| CO + N2= | 79.28 | % dv |
| Md= | 28.90 | lb/lb-mole |

Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

| | | |
|---|---|---|
| Md= | 28.90 | lb/lb-mole |
| Bws= | 0.0278 | vol. fraction |
| Ms= | 28.60 | lb/lb-mole |

Stack Pressure

Ps = Pbar + Pg/13.6

| | | |
|---|---|---|
| Pbar= | 29.33 | in. Hg |
| Pg= | 0.11 | in. H2O |
| Ps= | 29.34 | in. Hg |

Average Stack Gas Velocity

| | | |
|---|---|---|
| Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2 | | |
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8603 | in. H2O^1/2 |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Ms= | 28.60 | lb/lb-mole |
| Vs= | 51.89 | ft/s |

Area of the Stack

| | | |
|---|---|---|
| If W = 0, the stack is circular. | | |
| Circular | | |
| As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2 | | |
| PI= | 3.141593 | |
| Ds= | 72.00 | in. Hg |
| As= | 28.27 | ft2 |
| Rectangular | | |
| As = L * W * (1 ft / 12 in.)^2 | | |
| L= | 0.00 | in. Hg |
| W= | 0.00 | in. H2O |
| As= | 0.00 | ft2 |

Stack Gas Flow Rate, Actual

| | | |
|---|---|---|
| Qacfm = Vs * As * 60 | | |
| Vs= | 51.89 | ft/s |
| As= | 28.27 | ft2 |
| Qacfm= | 88,026 | acfm |
| Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf) | | |
| Qacfm= | 88,026 | acfm |
| Qacm/min= | 2,493 | acm/min |

Stack Gas Flow Rate, Standard

| | | |
|---|---|---|
| Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard) | | |
| Qacfm= | 88,026 | acfm |
| Tstandard= | 68 | F |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Pstandard= | 29.92 | in. Hg |
| Qscfm= | 77,002 | scfm |
| Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qscfm= | 77,002 | scfm |
| Qscm/min= | 2,180 | scm/min |

Stack Gas Flow Rate, Dry Standard

| | | |
|---|---|---|
| Qdscfm = Qscfm * (1 - Bws) | | |
| Qscfm= | 77,002 | scfm |
| Bws= | 0.0278 | vol. fraction |
| Qdscfm= | 74,863 | dscfm |
| Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qdscfm= | 74,863 | dscfm |
| Qdscm/min= | 2,120 | dscm/min |

Percent Isokinetic

I = K4method 5 * (Tsavg + 460) * Vm(std) / ( Ps * Vs * An * Theta * (1 - Bws) )

| | | |
|---|---|---|
| K4method5= | 0.0945 | |
| Tsavg= | 131.9 | F |
| Vm(std)= | 44.901 | dscf |
| Ps= | 29.34 | in. Hg |
| Vs= | 51.89 | ft/s |
| An= | 0.000131 | ft2 |
| Theta= | 120 | in. H2O |
| Bws= | 0.0278 | vol. fraction |
| I= | 107.91 | % |

Total Weight of TSO

mnTSO = (TSO Solvent wash weight gain + TSO filter weight gain) / (1000 ug/mg)

| | | |
|---|---|---|
| Acetone wash weight gain= | 8.50 | ug |
| Filter weight gain= | 0.00 | ug |
| $m_n$= | 0.009 | mg |

TSO Emission Concentration (mg/dscm)

TSO(gr/dscf) = 0.001 * (mn / Vm(std)) * 15.43

| | | |
|---|---|---|
| $m_n$= | 0.009 | mg |
| Vm(std)= | 1.27 | dscm |
| TSO(gr/dscf)= | 0.0067 | mg/dscm |

TSO Emission Rate (lb/hr)

TSO(lb/hr) = TSO(mg/dscm) * Qdscm/min * (Pushing Duration * Push Frequency) * (1 lb/453593 mg)

| | | |
|---|---|---|
| TSO(mg/dscm)= | 0.0067 | mg/dscm |
| Qdscfm= | 2,120 | dscm/min |
| Push Duration = | 2.5 | minutes/push |
| Push Frequency = | 3.32 | pushes/hour |
| TSO(lb/hr)= | 0.00026 | lb/hr |

# Method 0031

**ACCI SAMPLE CALCULATIONS**
**Flow, Moisture, Select VOC's**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**Nov. 1-2, 2016**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | ml | Tstandard | 68 | F |
| Vi | 0.0 | ml | Pstandard | 760 | mm Hg |
| Wf | 0.0 | g | K1method 4 | 0.04706 | scf/ml |
| Wi | 0.0 | g | K2method 4 | 0.04715 | scf/g |
| Vm | 0.000 | liters | K1method 5 | 17.64 | R/in. Hg |
| Vm | 0.000 | 0.000 | K4method 5 | 0.0945 | |
| Yd | 1.0030 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.33 | in. Hg | Kp | 85.49 | |
| dHavg | 0.44 | in. H2O | $\pi$ | 3.141593 | |
| Tm | 73.4 | F | Ds (or L) | 72.00 | inches |
| O2 | 20.09 | % dv | Stack Width (W) | 0.00 | inches |
| CO2 | 0.63 | % dv | Tsavg | 131.9 | F |
| Pg | 0.11 | in. H2O | Product rate | NA | ton/hr |
| Cp | 0.84 | | $F_d$ | NA | dscf/MMBtu |
| $(dP)^{1/2}$avg | 0.860 | in. H2O^1/2 | Bws | 0.0278 | vol. fraction |
| **Method 0031 Lab Results** | | | | | |
| Benzene MW | 78.11 | lb/lb-mole | Push Duration | 2.50 | minutes/push |
| Sample Volume | 0.0606 | dscm | Push Frequency | 3.32 | pushes/hour |
| Mass Collected | 8.68 | micrograms | | | |

Water Vapor in the Gas Stream

| | | |
|---|---|---|
| Bws used= | 0.0278 | vol. fraction |

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | | |
|---|---|---|
| CO2= | 0.63 | % dv |
| O2= | 20.09 | % dv |
| CO + N2= | 79.28 | % dv |

Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.63 | % dv |
| O2= | 20.09 | % dv |
| CO + N2= | 79.28 | % dv |
| Md= | 28.90 | lb/lb-mole |

Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

| | | |
|---|---|---|
| Md= | 28.90 | lb/lb-mole |
| Bws= | 0.0278 | vol. fraction |
| Ms= | 28.60 | lb/lb-mole |

Stack Pressure

Ps = Pbar + Pg/13.6

| | | |
|---|---|---|
| Pbar= | 29.33 | in. Hg |
| Pg= | 0.11 | in. H2O |
| Ps= | 29.34 | in. Hg |

Average Stack Gas Velocity

Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2

| | | |
|---|---|---|
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8603 | in. H2O^1/2 |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Ms= | 28.60 | lb/lb-mole |
| Vs= | 51.89 | ft/s |

| | | | |
|---|---|---|---|
| Area of the Stack | If W = 0, the stack is circular. | | |
| | Circular | | |
| | As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2 | | |
| | PI= | 3.141593 | |
| | Ds= | 72.00 | inches |
| | As= | 28.27 | ft2 |
| | Rectangular | | |
| | As = L * W * (1 ft / 12 in.)^2 | | |
| | L= | 0.00 | inches |
| | W= | 0.00 | inches |
| | As= | 0.00 | ft2 |
| Stack Gas Flow Rate, Actual | | | |
| | Qacfm = Vs * As * 60 | | |
| | Vs= | 51.89 | ft/s |
| | As= | 28.27 | ft2 |
| | Qacfm= | 88,026 | acfm |
| | Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf) | | |
| | Qacfm= | 88,026 | acfm |
| | Qacm/min= | 2,493 | acm/min |
| Stack Gas Flow Rate, Standard | | | |
| | Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard) | | |
| | Qacfm= | 88,026 | acfm |
| | Tstandard= | 68 | F |
| | Tsavg= | 131.9 | F |
| | Ps= | 29.34 | in. Hg |
| | Pstandard= | 29.92 | in. Hg |
| | Qscfm= | 77,002 | scfm |
| | Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf) | | |
| | Qscfm= | 77,002 | scfm |
| | Qscm/min= | 2,180 | scm/min |
| Stack Gas Flow Rate, Dry Standard | | | |
| | Qdscfm = Qscfm * (1 - Bws) | | |
| | Qscfm= | 77,002 | scfm |
| | Bws= | 0.0278 | vol. fraction |
| | Qdscfm= | 74,863 | dscfm |
| | Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf) | | |
| | Qdscfm= | 74,863 | dscfm |
| | Qdscm/min= | 2,120 | dscm/min |
| VOST Sample Volume (DSCF) | | | |
| | Sample $Volume_{DSCF}$ = Sample Volume (in liters)/ 28.136847 liters/$ft^3$ | | |
| | VOST Sample Volume = | 60.6142 | liters |
| | VOST Sample Volume | 2.154 | DSCF |
| Benzene emission concentration (mg/DSCM) | | | |
| | Benzene (mg/DSCM) = Mass Collected (mg) /1000 mg/ug / Sample Volume (liters) * 1000 (liters/m3) | | |
| | Mass Collected= | 8.68 | ug |
| | Sample Volume= | 0.0606 | dscm |
| | Benzene (mg/DSCM) = | 0.143 | mg/DSCM |
| Benzene Emission Rate (lb/hr) | | | |
| | E=(Mn)*(1/1000000 ug/g)/Vm(std) * Qdscfm*(Pushing Duration * Push Frequency)*(1/453.593 g/lb) | | |
| | Emission Mass | 8.68 | ug |
| | Vm(std)= | 2.15427 | DSCF |
| | Qdscfm= | 74,863 | dscfm |
| | Push Duration= | 2.5 | minutes/push |
| | Push Frequency= | 3.32 | pushes/hour |
| | E= | 5.52E-03 | lb/hr |

# Methods 3A/15

**Montrose SAMPLE CALCULATIONS**
**Flow, Moisture, CEMS**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**Nov. 1-2, 2016**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | ml | Tstandard | 68 | F |
| Vi | 0.0 | ml | Pstandard | 760 | mm Hg |
| Wf | 2,796.9 | g | K1method 4 | 0.04706 | scf/ml |
| Wi | 2,769.7 | g | K2method 4 | 0.04715 | scf/g |
| Vm | 46.103 | 0.000 | K1method 5 | 17.64 | R/in. Hg |
| Vm | 0.000 | 0.000 | K4method 5 | 0.0945 | |
| Yd | 1.0030 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.33 | in. Hg | Kp | 85.49 | |
| dHavg | 0.44 | in. H2O | $\pi$ | 3.141593 | |
| Tm | 73.4 | F | Ds (or L) | 72.00 | inches |
| O2 | 20.09 | % dv | Stack Width (W) | 0.00 | inches |
| CO2 | 0.63 | % dv | Tsavg | 131.9 | F |
| Pg | 0.11 | in. H2O | Product rate | NA | ton/hr |
| Cp | 0.84 | | $F_d$ | NA | dscf/MMBtu |
| $(dP)^{1/2}$avg | 0.860 | in. H2O^1/2 | | | |

**CEMS DATA**

| | | | | | |
|---|---|---|---|---|---|
| Push Duration | 2.5 | minutes/push | Hydrogen Sulfide | | |
| Push Frequency | 3.32 | pushes/hour | Cavg. | 0.50 | ppmwv |
| | | | MW H2S | 34.1 | lb/lb-mole |

Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

| | | |
|---|---|---|
| K1method 4= | 0.04706 | scf/ml |
| Vf= | 0.0 | ml |
| Vi= | 0.0 | ml |
| Vwc(std)= | 0.000 | scf |

Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

| | | |
|---|---|---|
| K2method 4= | 0.04715 | scf/g |
| Wf= | 2,796.9 | g |
| Wi= | 2,769.7 | g |
| Vwsg(std)= | 1.282 | scf |

Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

| | | |
|---|---|---|
| Vwc(std)= | 0.000 | scf |
| Vwsg(std)= | 1.282 | scf |
| Vw(std)= | 1.282 | scf |

Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

| | | |
|---|---|---|
| Volume metered in dacf= | 46.103 | 0.000 |
| Volume metered in dry actual liters= | 0.000 | 0.000 |
| Vm= | 46.103 dacf | |

$Vm(m^3)$ = Vm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Vm= | 46.103 | dacf |
| $Vm(m^3)$= | 1.305 | dacm |

Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

| | | |
|---|---|---|
| K1method 5= | 17.64 | R/in. Hg |
| Vm= | 46.103 | dacf |
| Yd= | 1.0030 | |
| Pbar= | 29.33 | in. Hg |
| dHavg= | 0.44 | in. H2O |
| Tm= | 73.4 | F |
| Vm(std)= | 44.901 | dscf |

$Vm(std)m^3$ = Vm(std) * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Vm(std)= | 44.901 | dscf |
| $Vm(std)m^3$= | 1.271 | dscm |

Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

| | | |
|---|---|---|
| Tsavg= | 131.9 | F |
| T= | 591.5 | R |
| C8= | -1.044040E+04 | |
| C9= | -1.1294650E+01 | |
| C10= | -2.702236E-02 | |
| C11= | 1.289036E-05 | |
| C12= | -2.478068E-09 | |
| C13= | 6.545967E+00 | |
| $SP_{H2O@Tsavg}$= | 4.76 | in. Hg |
| Ps= | 29.34 | in. Hg |
| Bws= | 0.1623 | vol. fraction |

Bws = Vw(std) / (Vm(std) + Vw(std))

| | | |
|---|---|---|
| Vw(std)= | 1.282 | scf |
| Vm(std)= | 44.901 | dscf |
| Bws= | 0.0278 | vol. fraction |
| Bws used= | 0.0278 | vol. fraction |

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | | |
|---|---|---|
| CO2= | 0.63 | % dv |
| O2= | 20.09 | % dv |
| CO + N2= | 79.28 | % dv |

Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.63 | % dv |
| O2= | 20.09 | % dv |
| CO + N2= | 79.28 | % dv |
| Md= | 28.90 | lb/lb-mole |

Molecular weight of wet gas stream

| | | |
|---|---|---|
| Ms = Md * (1 - Bws) + 18 * Bws | | |
| Md= | 28.90 | lb/lb-mole |
| Bws= | 0.0278 | vol. fraction |
| Ms= | 28.60 | lb/lb-mole |

Stack Pressure

| | | |
|---|---|---|
| Ps = Pbar + Pg/13.6 | | |
| Pbar= | 29.33 | in. Hg |
| Pg= | 0.11 | in. H2O |
| Ps= | 29.34 | in. Hg |

Average Stack Gas Velocity

| | | |
|---|---|---|
| Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2 | | |
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8603 | in. H2O^1/2 |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Ms= | 28.60 | lb/lb-mole |
| Vs= | 51.89 | ft/s |

Area of the Stack

If W = 0, the stack is circular.

Circular

| | | |
|---|---|---|
| As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2 | | |
| PI= | 3.141593 | |
| Ds= | 72.00 | inches |
| As= | 28.27 | ft2 |

Rectangular

| | | |
|---|---|---|
| As = L * W * (1 ft / 12 in.)^2 | | |
| L= | 0.00 | inches |
| W= | 0.00 | inches |
| As= | 0.00 | ft2 |

Stack Gas Flow Rate, Actual

| | | |
|---|---|---|
| Qacfm = Vs * As * 60 | | |
| Vs= | 51.89 | ft/s |
| As= | 28.27 | ft2 |
| Qacfm= | 88,026 | acfm |
| Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf) | | |
| Qacfm= | 88,026 | acfm |
| Qacm/min= | 2,493 | acm/min |

Stack Gas Flow Rate, Standard

| | | |
|---|---|---|
| Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard) | | |
| Qacfm= | 88,026 | acfm |
| Tstandard= | 68 | F |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Pstandard= | 29.92 | in. Hg |
| Qscfm= | 77,002 | scfm |
| Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qscfm= | 77,002 | scfm |
| Qscm/min= | 2,180 | scm/min |

Stack Gas Flow Rate, Dry Standard

| | | |
|---|---|---|
| Qdscfm = Qscfm * (1 - Bws) | | |
| Qscfm= | 77,002 | scfm |
| Bws= | 0.0278 | vol. fraction |
| Qdscfm= | 74,863 | dscfm |
| Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qdscfm= | 74,863 | dscfm |
| Qdscm/min= | 2,120 | dscm/min |

Hydrogen Sulfide H2Sncentration (ppmdv)

| | | |
|---|---|---|
| $C_{H2S}$ = ($C_{H2S}$ wet) / (1 -Bws) | | |
| $C_{H2S}$ wet = | 0.50 | ppmwv |
| Bws = | 0.03 | vol. fraction |
| $C_{H2S}$= | 0.51 | ppmdv |

Hydrogen Sulfide emission rate (lb/hr)

| | | |
|---|---|---|
| H2S(lb/hr) = CH2S / 1,000,000 * Qdscfm * (Push Duration * Push Frequency) / V/nstandard * H2SMW | | |
| CH2S= | 0.51 | ppmdv |
| Qdscfm= | 74,863 | dscfm |
| $V/n_{standard}$= | 385.3 | ft3/lb-mole |
| H2S MW= | 34.1 | lb/lb-mole |
| Push Duration = | 2.5 | minutes/push |
| Push Frequency= | 3.32 | pushes/hour |
| H2S(lb/hr)= | 0.028 | lb/hr |

# Method 320

**Montrose SAMPLE CALCULATIONS**
**Flow, Moisture, M320**
**ArcelorMittal**
**16-167**
**Monessen, PA**
**Pushing Baghouse**
**Normal**
**Nov. 1, 2016**
**Baghouse Exhaust**
**Run 1**

| | | | | | |
|---|---|---|---|---|---|
| Vf | 0.0 | ml | Tstandard | 68 | F |
| Vi | 0.0 | ml | Pstandard | 760 | mm Hg |
| Wf | 2,796.9 | g | K1method 4 | 0.04706 | scf/ml |
| Wi | 2,769.7 | g | K2method 4 | 0.04715 | scf/g |
| Vm | 46.103 | dacf | K1method 5 | 17.64 | R/in. Hg |
| Vm | 0.000 | dry actual liters | K4method 5 | 0.0945 | |
| Yd | 1.0030 | | $V/n_{standard}$ | 385.3 | ft3/lb-mole |
| Pbar | 29.33 | in. Hg | Kp | 85.49 | |
| dHavg | 0.44 | in. H2O | π | 3.141593 | |
| Tm | 73.4 | F | Ds (or L) | 72.00 | inches |
| O2 | 20.06 | % dv | Stack Width (W) | 0.00 | inches |
| CO2 | 0.64 | % dv | Tsavg | 131.9 | F |
| Pg | 0.11 | in. H2O | Product rate | NA | ton/hr |
| Cp | 0.84 | | $F_d$ | NA | dscf/MMBtu |
| $(dP)^{1/2}$avg | 0.860 | in. H2O^1/2 | Push Frequency | 3.32 | pushes/hour |
| | | | Push Duration | 2.50 | minutes/push |
| **CEMS DATA** | | | | | |
| HCl | | | HF | | |
| $Caverage_{HCl}$ | #DIV/0! | ppmwv | $Caverage_{HF}$ | 0.062 | ppmwv |
| MW HCl | 36.4609 | lb/lb-mole | MW HF | 20.010 | lb/lb-mole |
| HCN | | | | | |
| $Caverage_{HCN}$ | 1.12 | ppmwv | | | |
| MW HCN | 27.0253 | lb/lb-mole | | | |

Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

| | | |
|---|---|---|
| K1method 4= | 0.04706 | scf/ml |
| Vf= | 0.0 | ml |
| Vi= | 0.0 | ml |
| Vwc(std)= | 0.000 | scf |

Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

| | | |
|---|---|---|
| K2method 4= | 0.04715 | scf/g |
| Wf= | 2,796.9 | g |
| Wi= | 2,769.7 | g |
| Vwsg(std)= | 1.282 | scf |

Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

| | | |
|---|---|---|
| Vwc(std)= | 0.000 | scf |
| Vwsg(std)= | 1.282 | scf |
| Vw(std)= | 1.282 | scf |

Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

| | | |
|---|---|---|
| Volume metered in dacf= | 46.103 | dacf |
| Volume metered in dry actual liters= | 0.000 | dry actual liters |
| Vm= | 46.103 | dacf |

$Vm(m^3)$ = Vm * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Vm= | 46.103 | dacf |
| $Vm(m^3)$= | 1.305 | dacm |

Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

| | | |
|---|---|---|
| K1method 5= | 17.64 | R/in. Hg |
| Vm= | 46.103 | dacf |
| Yd= | 1.0030 | |
| Pbar= | 29.33 | in. Hg |
| dHavg= | 0.44 | in. H2O |
| Tm= | 73.4 | F |
| Vm(std)= | 44.901 | dscf |

$Vm(std)m^3$ = Vm(std) * (1 $m^3$ / 35.3145 cf)

| | | |
|---|---|---|
| Vm(std)= | 44.901 | dscf |
| $Vm(std)m^3$= | 1.271 | dscm |

Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

| | | |
|---|---|---|
| Tsavg= | 131.9 | F |
| T= | 591.5 | R |
| C8= | -1.044040E+04 | |
| C9= | -1.1294650E+01 | |
| C10= | -2.702236E-02 | |
| C11= | 1.289036E-05 | |
| C12= | -2.478068E-09 | |
| C13= | 6.545967E+00 | |
| $SP_{H2O@Tsavg}$= | 4.76 | in. Hg |
| Ps= | 29.34 | in. Hg |
| Bws= | 0.1623 | vol. fraction |

Bws = Vw(std) / (Vm(std) + Vw(std))

| | | |
|---|---|---|
| Vw(std)= | 1.282 | scf |
| Vm(std)= | 44.901 | dscf |
| Bws= | 0.0278 | vol. fraction |
| Bws used= | 0.0278 | vol. fraction |

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

| | | |
|---|---|---|
| CO2= | 0.64 | % dv |
| O2= | 20.06 | % dv |
| CO + N2= | 79.30 | % dv |

Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

| | | |
|---|---|---|
| CO2= | 0.64 | % dv |
| O2= | 20.06 | % dv |
| CO + N2= | 79.30 | % dv |
| Md= | 28.91 | lb/lb-mole |

Molecular weight of wet gas stream

| | | |
|---|---|---|
| Ms = Md * (1 - Bws) + 18 * Bws | | |
| Md= | 28.91 | lb/lb-mole |
| Bws= | 0.0278 | vol. fraction |
| Ms= | 28.60 | lb/lb-mole |

Stack Pressure

| | | |
|---|---|---|
| Ps = Pbar + Pg/13.6 | | |
| Pbar= | 29.33 | in. Hg |
| Pg= | 0.11 | in. H2O |
| Ps= | 29.34 | in. Hg |

Average Stack Gas Velocity

| | | |
|---|---|---|
| Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2 | | |
| Kp= | 85.49 | |
| Cp= | 0.84 | |
| $(dP)^{1/2}$avg= | 0.8603 | in. H2O^1/2 |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Ms= | 28.60 | lb/lb-mole |
| Vs= | 51.89 | ft/s |

Area of the Stack

If W = 0, the stack is circular.

Circular

| | | |
|---|---|---|
| As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2 | | |
| PI= | 3.141593 | |
| Ds= | 72.00 | inches |
| As= | 28.27 | ft2 |

Rectangular

| | | |
|---|---|---|
| As = L * W * (1 ft / 12 in.)^2 | | |
| L= | 0.00 | inches |
| W= | 0.00 | inches |
| As= | 0.00 | ft2 |

Stack Gas Flow Rate, Actual

| | | |
|---|---|---|
| Qacfm = Vs * As * 60 | | |
| Vs= | 51.89 | ft/s |
| As= | 28.27 | ft2 |
| Qacfm= | 88,024 | acfm |
| Qacm/min = Qacfm * (1 $m^3$ / 35.3145 cf) | | |
| Qacfm= | 88,024 | acfm |
| Qacm/min= | 2,493 | acm/min |

Stack Gas Flow Rate, Standard

| | | |
|---|---|---|
| Qscfm = Qacfm * ( (Tstandard + 460) / (Tsavg + 460) ) * (Ps / Pstandard) | | |
| Qacfm= | 88,024 | acfm |
| Tstandard= | 68 | F |
| Tsavg= | 131.9 | F |
| Ps= | 29.34 | in. Hg |
| Pstandard= | 29.92 | in. Hg |
| Qscfm= | 77,000 | scfm |
| Qscm/min = Qscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qscfm= | 77,000 | scfm |
| Qscm/min= | 2,180 | scm/min |

Stack Gas Flow Rate, Dry Standard

| | | |
|---|---|---|
| Qdscfm = Qscfm * (1 - Bws) | | |
| Qscfm= | 77,000 | scfm |
| Bws= | 0.0278 | vol. fraction |
| Qdscfm= | 74,862 | dscfm |
| | | |
| Qdscm/min = Qdscfm * (1 $m^3$ / 35.3145 cf) | | |
| Qdscfm= | 74,862 | dscfm |
| Qdscm/min= | 2,120 | dscm/min |

Hydrogen Flouride concentration (ppmdv)

| | | |
|---|---|---|
| CHF = (CHF wet) / (1 -Bws) | | |
| CHF (raw, M320)= | 0.0622 | ppmwv |
| CHF (MDL by M320)= | 0.0473 | ppmwv |
| CHF (used)= | 0.0622 | ppmwv |
| | | |
| CHF wet = | 0.062 | ppmwv |
| Bws = | 0.0278 | vol. fraction |
| CHF= | 0.064 | ppmdv |

Hydrogen Flouride emission rate (lb/hr)

| | | |
|---|---|---|
| HF(lb/hr) = CHF / 1,000,000 * Qdscfm * (Push Frequency * Push Duration) / V/nstandard * HFMW | | |
| CHF= | 0.06 | ppmdv |
| Qdscfm= | 74,862 | dscfm |
| $V/n_{standard}$= | 385.3 | ft3/lb-mole |
| HF MW= | 20.01 | lb/lb-mole |
| Push Frequency = | 3.32 | pushes/hour |
| Push Duration= | 2.50 | minutes/push |
| HF(lb/hr)= | 0.0021 | lb/hr |

Hydrogen Cyanide concentration (ppmdv)

| | | |
|---|---|---|
| CHCN = (CHCN wet) / (1 -Bws) | | |
| CHCN (raw, M320)= | 1.12 | ppmwv |
| CHCN (MDL by M320)= | 0.41 | ppmwv |
| CHCN (used)= | 1.12 | ppmwv |
| | | |
| CHCN wet = | 1.12 | ppmwv |
| Bws = | 0.0278 | vol. fraction |
| CHCN= | 1.15 | ppmdv |

Hydrogen Cyanide emission rate (lb/hr)

| | | |
|---|---|---|
| HCN(lb/hr) = CHCN / 1,000,000 * Qdscfm * (60 min / 1 hour) / V/nstandard * HCNMW | | |
| CHCN= | 1.150 | ppmdv |
| Qdscfm= | 74,862 | dscfm |
| $V/n_{standard}$= | 385.3 | ft3/lb-mole |
| HCN MW= | 27.0253 | lb/lb-mole |
| Push Frequency = | 3.32 | pushes/hour |
| Push Duration= | 2.50 | minutes/push |
| HCN(lb/hr)= | 0.0501 | lb/hr |

**END OF REPORT**