The Avogadro Group, LLC

NTV-382

SOURCE TEST REPORT
INITIAL EMISSION COMPLIANCE TEST
SCRAP METAL SHREDDER
SCHNITZER STEEL PRODUCTS
OAKLAND, CALIFORNIA

Prepared For:

Ms. Melisa Cohen

SCHNITZER STEEL PRODUCTS
Oakland, California

For Submittal To:

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
San Francisco, California

Prepared By:

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March 28, 2007

2020-04-28: SSI-001

REVIEW AND CERTIFICATION

All work, calculations, and other activities and tasks performed and documented in this report were carried out under my direction and supervision.

Name: Kevin Donahoe Title: Test Team Leader

Sign: Shawn M. Malczyn Date: March 30, 2007

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein, and hereby certify that the presented material is authentic and accurate.

Name: Erick Mirabella Title: General Manager

Sign: Erick Mirabella Date: 03/30/2007

2020-04-28: SSI-002

SUMMARY INFORMATION

Source Information

Source Location:	Schnitzer Steel Products 1101 Embarcadero West Oakland, California 94607	
Contact:	Ms. Melisa Cohen	Nick Andrusyshyn
Telephone:	(510) 452-6378	(510) 452-6360
Facsimile:	(510) 471-4528	(510) 471-4528
Plant no.:	208	
Application no.:	14194	
Condition no.:	23114	
Source:	S-6 & S-7: Shredder and infeed conveyor	
Purpose:	Demonstrate compliance with BAAQMD ATC condition 7.	
Procedures:	EPA 1, 2, 3a, 4, 5/202, 25 and TO-15 CARB 425 and 428	

Testing Company Information

Testing Firm:	The Avogadro Group, LLC 2825 Verne Roberts Circle Antioch, CA 94509	
Contacts:	Mr. Shawn Nelezen Project Manager	Mr. Erick Mirabella General Manager
Telephone:	(925) 680-4397	(925) 680-0935
Facsimile:	(925) 680-4416	(925) 680-4416
Certification:	ARB Independent Tester	
Test Date:	February 28 - March 2 of 2007	

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SECTION 1.0

INTRODUCTION

The Avogadro Group, LLC (Avogadro) was contracted by Schnitzer Steel Products (Schnitzer) to perform a series of emission tests on a scrap metal shredder located at the facility located at the Port of Oakland. Avogadro conducted the testing as directed by item 7 of Authority to Construct (ATC) application no. 14194 issued by the Bay Area Air Quality Management District (BAAQMD).

Kevin Donahoe, Charles Arrivas, and Eric Seyler of Avogadro performed the tests between the dates of February 28 and March 2 of 2007. Melisa Cohen of Schnitzer was responsible for overseeing the operation of the shredder during the test. Though notified of the tests in advance via a faxed letter, no BAAQMD personnel observed any portion of the test program.

Tests were performed on the shredder to determine emission concentrations and factors of the following compounds as specified in the ATC:

- Primary parameters:
  - Total organic compounds (TOC) - ppm volume dry, lb/hr, lb/ton of feed
  - Particulate matter (PM) - gr/dscf, lb/hr, lb/ton of feed
  - Hexavalent chromium (Cr^{6+}) - ug/dscm, lb/hr, lb/ton of feed
  - Polychlorinated biphenyl (PCB) - ng/dscm, lb/hr, lb/ton of feed
  - Benzene – ppb volume dry, lb/hr, lb/ton of feed

- Secondary parameters:
  - O_2 and CO_2 for molecular weight and dilution calculations - % volume dry
  - Stack gas moisture content - % by volume
  - Stack volumetric flow - dscfm

The emission test results are summarized and compared to the permit limits in Table 1-1. Detailed results of individual test runs are presented in Section 4.0. All supporting data including field data sheets, laboratory analysis data, and emissions calculation spreadsheets are located in the appendices.

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TABLE 1-1
SUMMARY OF AVERAGE RESULTS
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER
FEBRUARY 28, 2007

Parameter	Average Results
Process Data:	
Feed rate, ton/hr	[redacted]
Flue Gas:	
O_2, % volume dry	20.76
CO_2, % volume dry	0.158
Moisture content, %	2.075
Temperature, °F	79.8
Flow rate, acfm	21,683
Flow rate, dscfm	20,801
TOC Emissions:	
ppm volume dry as C	87.66
lb/hr as CH_4	4.53
lb/ton of feed as CH_4	[redacted]
PM Emissions:	
gr/dscf	0.0016
lb/hr	0.276
lb/ton of feed	[redacted]
Benzene Emissions:	
ppb volume dry	9.47
lb/hr	0.00238
lb/ton of feed	[redacted]

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TABLE 1-2
SUMMARY OF AVERAGE RESULTS
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER
MARCH 1 & 2, 2007

Parameter	Average Results
Process Data:	
Feed rate, ton/hr	[redacted]
Flue Gas:	
O_2, % volume dry	20.51
CO_2, % volume dry	0.09
Moisture content, %	1.42
Temperature, °F	78.1
Flow rate, acfm	20,305
Flow rate, dscfm	19,695
Hexavalent Chromium Emissions:	
µg/dscm	0.087
lb/hr	6.60E-06
lb/ton of feed	[redacted]
Total PCB Emissions:	
ng/dscm	4,430
lb/hr	3.34E-04
lb/ton of feed	[redacted]

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SECTION 2.0

SOURCE LOCATION INFORMATION

2.1 FACILITY AND SOURCE DESCRIPTION

The Schnitzer Steel Products facility at the Port of Oakland serves as a processing and loading center for scrap metal bound for marine transport. The metal shredder is composed of multiple steel alloy hammers that are rotated at speed by an electric motor and impacted against the material to be shredded. Infeed material consists primarily of automobiles that have been pre-processed to minimize the amount of hazardous fluids and non-usable metal content. A conveyor system is loaded with infeed material by manually-operated cranes, and then fed into the shredder at a known mass rate.

Water is injected into the shredder to reduce the heat generated as well as to reduce emission of particulate matter. The emissions from the shredder are captured by an exhaust system fed by a nozzle placed at the entrance to the shredder. The exhaust system ducts the collected air through a wet venturi scrubber, a demister, and two separate filtering systems before being emitted to atmosphere via a vertical stack.

2.2 SAMPLING LOCATION

Exhaust from the shredder is emitted via a vertical cylindrical duct 47.5 inches in diameter. The stack is equipped with two sampling ports located 90° apart from each other in the same horizontal plane located approximately 12 feet downstream and 3 feet upstream from any flow disturbances. EPA Method 1 criteria are satisfied at this sampling location. Samples were collected from both sampling ports using probes of sufficient length to traverse the entire cross section of the duct. A diagram of a typical sampling location as well as the traverse points used for this program is presented in Appendix C.1.

2020-04-28: SSI-009

SECTION 3.0

TEST DESCRIPTION

3.1 PROGRAM OBJECTIVES

The objective of the testing program was to satisfy item 7 of the ATC issued by the BAAQMD for this emission source. The ATC specified the parameters to be tested, but does not convey any limits associated with those parameters. Emission results are presented in commonly used units as well as the lb/ton of infeed factor specified in the ATC.

3.2 TEST CONDITIONS

During the tests the shredder was operated at infeed rates representative of [redacted], [redacted] operations. Process parameters were controlled and monitored by Schnitzer personnel and are included in the appendices for reference and support of emission factor calculations.

3.3 TEST PROGRAM SCHEDULE

The test program was completed in three days. The actual test program schedule is presented in Table 3-1.

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TABLE 3-1
TEST PROGRAM SCHEDULE
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER

Day	Location/Activity	Test Runs	Run Time
February 27, 2007	Travel to site	--	--
	Set-up Equipment	--	--
February 28, 2007	Particulate Matter	1, 2, 3 of 3	60 minutes
	Benzene	1, 2, 3 of 3	60 minutes
	TOC	1, 2, 3 of 3	60 minutes
	Volumetric flow rate	1, 2, 3 of 3	60 minutes
	Moisture determination	1, 2, 3 of 3	60 minutes
March 1, 2007	Hexavalent chromium	1 of 3	120 minutes
	PCB	1 of 3	120 minutes
	Volumetric flow rate	1 of 3	120 minutes
	Moisture determination	1 of 3	120 minutes
March 2, 2007	Hexavalent chromium	2, 3* of 3	120 minutes
	PCB	2, 3* of 3	120 minutes
	Volumetric flow rate	2, 3* of 3	120 minutes
	Moisture determination	2, 3* of 3	120 minutes

* Test run 3 for the hexavalent chromium and PCB tests were forced to be prematurely concluded when the shredder developed a complication forcing its shutdown for an extended period. See the detailed run tables in Section 4.0 for more detail.

3.4 TEST PROCEDURES

The test procedures used for this program are presented in Table 3-2. Generic descriptions of the test methods are included in Appendix A. Site-specific applications or modifications of the methods are described in the following sections. Where conflicts exist in the descriptions, the version here in Section 3.4 takes precedence.

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TABLE 3-1
TEST METHODS AND PROCEDURES
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER

Parameter	Reference Method	Measurement Principle
Oxygen (O_2)	EPA 3A	Paramagnetism
Carbon dioxide (CO_2)	EPA 3A	Non-dispersive infrared
Total particulate matter	EPA 5 / 202	Gravimetric filtration
Hexavalent chromium	CARB 425	ICP/MS
PCB	CARB 428	HRGC/HRMS-SIM
Benzene	TO-15	GC/MS
Total organic compounds (TOC)	EPA 25	Gas chromatograph
Volumetric flow rate	EPA 1, 2	Pitot-tube traverse
Moisture content	EPA 4	Impinger weight gain

3.4.1 Gaseous Emissions

Concentrations of the primary constituents of exhaust gas (O_2 and CO_2) were measured using elements of Avogadro's continuous emissions monitor system (CEMS) described in Appendix A. As only O_2 and CO_2 were to be measured, integrated bag samples were collected from the outlet of the dry gas meter used for the moisture sampling train during each run. The contents of the bag were then introduced to the applicable analyzers in the mobile laboratory.

The calibration gas system utilizes only EPA Protocol gases to verify the operation, linearity, and range settings of the electronic analyzers. The sample gas system allows for the introduction of the protocol gases to the analyzers directly through the manifold during a calibration error check, which is performed once daily. The analyzers were calibrated in accordance with EPA Method 3A.

The electronic analyzers are rack mounted and are maintained in the mobile lab. The data recording and acquisition system is based on a digital system known as STRATA. It includes software for controlling the collection of calibration and emission monitoring data, and hardware for connection of the analyzer outputs to the recording system. Test results are provided in three forms: on-site printouts of the digitized data, diskette

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recordings of the digitized data, and printouts of strip charts from the monitoring data. For this test program, print-outs of the average values are provided.

3.4.2 Particulate Matter Emissions

Stack gas concentrations of total particulate matter (total PM) were measured using EPA Methods 5 and 202, which included analysis of the sampling filter for filterable particulate matter and the impinger contents for condensable particulate matter. Lab analysis results for filterable ("front half") and condensable ("back half") particulate matter were combined as total particulate matter. The back half analysis also included methylene chloride extractions to capture organic particulate matter.

Mass emission rates (lb/hr) were calculated from the measured concentration and volumetric flow rates from each of the triplicate test runs. Each test run was 60 minutes in duration.

3.4.3 Total Organic Compound Emissions

Concentrations of TOC were measured by the application of EPA Method 25. The sample train consisted of a pre-evacuated canister preceded by a cryogenic moisture trap. Samples were collected at a constant sampling rate over a period of 60 minutes. The sampling apparatus was sealed and shipped to the laboratory at AtmAA, Inc. in Calabasas, California. Total carbon analysis (TCA) was conducted as described in Method 25 at the AtmAA laboratory. The results were provided in concentrations of total gaseous non-methane (excluding ethane) organics (TGNMO) as carbon.

3.4.4 Hexavalent Chromium Emissions

Method: **CARB 425, Amended July 28, 1997**
Deviations: **None - choices listed below by section**

End User:	Schnitzer Steel, BAAQMD
Tester:	The Avogadro Group, LLC
Contact:	Shawn Nelezen 925.680.4397, fax 925.680.4416
Lab:	Curtis & Tompkins Laboratory of Berkeley, California
Analysis:	Ion chromatography with a post column reactor (IC-PCR)
Contact:	John Goyette 510.486.0900, fax 510.486.0532

Our cleaning procedure follows the recommended procedure, including soaking of the interior surfaces of the probe in nitric acid. The field data sheets were used to record sampling activities, such as process changes, pH checks, and so on. Each data sheet provides the notes (if needed) for a narrative log of each test run.

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Hexavalent chromium emissions were measured according to the procedures in CARB Method 425. The samples were extracted in triplicate from the outlet stack of the scrubber while it was operating under normal conditions. The tests were 120 minutes in duration and collected at least 60 dscf of flue gas with the exception of test run 3. Run 3 was prematurely concluded due to a complication with the shredder forcing its shutdown. The sample volume and sampling time were calculated based on desired target concentrations. A full field blank train (a train that is prepared, charged, assembled, leak-checked, and recovered as a sample train) was also collected and analyzed according to the method.

The chromium sampling was performed isokinetically with a full traverse of the sampling plane. The pH of the impinger contents was maintained above 8.0 at all times. A supply of NaOH solution, pre-screened for chromium, was provided to Avogadro by Curtis & Tompkins and was used for all sampling and analytical procedures.

The analysis was performed by Curtis & Tompkins Laboratory. Sample recovery and analysis procedures were performed in strict accordance with the method. The analysis included the use of ion chromatography with a post column reactor (IC/PCR) and a high-resolution detector. QA procedures were also used according to the method.

After collection, the samples were transported to the laboratory for analysis within the method's hold-time. The samples were protected from light and kept below 4 ºC at all times. The results are presented in terms of reagent-blank-corrected concentrations and mass emissions and are reported in comparison to the reporting limit as calculated using CARB Method 425. Non-detected compounds are calculated at the laboratory reporting limit.

3.4.5 Polychlorinated Biphenyl Emissions

Method: **CARB 428**
Deviations: **None**

End Users:	Schnitzer Steel, BAAQMD
Tester:	The Avogadro Group, LLC
Contact:	Shawn Nelezen (925) 680-4397, fax (925) 680-4416
Analyst:	Vista Analytical Laboratory, Inc. Laboratory services, including preparation and analysis of the sampling reagent, were conducted by Vista Analytical Laboratory, Inc. of El Dorado Hills, California.
Contact:	Martha Maier (916) 673-1520, fax (916) 673-0106

Test Description: Measurements polychlorinated biphenyl (PCB) compounds were performed according to the procedures of CARB Method 428. The target analytes for

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PCB were total mono- through deca- chlorinated biphenyls. Triplicate samples were extracted from the exhaust stack. The tests were 120 minutes in duration and collected at least 60 dscf of flue gas, with the exception of test run 3. Run 3 was prematurely concluded due to a complication with the shredder forcing its shutdown.

Pre-test Cleaning Procedure: All glassware and Teflon sampling apparatus coming into contact with the sample (this includes the probe nozzle, probe liner, filter assembly, Teflon connecting tube, condenser, and resin cartridge) were cleaned prior to use per the following procedures:

a. The apparatus was soaked in a hot solution of Liquinox detergent and water;
b. Following soaking, it was washed and rinsed with hot tap water;
c. Next, it was rinsed with deionized water;
d. Next, it was rinsed with acetone, toluene, and methylene chloride;
e. And finally, it was dried in a 200 degree F oven.

All the cleaned glassware and Teflon parts were sealed in hexane-rinsed aluminum foil. Sampling reagents included pre-cleaned glass fiber filters and resin cartridges charged with pre-cleaned Amberlite XAD-2 resin. The filters and resin cartridges were pre-cleaned and screened for contamination by Vista Analytical Laboratory. Pesticide-grade (Fisher Scientific *Optima* grade or equivalent) methanol, toluene, and methylene chloride reagents were used as recovery solvents.

Sample Train Operation: The PCB sampling was performed isokinetically with a full traverse of each stack sampling plane. Samples were extracted from 12 sample points as specified in CARB Method 1 (the lengths of straight-run before and after the ports allows the use of 12 sample points). Velocity data was collected for each sampling point.

Pretest preparations, preliminary determinations, and leak check procedures were those outlined in CARB Method 5. Borosilicate glass or quartz probe liners and nozzles were used to avoid possible contamination and sealing greases were not used on the sample train.

This train was operated in the same manner as a regular CARB Method 5 sampling train. The sampling apparatus included a heated glass probe equipped with an S-type pitot tube and thermocouple. The probe was attached to an oven containing a heated filter holder, Teflon frit and toluene-rinsed glass-fiber filter. Both the probe exit temperature and oven were maintained at 248°F ± 25°F during sampling. The filter holder was connected by a length of new Teflon tubing to the impinger train containing four chilled impingers in series. The impinger train was connected to the control box, which contained the sampling pump and calibrated dry gas meter. The temperature of the gas entering the sorbent trap was maintained at or below 68 °F.

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The first and second impingers each contained 100 ml of organic free water, the third was empty, and impinger contained silica gel. All of the impinger tare weights were recorded prior to sampling.

The entire sample train was leak tested once prior to sampling and once following testing. The pre-test leak check was performed at a nominal vacuum to ensure that leakage did not exceed 0.02 cfm. The post-test leak check was performed at a vacuum greater than the highest vacuum recorded during the test to ensure that leakage did not exceed the lesser of a) 4 percent of the average sampling rate, or b) 0.02 cfm. The sampling rate and nozzle size were chosen to allow isokinetic sampling at 100% ±10%.

Sample Recovery: Avogadro collected and recovered the samples, protected them from contamination, and delivered them for analysis. The quality assurance procedures detailed in the method were followed.

All sample fractions, except the resin cartridges, were collected in pre-cleaned amber glass jars with Teflon-lined lids. The resin cartridges were sealed with hexane-rinsed aluminum foil for protection from light. All sample fractions were stored at 0-4 degrees C following sample collection. The samples were delivered in ice chests packed with blue ice to Vista Analytical Laboratory for analysis. The chain of custody and sample log-in were documented on suitable forms.

The XAD resin trap was removed and capped. The filter was removed and placed in a Petri dish and sealed with Teflon tape and stored on ice. The contents of the first three impingers were returned to the original jar, weighed, the weight recorded and the liquid level marked. The silica gel was weighed and recorded.

The entire sampling train prior to the XAD resin trap including the nozzle, probe liner, the filter holder and the condenser was rinsed three times each with methanol, toluene, and methylene chloride into a glass jar. Recovery of the samples and assembly of the sample trains were conducted in an environment free from uncontrolled dust. A single field blank sample was also collected and analyzed according to the method. The field blank train was prepared, charged, assembled, leak-checked, and recovered exactly like the sample trains.

Sample Analysis: Analyses for dioxin/furans and PCBs were performed by Vista Analytical Laboratory. The XAD resin trap, filter and rinses were analyzed according to CARB Method 428. The analytical method entails the addition of internal standards in known quantities, matrix-specific extraction of the sample, preliminary fractionating and cleanup of extracts (if necessary) and analysis of the processed extract. The analyses were conducted using high resolution capillary column gas chromatography coupled with high resolution mass spectrometry (HRGC/HRMS).

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Reporting: The results are presented in terms of non-blank-corrected concentrations. The non-detected isomers were reported as the full reporting limit.

3.4.6 Benzene Emissions

Method: EPA TO-15, Second Edition, Amended January 1999
Deviations: There were no deviations or modifications to the method

Tester:	The Avogadro Group, LLC
Contact:	Shawn Nelezen (925) 680-4397, fax (925) 680-4416
Lab:	Air Toxics, Ltd. of Folsom, California
Contact:	Sarah Nguyen (916) 985-1000, fax (916) 985-1020
Analysis:	Gas chromatography / mass spectrometry (GC/MS)

Test Description: Triplicate 60-minute runs were performed at the exhaust stack according to EPA Method TO-15. Integrated flue gas samples were collected via new Teflon tubing in specially prepared evacuated stainless steel (SUMMA) canisters for analysis of benzene. Samples were drawn from a single point chosen to represent the average diluent gas concentrations. Field blanks were not collected.

Sample Analysis: After sample collection, the canisters were transported to Air Toxics, Ltd. of Folsom, California for analysis within 14 days using high-resolution gas chromatography (GC) coupled with a mass spectrometer (MS). The chain of custody and sample log-in were documented on suitable forms.

Reporting: The results are presented in terms of non-blank-corrected concentrations and mass emission rates. Results were reported in units of concentration (ng/dscm) and mass emissions (lb/hr and lb/ton processed). Complete documentation of the calculations is provided in the appendices.

3.4.7 Volumetric Flow Rate and Moisture Content

Stack gas volumetric flow rate and moisture content was determined by using EPA Methods 1, 2 and 4 in concurrence with the test runs. An s-type pitot tube was used for determination of stack gas velocity in coordination with all isokinetic tests. The results were used in conjunction with gaseous pollutant concentrations for calculation of mass emission rates in units of lb/hr and lb/ton of feed.

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SECTION 4.0

RESULTS

The average test results are presented in Section 1.0. The results of individual compliance test runs are shown in Tables 4-1, 4-2, and 4-3.

Generic descriptions of the test methods are located in Appendix A. A summary of our quality assurance program, our ARB certifications, and our equipment calibration data are included in Appendix B. All supporting data including the field data sheets, raw CEM data, and process data are provided in Appendix C. Laboratory reports are presented in Appendix D. Result calculations are shown in Appendix E. Correspondence is presented in Appendix F.

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TABLE 4-1
SUMMARY OF AVERAGE RESULTS
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER
FEBRUARY 28, 2007

Parameter	Run 1	Run 2	Run 3	Average Results
Date:	2/28/07	2/28/07	2/28/07	--
Time:	0900-1003	1033-1136	1206-1308	--
Process Data:				
Feed rate, ton/hr	[redacted]	[redacted]	[redacted]	[redacted]
Flue Gas:				
O_2, % volume dry	20.691	20.786	20.791	20.756
CO_2, % volume dry	0.176	0.153	0.145	0.158
Moisture content, %	2.492	1.946	1.786	2.075
Temperature, °F	79.1	79.8	80.4	79.8
Flow rate, acfm	21,097	21,609	22,343	21,683
Flow rate, dscfm	20,170	20,748	21,485	20,801
TOC Emissions:				
ppmvd as C	84.10	111.16	67.71	87.66
lb/hr as CH_4	4.22	5.74	3.62	4.53
lb/ton of feed as CH_4	[redacted]	[redacted]	[redacted]	[redacted]
PM Emissions:				
gr/dscf	0.0021	0.0016	0.0010	0.0016
lb/hr	0.363	0.288	0.178	0.276
lb/ton of feed	[redacted]	[redacted]	[redacted]	[redacted]
Benzene Emissions:				
ppbvd	9.60	9.60	9.20	9.47
lb/hr	0.00235	0.00241	0.00239	0.00238
lb/ton of feed	[redacted]	[redacted]	[redacted]	[redacted]

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TABLE 4-2
SUMMARY OF AVERAGE HEXAVALENT CHROMIUM RESULTS
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER
MARCH 1 & 2, 2007

Parameter	Run 1	Run 2	Run 3	Average Results
Date:	3/1/07	3/2/07	3/2/07	--
Time:	0853-1045	0753-1012	1115-1209	--
Process Data:				
Feed rate, ton/hr	[redacted]	[redacted]	[redacted]	[redacted]
Flue Gas:				
O_2, % volume dry	20.51	20.46	20.46	20.51
CO_2, % volume dry	0.09	0.11	0.11	0.09
Moisture content, %	1.42	1.67	1.86	1.42
Temperature, °F	78.1	78.0	78.6	78.1
Flow rate, acfm	20,305	19,541	22,153	20,305
Flow rate, dscfm	19,695	18,897	21,292	19,695
Hexavalent Cr Emissions:				
µg/dscm	0.087	0.057	0.117	0.087
lb/hr	6.54E-06	4.02E-06	9.33E-06	6.60E-06
lb/ton of feed	[redacted]	[redacted]	[redacted]	[redacted]

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TABLE 4-3
SUMMARY OF AVERAGE PCB RESULTS
SCHNITZER STEEL PRODUCTS
SCRAP METAL SHREDDER
MARCH 1 & 2, 2007

Test No.	1-PCB	2-PCB	3-PCB	AVERAGE			FB-PCB
Date:	3/1/2007	3/2/2007	3/2/2007				3/1/2007
Time:	0849-1045	0752-1011	1114-1209				--
Flow Rate, dscfm:	20,200	20,207	19,920				20,109
Sample Volume, dscf:	66.20	74.79	37.33				59.44
Temperature, ºF	77.3	78.5	78.5				78.1
O_2, % volume dry:	20.51	20.46	20.46				20.48
CO_2, % volume dry:	0.087	0.111	0.111				0.103
H_2O, % by volume:	1.15	0.98	1.01				1.05
Species	**ng/dscm**	**ng/dscm**	**ng/dscm**	**ng/dscm**	**lb/hr**	**lb/ton**	**ng/dscm**
Chlorobiphenyls	513.6	155.3	151.3	273.4	2.06E-05	[redacted]	0.043
Dichlorobiphenyls	2,896	1,662	1,267	1,942	1.46E-04	[redacted]	0.283
Trichlorobiphenyls	1,675	1,941	1,476	1,697	1.28E-04	[redacted]	1.348
Tetrachlorobiphenyls	262.4	712.9	385.9	453.8	3.42E-05	[redacted]	0.659
Pentachlorobiphenyls	15.84	90.18	45.69	50.57	3.81E-06	[redacted]	0.067
Hexachlorobiphenyls	3.494	21.06	9.222	11.26	8.48E-07	[redacted]	ND<0.030
Heptachlorobiphenyls	0.667	3.093	1.428	1.729	1.30E-07	[redacted]	ND<0.030
Octachlorobiphenyls	0.276	0.637	0.253	0.389	2.93E-08	[redacted]	ND<0.030
Nonachlorobiphenyls	0.061	0.141	ND<0.047	<0.083	<6.27E-09	[redacted]	ND<0.030
Decachlorobiphenyls	ND<0.027	0.028	ND<0.047	<0.034	<2.54E-09	[redacted]	ND<0.030
TOTAL PCBs	<5,367	4,586	<3,337	<4,430	<3.34E-04	[redacted]	<2.549

2020-04-28: SSI-021

APPENDIX A
STANDARD MEASUREMENT PROCEDURES

2020-04-28: SSI-022

Continuous Emissions Monitoring System

O_2, CO, CO_2, NO, NO_x and SO_2 are measured using an extractive continuous emissions monitoring (CEM) package, shown in the following figure. This package is comprised of three basic subsystems. They are: (1) the sample acquisition and conditioning system, (2) the calibration gas system, and (3) the analyzers themselves. This section presents a description of the sampling and calibration systems. Descriptions of the analyzers used in this program and the corresponding reference test methods follow. Information regarding quality assurance information on the system, including calibration routines and system performance data follows.

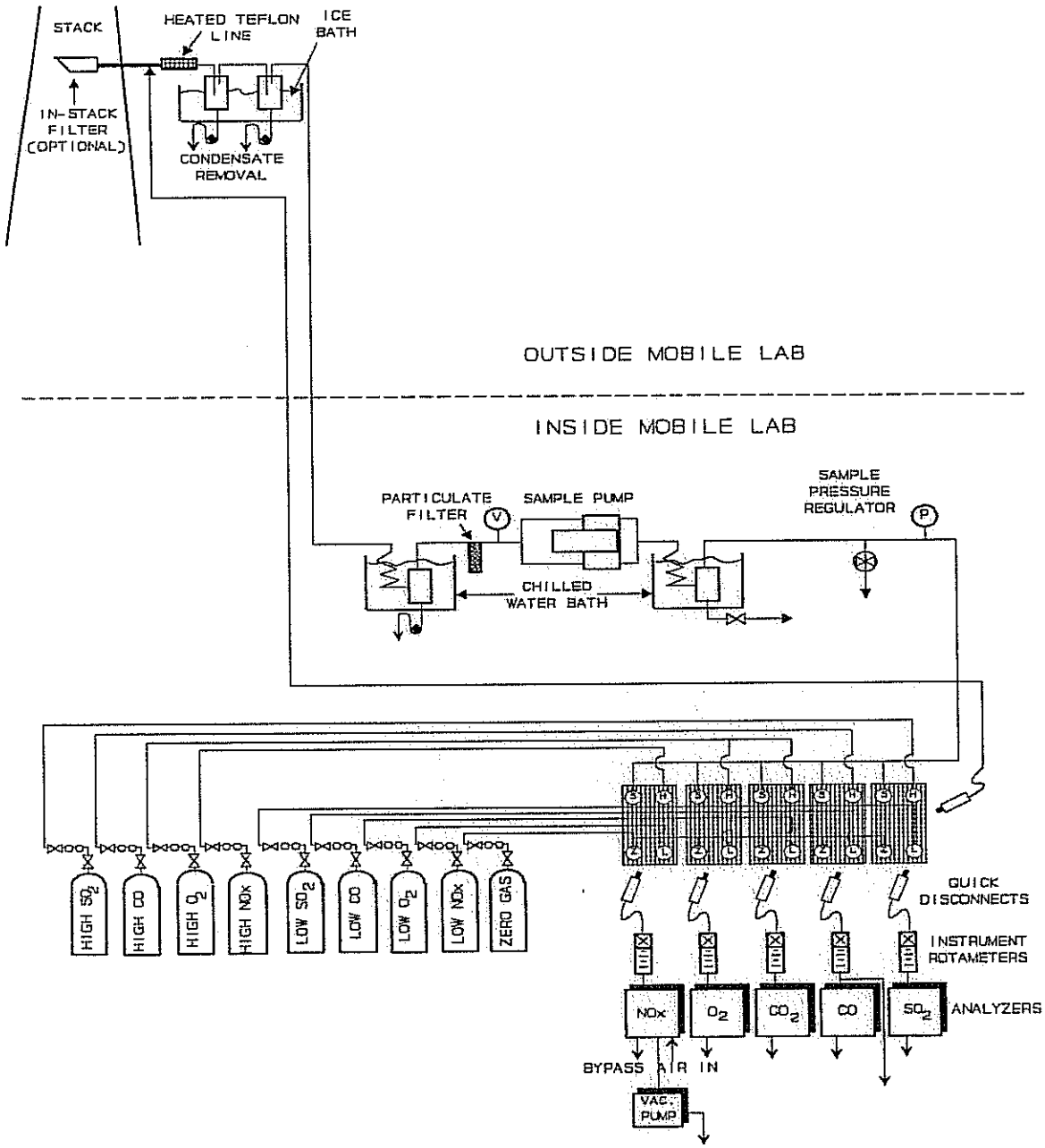
The sample acquisition and conditioning system contains components to extract a representative sample from the stack or flue, transport the sample to the analyzers, and remove moisture and particulate material from the sample. In addition to performing the tasks above, the system must preserve the measured species and deliver the sample for analysis intact. The sample acquisition system extracts the sample through a stainless steel probe. The probe is insulated or heated as necessary to avoid condensation. If the particulate loading in the stack is high, a sintered stainless steel filter is used on the end of the probe.

Where water soluble NO_2 and/or SO_2 are to be measured, the sample is drawn from the probe through a heated teflon sample line into an on-stack cooled (approximately 35-40°F) water removal trap. The trap consists of stainless steel flasks in a bath of ice and water. This design removes the water vapor by condensation. The contact between the sample and liquid water is minimized and the soluble NO_2 and SO_2 are conserved. This system meets the requirements of EPA Method 20. The sample is then drawn through a teflon transport line, particulate filter, secondary water removal and into the sample pump. The pump is a dual head, diaphragm pump. All sample-wetted components of the pump are stainless steel or teflon. The pressurized sample leaving the pump flows through a third condensate trap in a refrigerated water bath ($\approx$38°F) for final moisture removal. A drain line and valve are provided to constantly expel any condensed moisture from the dryer at this point. After the dryer, the sample is directed into a distribution manifold. Excess sample is vented through a back-pressure regulator, maintaining a constant pressure of 5-6 psig to the analyzer rotameters.

The calibration system is comprised of two parts: the analyzer calibration, and the system bias check (dynamic calibration). The analyzer calibration equipment includes pressurized cylinders of certified span gas. The gases used are, as a minimum, certified to 1% by the manufacturer. Where necessary to comply with reference method requirements EPA Protocol 1 gases are used. The cylinders are equipped with pressure regulators which supply the calibration gas to the analyzers at the same pressure and flow rate as the sample. The selection of zero, span, or sample gas directed to each analyzer is accomplished by operation of the sample/calibration selector fittings.

The system bias check is accomplished by transporting the same gases used to zero and span the analyzers to the sample system as close as practical to the probe inlet. This is done either by attaching the calibration gas supply line to the probe top with flexible tubing or by actuation of a solenoid valve located at the sample conditioner inlet (probe exit). The span gas is exposed to the same elements as the sample and the system response is documented. The analyzer indications for the system calibration check must agree within 5% of the analyzer calibration. Values are adjusted and changes/repairs are made to the system to compensate for any difference in analyzer readings. Specific information on the analytical equipment and test methods used is provided in the following pages.

2020-04-28: SSI-023



Schematic of CEM System

2020-04-28: SSI-024

Method:	**Oxygen (O_2) by Continuous Analyzer**
Reference:	EPA 3A, EPA 20, ARB 100, BA ST-14, SCAQMD 100.1
Principle:	A sample is continuously drawn from the flue gas stream, conditioned, and conveyed to the instrument for direct readout of O_2 concentration.
Analyzer:	Teledyne Model 326A
Measurement Principle:	Electrochemical cell
Ranges:	0-5, 0-10, 0-25% O_2
Accuracy:	1% of full scale
Output:	0-100 mV, linear
Interferences:	Halogens and halogenated compounds will cause a positive interference. Acid gases will consume the fuel cell and cause a slow calibration drift.
Response Time:	90% <7 seconds
Sampling Procedure:	A representative flue gas sample is collected and conditioned using the CEM system described previously. If Method 20 is used, that method's specific procedures for selecting sample points are used. Otherwise, stratification checks are performed at the start of a test program to select single or multiple-point sample locations.
Analytical Procedure:	An electrochemical cell is used to measure O_2 concentration. Oxygen in the flue gas diffuses through a Teflon membrane and is reduced on the surface of the cathode. A corresponding oxidation occurs at the anode internally, and an electric current is produced that is proportional to the concentration of oxygen. This current is measured and conditioned by the instrument's electronic circuitry to give an output in percent O_2 by volume.
Special Calibration Procedure:	Te measurement cells used with the O2 instrument have to be replaced on a regular basis. After extended use, the cells tend to produce a nonlinear response. Therefore, a three-point calibration is performed at the start of each test day to check for linearity. If the response is not linear (± 1% of scale), the cell is replaced.

2020-04-28: SSI-025

Method:	**Carbon Dioxide by (CO_2) by Continuous Analyzer**
Reference:	EPA 3A, ARB 100, BA ST-5, SCAQMD 100.1
Principle:	A sample is continuously drawn from the flue gas stream, conditioned, and conveyed to the instrument for direct readout of CO_2 concentration.
Analyzer:	Horiba PIR 2000
Measurement Principle:	Non-dispersive infrared (NDIR)
Accuracy:	1% of full scale
Ranges::	0-5, 0-10, 0-25%
Output:	0-10 mV
Interferences:	A possible interference includes water. Since the instrument receives dried sample gas, this interference is not significant.
Response Time:	1.2 seconds
Sampling Procedure:	A representative flue gas sample is collected and conditioned using the CEM system described previously.
Analytical Procedure:	Carbon dioxide concentrations are measured by short path length non-dispersive infrared analyzers. These instruments measure the differential in infrared energy absorbed from energy beams passed through a reference cell (containing a gas selected to have minimal absorption of infrared energy in the wavelength absorbed by the gas component of interest) and a sample cell through which the sample gas flows continuously. The differential absorption appears as a reading on a scale of 0 to 100%.

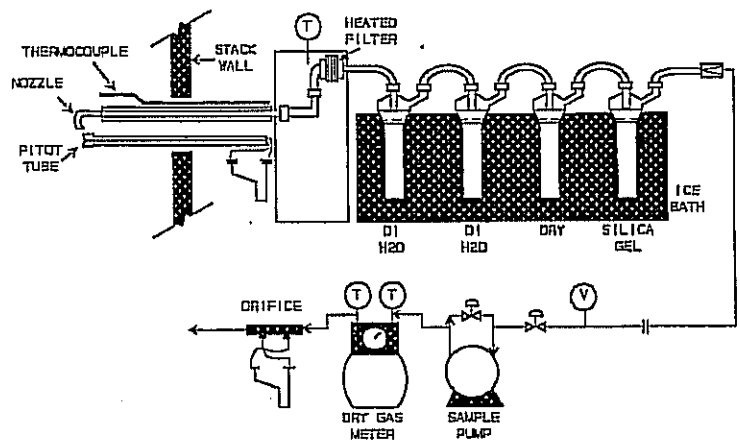
2020-04-28: SSI-026

Method: **Total Particulate by EPA Method 5 with Condensible Analysis**

Reference: EPA Method 5
SCAQMD Method 5.2

Principle: A metered flue gas sample is collected isokinetically and particulates are collected in a heated filter followed by a series of water impingers.

Sampling Procedure: The sample train used in the tests is shown in the following figure. The sample is drawn isokinetically through a nozzle, a stainless steel or glass probe, and a filter in a 250°F temperature-controlled oven. This is followed by two Greenburg-Smith impingers which contain 100 ml of distilled water, an empty impinger as a knock-out, and an impinger containing silica-gel to protect the leak-tight vacuum pump and calibrated dry gas meter from moisture. The impingers collect condensible particulate species while the filter collects any existing as particulate at 250°F.



Sample Train for Determination of Total Particulate by EPA Method 5 with Condensible Analysis

EPA Method 4 (moisture) and Methods 1 and 2 (velocity) are performed in conjunction with the test. Stack velocity is measured during the test to maintain isokinetic sampling and to measure stack flow rate. Moisture concentration is determined by weighing the impingers before and after sampling to determine the amount of moisture collected.

2020-04-28: SSI-027

Sample Recovery and Analysis:

Following testing, the impingers are weighed for moisture determination and the following sample fractions are recovered:

1. Probe, nozzle and front-half glassware - H_2O or acetone wash and brushing
2. Filter
3. Impingers and connecting glassware - water wash

The probe wash is evaporated at low temperatures, baked at 105°C, desiccated and weighed; the filter is baked at 105°C, desiccated and weighed; and the aliquots of the impinger catch are baked at 105°C, desiccated and weighed.

Particulate concentration is determined by dividing the mass of particulate collected by the sample gas volume.

If the sample contains semi-volatile hydrocarbon species that might be lost by evaporating at 105°C, the sample is extracted with methylene chloride to remove those species, and the methylene chloride fraction is evaporated at ambient temperature and weighed.

If there are high concentrations of SO_2 in the gas stream, a positive interference can be caused by oxidation of SO_2 to sulfuric acid in the impingers. In this case, the impinger boildown residue is analyzed for sulfuric acid (either by titration or precipitation) and the acid is subtracted from the particulate catch as $H_2SO_4 \cdot 2H_2O$. Since this fraction includes both SO_2-related "pseudo-particulate" as well as the true particulate species SO_3, a separate test for sulfuric acid mist is run and sulfuric acid mist is added back to the particulate catch as $H_2SO_4 \cdot 2H_2O$.

If interfering species such as NH_3 or HCl are present in the gas, large quantities of pseudo-particulate sulfates and chlorides can be formed. In these cases, special procedures must be used to ensure that erroneously high particulate emission rates are not reported.

2020-04-28: SSI-028

Method:	**Determination of Volatile Organic Compounds (VOCs) by EPA Compendium Method TO-15**
Reference:	EPA Compendium Method TO-15
Principle:	An evacuated canister is filled with flue gas at a constant rate. The tank contents are analyzed by gas chromatography/ mass spectrometry (GC/MS) for VOCs.
Sampling Procedure:	A sample is collected at the source (usually from a stack or vent) into a canister evacuated to 0.05 mm Hg. When the canister is opened to the source containing the VOCs to be sampled, the differential pressure causes the sample to flow into the canister. The flow rate is regulated so that it is constant and the period sampled is one hour if possible. Pitot and temperature measurements of the total stack or vent flow are made.
Analytical Procedure:	The canister is shipped immediately after sampling to the laboratory for analysis. The gaseous sample from the canister is drawn through a multisorbent packing. Next, the sample is thermally desorbed from the packing and backflushed from the trap onto a gas chromatographic column to separate the compounds. Compounds of interest are determined by mass spectrometry. The Avogadro Group, LLC subcontracts TO-15 analysis to qualified local laboratories experienced in the analytical procedures. These laboratories also supply the canisters for sampling.

2020-04-28: SSI-029

Method: **Stack Gas Velocity and Volumetric Flow Rate**

Reference: EPA Method 2, SCAQMD Method 2.1, ARB Method 2

Principle: The average gas velocity in a stack is determined from the measurement of the gas density and from the measurement of the average velocity head using a Type-S (Stausscheibe) Pitot tube.

Sampling Procedure: The velocity head and temperature are measured at traverse points specified by EPA Method 1 or SCAQMD Method 1.1. The velocity is measured using a Type-S Pitot tube and an inclined water manometer. The flow coefficient of the pitot tube is known. Temperature of the gas is measured using a thermocouple. The stack gas molecular weight is determined from independent measurements of O_2, CO_2, and H_2O concentrations.

Sample Analysis and Recovery: The stack gas velocity is determined from the measured average velocity head, the measured average temperature, the measured average duct static pressure, the measured dry concentrations of O_2 and CO_2, and the measured concentration of H_2O. The velocity is determined from the following set of equations:

$$V_S = 2.90 C_p \sqrt{\Delta p T_s \left[\frac{29.92}{P_s}\right]\left[\frac{28.95}{MW_{wet}}\right]} \quad [\text{ ft/s }]$$

Δp = *Velocity/Head, inches* H_2O [in. H_2O]

T_s = *Gas Temperature, degrees R* [R]

P_s = *Absolute Static Pressure* [in Hg]

C_p = *Pitot Flow Coefficient* [unitless]

$$MW_{wet} = \left[(0.44)(\%CO_2)+(0.32)(\%O_2)+(0.28)(\%N_2)\right](1-\frac{\%H_2O}{100})+(18)(\frac{\%H_2O}{100})$$

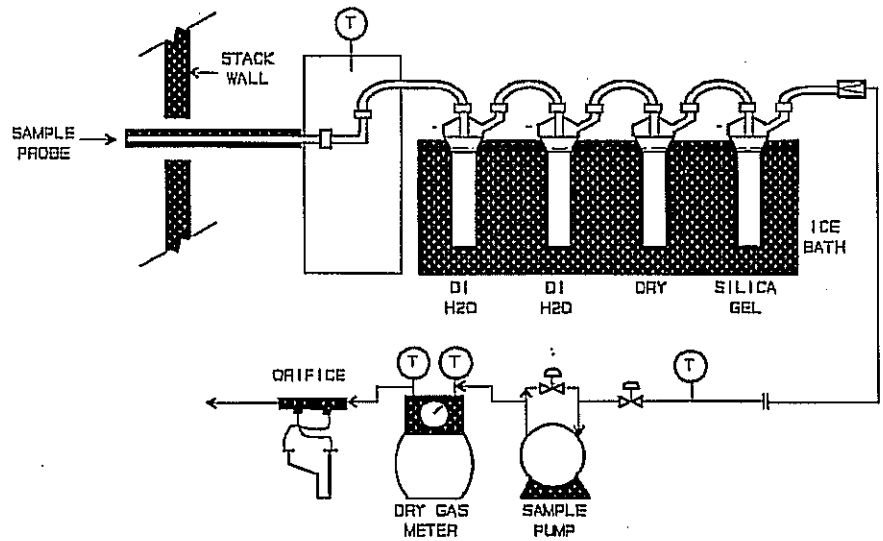
The stack gas volumetric flow rate is determined from the measured stack gas velocity, the area of the stack at the measurement plane, and the measured gas temperature and pressure. The volumetric flow rate is determined from the following set of equations:

$$Q = (V_s)(AREA)(60) \quad [\text{ wacfm }]$$

$$Q_{ws} = Q\left[\frac{T_{ref}}{T_s}\right]\left[\frac{P_s}{29.92}\right] \quad [\text{ wscfm }]$$

$$Q_{sd} = Q_{ws}\left[1-\frac{\%H_2O}{100}\right] \quad [\text{ dscfm }]$$

Method:	**Determination of Moisture in Stack Gases**
Applicable Ref. Methods:	EPA 4, ARB 1-4, SCAQMD 4.1
Principle:	A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined volumetrically or gravimetrically.
Sampling Procedure:	The sample train used in the tests is shown in the following figure. The sample is drawn at a constant rate through a stainless steel probe. The probe is connected to an impinger train by Teflon tubing. The train consists of two Greenburg-Smith impingers which contain 100 ml water, an empty impinger as a knockout, and an impinger containing silica gel to protect the pump from moisture.



Sample Train for Determination of Moisture by EPA Method 4

Sample Recovery and Analysis:	Following testing, moisture content is determined gravimetrically from initial and final impinger weights.

2020-04-28: SSI-031

Method:	**Hydrocarbons by EPA Total Carbon Analysis (TCA) Method**
Reference:	EPA Method 25
Principle:	An evacuated tank, preceded by a cold trap immersed in dry ice, is filled with flue gas at a constant rate. The tank contents are analyzed by gas chromatography for CO, CH_4, CO_2, and non-methane hydrocarbons. The trap contents are analyzed separately for condensable hydrocarbons by combustion and measurement of CO_2.
Sampling Procedure:	A sample is collected at the source (usually from a stack or vent) into an evacuated tank preceded by a cold trap immersed in dry ice. The flow rate is regulated so that it is constant and the period sampled is one hour if possible. Pitot and temperature measurements of the total stack or vent flow are made. During sample collection, the lighter components pass as gases through the trap into the tank. Heavier components condense as liquid and solids in the trap.
Analytical Procedure:	In the analytical phase, tank and trap contents are processed separately. Gaseous carbon compounds from the tank are fractioned on a chromatographic column, eluting in the order: carbon monoxide, methane, carbon dioxide. Carrier-gas flow is then reversed and organic compounds other than methane are eluted off of the column as "back flush." All resulting vapors are passed through oxidizers where they are converted to carbon dioxide and measured by non-dispersive infrared detectors. The Avogadro Group, LLC subcontracts TCA analysis to qualified local laboratories experienced in the analytical procedures. These laboratories also supply the tanks for sampling.

2020-04-28: SSI-032

APPENDIX B
QUALITY ASSURANCE AND CALIBRATION DATA

2020-04-28: SSI-033

APPENDIX B.1
QUALITY ASSURANCE AND ARB CERTIFICATION

2020-04-28: SSL-034

QUALITY ASSURANCE PROGRAM SUMMARY AND CARB CERTIFICATION

The Avogadro Group, LLC (Avogadro) ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA Officer and encompasses seven major areas:

1. Development and use of an internal QA manual.
2. QA reviews of reports, laboratory work, and field testing.
3. Equipment calibration and maintenance.
4. Chain of custody.
5. Continuous training.
6. Knowledge of current test methods.
7. Agency certification.

Each of these areas is discussed individually below.

Quality Assurance Manual. Avogadro has prepared a QA Manual according to EPA guidelines. The manual serves to document and formalize all of Avogadro's QA efforts. The manual is constantly updated, and each employee involved in technical services for emission measurements is required to read and understand its contents. The manual includes details on the other six QA areas discussed below.

QA Reviews. Avogadro's review procedure includes review of each source test report by a project QA Officer, including reviews of laboratory and field work, data sheets, data input, calculations and averages, and report text.

The most important review is the one that takes place before a test program begins. The QA Officer works closely with testing personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of any interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance. The equipment used to conduct the emission measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the California Air Resources Board (CARB). The schedules for maintenance and calibrations are given in Tables B-1 and B-2.

Quality control checks are also conducted in the field for each test program. A partial list of checks made as part of each CEM system test series is included below as an example of the field QA procedures.

- Sample acquisition and conditioning system leak check.
- 2-point analyzer calibrations (all analyzers)
- 3-point analyzer calibrations (analyzers with potential for linearity errors).
- Complete system calibration check ("dynamic calibration" through entire sample system).
- Periodic analyzer calibration checks (once per hour) are conducted at the start and end of each test run. Any changes between pre- and post-test readings are recorded.
- All calibrations are conducted using gases certified by the manufacturer to be + 1% of label value (NBS traceable).
- Calibration and CEM performance data are fully documented, and are included in each source test report.

Chain of Custody. Avogadro maintains full chain of custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Avogadro documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.).

Samples are stored in a locked area to which only laboratory personnel have access. Neither other Avogadro employees nor cleaning crews have keys to this area.

Data sheets are copied immediately upon return from the field, and this first generation copy is placed in locked storage. Any notes made on original sheets are initialed and dated.

Training. Personnel training is essential to ensure quality testing. Avogadro has formal and informal training programs, which include:

1. Attendance at EPA-sponsored training courses.
2. Enrollment in EPA correspondence courses.
3. A requirement for all technicians to read and understand Avogadro's QA Manual.
4. In-house training and QA meetings on a regular basis.
5. Maintenance of training records.

Knowledge of Current Test Methods. With the constant updating of standard test methods and the wide variety of emerging test methods, it is essential that any qualified source tester keep abreast of new developments. Avogadro subscribes to services, which provide updates on EPA and CARB reference methods, and on EPA, CARB and local District rules and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Avogadro personnel maintain membership in the Air and Waste Management Association and in the Source Evaluation Society.

AGENCY CERTIFICATION

Avogadro is certified by the CARB as an independent source test contractor for gaseous and particulate measurements. Avogadro also participates in EPA QA audit programs for Methods 5, 6 and 7.

TABLE B-1
SAMPLING INSTRUMENTS AND EQUIPMENT CALIBRATION SCHEDULE
As Specified by the CARB

Instrument Type	Frequency of Calibration	Standard of Comparison or Method of Calibration	Acceptance Limits
Orifice Meter (large)	12 months	Calibrated dry test meter	± 2% of volume measured
Dry Gas Meter	6 months or when repaired	Calibrated dry test meter	± 2% of volume measured
S-Type Pitot (for use with EPA-type sampling train	6 months	EPA Method 2	Cp constant (+5%) over working range; difference between average Cp for each leg must be less than 2%
Vacuum Gauges Pressure Gauges	6 months	Manometer	± 3%
Field Barometer	2 weeks (or on site)	Mercury barometer	± 0.2" Hg
Temperature Measurement (thermocouples)	6 months	NBS mercury thermometer or NBS calibrated platinum RTD	± 4 F for <400 F ± 1.5% for >400 F
Temperature Readout Devices	6 months	Precision potentiometer	± 2% full scale reading
Analytical Balance	12 months (check prior to each use)	Should be performed by manufacturer or qualified laboratory	± 0.3 mg of stated weight
Probe Nozzles	Each field day	Nozzle diameter check micrometer	Range <± 0.10 mm for three measurements
Continuous Analyzers	Every field day, Depends upon use, frequency and performance	As specified by manufacturers operating manuals, EPA NBS gases and/or reference methods	Satisfy all limits specified in operating specifications

2020-04-28: SSI-038

TABLE B-2
EQUIPMENT MAINTENANCE SCHEDULE
Based on Manufacturer's Specifications and Avogadro's Experience

Equipment	Performance Requirement	Maintenance Interval	Corrective Action
Pumps	1. Absence of leaks 2. Ability to draw manufacturer required vacuum and flow	Every 300 hours of operation or 6 months, whichever is less	1. Visual inspection 2. Clean 3. Replace worn parts 4. Leak check
Flow Measuring Device	1. Free mechanical movement 2. Absence of malfunction	Every 300 hours of operation or 6 months, whichever is less After each test, if used in sampling of corrosive atmospheres (e.g. H_2S)	1. Visual inspection 2. Clean 3. Calibrate
Sampling Instruments	1. Absence of malfunction 2. Proper response to zero, span gas	As required by the manufacturer	As recommended by manufacturer
Integrated Sampling Tanks	Absence of leaks	Depends on nature of use	1. Steam clean 2. Leak check
Mobile Van Sampling Systems	Absence of leaks	Depends on nature of use	1. Change filters 2. Change gas dryer 3. Leak check 4. Check for system contamination
Sampling Lines	Sample degradation less than 2%	After each test or test series	Blow filtered air through line until dry

2020-04-28: SSI-039

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER G-06-011

Relating to Independent Contractor Approval under
Section 91207, Title 17, California Code of Regulations

The Avogadro Group, LLC

WHEREAS, the Air Resources Board (ARB), pursuant to section 41512 of the California Health and Safety Code, has established the procedures contained in sections 91200-91220, title 17, California Code of Regulations, to allow the use of independent testers for compliance tests required by ARB;

WHEREAS, it has been determined that The Avogadro Group, LLC, meets the requirements of ARB for conducting ARB Test Methods 1, 2, 3, 4, 5, 8, 17, 100 (CO, CO_2, NO_X, O_2; SO_2, THC), Visible Emissions Evaluation (VEE), United States Environmental Protection Agency (U.S. EPA) Test Method 201A, determining the condensable using back-half as specified in ARB Test Method 5, and U. S. EPA Test Method 202 pursuant to sections 91200-91220, title 17, California Code of Regulations when the following conditions are met:

1. The Avogadro Group, LLC permanently marks or engraves an identification number on each of its pitot tubes.

2. The Avogadro Group, LLC calibrates its magnehelic gauges after each test series.

3. The Avogadro Group, LLC installs a temperature gauge on the outlet of its continuous sample conditioner.

4. The Avogadro Group, LLC permanently and uniquely identifies each of its probe nozzles used in isokinetic testing.

5. The Avogadro Group, LLC uses a glass frit filter support with a silicone rubber gasket for ARB Test Methods 5 and 8, unless other materials are approved by the Executive Officer.

6. The Avogadro Group, LLC, permanently marks or engraves an identification number on each of their nozzles.

7. The Avogadro Group, LLC reshapes, sharpens, and recalibrates their nozzles before use when they are nicked, dented, or corroded. The Avogadro Group, LLC establishes and maintains a log for the calibrations which shall include notes on the repairs on each nozzle.

2020-04-28: SSI-040

8. The person performing VEE is certified to conduct VEE by a certifying body recognized by ARB at the time of the test.

WHEREAS, ARB's Executive Officer pursuant to Health and Safety Code section 39516 issued Executive Order G-02-008 delegating to the Chief of ARB's Monitoring and Laboratory Division the authority to approve independent testers in accordance with title 17, California Code of Regulations, sections 91200-91220;

NOW, THEREFORE, I, William V. Loscutoff, Chief of ARB's Monitoring and Laboratory Division, order that The Avogadro Group, LLC is granted an approval, from the date of execution of this order, until June 30, 2007 to conduct the tests listed above, subject to compliance with sections 91200-91220, title 17, California Code of Regulations.

BE IT FURTHER ORDERED that during the approved period the Executive Officer or his or her authorized representative may field audit one or more tests conducted pursuant to this order for each type of testing listed above.

Executed at Sacramento, California this 15th day of May 2006.

William V. Loscutoff, Chief
Monitoring and Laboratory Division

2020-04-28: SSI-041

State of California

Air Resources Board

Approved Independent Contractor

The Avogadro Group, LLC

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to section 91207, title 17, California Code of Regulations, until June 30, 2007, for those test methods listed below:

ARB Source Test Methods:
1, 2, 3, 4, 5, 8, 17
100 (CO, CO_2, NO_x, O_2, SO_2, THC)

William V. Loscutoff, Chief
Monitoring and Laboratory Division

2020-04-28 SSI-042

State of California

Air Resources Board

Approved Independent Contractor

The Avogadro Group, LLC

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to section 91207, title 17, California Code of Regulations, until June 30, 2007, for those test methods listed below:

United States Environmental Protection Agency Test Method 201A determining the condensable using back-half as specified in ARB Test Method 5

William V. Loscutoff, Chief
Monitoring and Laboratory Division

State of California

Air Resources Board

Approved Independent Contractor

The Avogadro Group, LLC

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to section 91207, title 17, California Code of Regulations, until June 30, 2007 for those test methods listed below:

Visible Emissions Evaluation

United States Environmental Protection Agency Test Method 202

William V. Loscutoff, Chief
Monitoring and Laboratory Division

APPENDIX B.2
CEMS PERFORMANCE AND CALIBRATION DATA

02-28-2007 11:28:57
File Name: C:\Strata Configs\06178.str

Operator:	Kevin Donahoe
Plant Name:	Schnitzer Steel
Location:	Shredder
Run Length:	30 minutes
Sample Rate:	10 per minute
Average Calibration Results:	0.1 minutes
Automatic Sequence, Calibration Error:	No
Automatic Sequence, System Bias:	No
Max Response Time:	Manual
Max Response Time:	2 minutes
Traverse During Run:	No

Active	Chan.	Analyte Name	Units	Span Units	Span Volts	Offset Volts
Yes	1	O2	%	25	10	0
Yes	2	CO2	%	10	10	0

Measurement System Preparation Table

Gas Name	Reference Cylinder Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
O2	Z	M	H													
CO2	Z	M	H													

2020-04-28: SSI-046

Gas Name	Zero Reference Cylinder No.	Conc	ID Number	Low Reference Cylinder No.	Conc	ID Number
O2	1	0	SA 5884	99	1	
CO2	1	0	SA 5884	99	1	

Gas Name	Mid Reference Cylinder No.	Conc	ID Number	High Reference Cylinder No.	Conc	ID Number
O2	2	15.01	CC 49832	3	19.96	CC 92491
CO2	2	3.08	CC 49832	3	8.51	CC 92491

Seq Num	Calibration Error Test Sequence O2	CO2
1	Zero	Zero
2	High	High
3	Mid	Mid
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Seq Num	Calibration Error Valve Sequence 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	X															
2			X													
3		X														
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

System Bias Check Sequence

Seq Num	O2	CO2
1	Mid	Mid
2	Zero	Zero
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

System Bias Valve Sequence

Seq Num	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1		X														
2	X															
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

STRATA Configuration End

2020-04-28: SSI-048

Calibration Error Test, Run 1 STRATA Version 2.01

	O2 %	CO2 %
02-28-2007 11:23:20	0.034	2.171
02-28-2007 11:24:20	0.047	1.778
02-28-2007 11:25:21	0.060	0.612
02-28-2007 11:26:21	19.609	7.686
02-28-2007 11:27:22	18.612	7.155
02-28-2007 11:28:22	14.861	2.963

Calibration Error Test at Run 1

Operator: Kevin Donahoe
Plant Name: Schnitzer Steel
Location: Shredder

Reference Cylinder Numbers

	Zero	Low-range	Mid-range	High-range
O2	SA 5884		CC 48932	CC 92491
CO2	SA 5884		CC 48932	CC 92491

Date/Time 02-28-2007 11:28:41 PASSED

Analyte	O2	CO2
Units	%	%
Zero Ref Cyl	0.000	0.000
Zero Avg	0.039	0.004
Zero Error%	0.2%	0.0%
Low Ref Cyl		
Low Avg		
Low Error%		
Mid Ref Cyl	15.010	3.080
Mid Avg	14.871	3.003
Mid Error%	0.6%	0.8%
High Ref Cyl	19.960	8.510
High Avg	20.039	8.561
High Error%	0.3%	0.5%

Calibration Error Test End

2020-04-28: SSI-049

Calibration Error Test, Run 2 STRATA Version 2.01

	O2 %	CO2 %
03-01-2007 14:06:49	0.001	-0.068
03-01-2007 14:07:50	12.933	4.564
03-01-2007 14:08:50	19.322	7.833
03-01-2007 14:09:51	14.863	2.956

Calibration Error Test at Run 2

Operator: Kevin Donahoe
Plant Name: Schnitzer Steel
Location: Shredder

Reference Cylinder Numbers

	Zero	Low-range	Mid-range	High-range
O2	SA 5884		CC 48932	CC 92491
CO2	SA 5884		CC 48932	CC 92491

Date/Time 03-01-2007 14:10:40 PASSED

Analyte	O2	CO2
Units	%	%
Zero Ref Cyl	0.000	0.000
Zero Avg	-0.005	-0.002
Zero Error%	0.0%	0.0%
Low Ref Cyl		
Low Avg		
Low Error%		
Mid Ref Cyl	15.010	3.080
Mid Avg	14.879	3.008
Mid Error%	0.5%	0.7%
High Ref Cyl	19.960	8.510
High Avg	19.871	8.520
High Error%	0.4%	0.1%

Calibration Error Test End

2020-04-28: SSI-050

Calibration Error Test, Run 2 STRATA Version 2.01

	O2 %	CO2 %
03-02-2007 11:22:05	13.640	5.403
03-02-2007 11:23:06	17.564	6.169

Calibration Error Test at Run 2

Operator: Kevin Donahoe
Plant Name: Schnitzer Steel
Location: Shredder

	Reference Cylinder Numbers			
	Zero	Low-range	Mid-range	High-range
O2	SA 5884		CC 48932	CC 92491
CO2	SA 5884		CC 48932	CC 92491

Date/Time 03-02-2007 11:23:42 PASSED

Analyte	O2	CO2
Units	%	%
Zero Ref Cyl	0.000	0.000
Zero Avg	0.011	-0.005
Zero Error%	0.0%	0.1%
Low Ref Cyl		
Low Avg		
Low Error%		
Mid Ref Cyl	15.010	3.080
Mid Avg	14.912	2.989
Mid Error%	0.4%	0.9%
High Ref Cyl	19.960	8.510
High Avg	19.847	8.433
High Error%	0.5%	0.8%

Calibration Error Test End

2020-04-28: SSI-051

PRAXAIR

Praxair
5700 South Alameda Street
Los Angeles, CA 90058
Telephone: (323) 585-2154
Facsimile: (714) 542-6689

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER AVOGADRO

P.O NUMBER

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON DIOXIDE GMIS	vs.SRM#1674	CC 95754	5.04 %
OXYGEN GMIS	vs.SRM#2659	SA 3633	15.03 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT CARBON DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N A12-730
   ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 09/15/06
   FIRST ANALYSIS DATE 10/03/06 SECOND ANALYSIS DATE

Z 0.00	R 5.04	C 3.08	CONC. 3.08	Z	R	C	CONC.
R 5.04	Z 0.00	C 3.08	CONC. 3.08	R	Z	C	CONC.
Z 0.00	C 3.08	R 5.04	CONC. 3.08	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	3.08	U/M %		MEAN TEST ASSAY	

2. COMPONENT OXYGEN GMIS ANALYZER MAKE-MODEL-S/N Siemens Oxymat 5E S/N A12-839
   ANALYTICAL PRINCIPLE Paramagnetic LAST CALIBRATION DATE 09/15/06
   FIRST ANALYSIS DATE 10/03/06 SECOND ANALYSIS DATE

Z 0.00	R 15.04	C 15.02	CONC. 15.01	Z	R	C	CONC.
R 15.04	Z 0.00	C 15.02	CONC. 15.01	R	Z	C	CONC.
Z 0.00	C 15.02	R 15.04	CONC. 15.01	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	15.01	U/M %		MEAN TEST ASSAY	

Values not valid below 150 psig

THIS CYLINDER NO. CC 49832
HAS BEEN CERTIFIED ACCORDING TO SECTION EPA-600/R97/121
OF TRACEABILITY PROTOCOL NO. Rev. 9/97
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 10/03/06
EXPIRATION DATE 10/03/09 TERM 36 MONTHS

CERTIFIED CONCENTRATION	
CARBON DIOXIDE	3.08 %
OXYGEN	15.01 %
NITROGEN	BALANCE

ANALYZED BY KING CHEUNG

CERTIFIED BY PHU TIEN NGUYEN

IMPORTANT
Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc. arising out of the use of the information contained herein exceed the fee established for providing such information.

2020-04-28 SSI-052

PRAXAIR

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Facsimile: (714) 542-6689

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER AVOGADRO

P.O NUMBER

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON DIOXIDE GMIS	vs.SRM#2745	HA 8215	9.99 %
OXYGEN GMIS	vsSRM#2659a	CC 199167	21.08 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT CARBON DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N A12-730

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 10/15/06

FIRST ANALYSIS DATE 10/19/06 SECOND ANALYSIS DATE

Z 0.00	R 9.99	C 8.51	CONC. 8.51	Z	R	C	CONC.
R 9.99	Z 0.00	C 8.51	CONC. 8.51	R	Z	C	CONC.
Z 0.00	C 8.51	R 9.99	CONC. 8.51	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	8.51	U/M %		MEAN TEST ASSAY	

2. COMPONENT OXYGEN GMIS ANALYZER MAKE-MODEL-S/N Siemens Oxymat 5E S/N A12-839

ANALYTICAL PRINCIPLE Paramagnetic LAST CALIBRATION DATE 10/15/06

FIRST ANALYSIS DATE 10/19/06 SECOND ANALYSIS DATE

Z 0.00	R 21.08	C 19.96	CONC. 19.96	Z	R	C	CONC.
R 21.08	Z 0.00	C 19.96	CONC. 19.96	R	Z	C	CONC.
Z 0.00	C 19.96	R 21.08	CONC. 19.96	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY	19.96	U/M %		MEAN TEST ASSAY	

Values not valid below 150 psig

THIS CYLINDER NO. CC 92491
HAS BEEN CERTIFIED ACCORDING TO SECTION EPA-600/R97/121
OF TRACEABILITY PROTOCOL NO. Rev. 9/97
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 10/19/06
EXPIRATION DATE 10/19/09 TERM 36 MONTHS

CERTIFIED CONCENTRATION	
CARBON DIOXIDE	8.51 %
OXYGEN	19.96 %
NITROGEN	BALANCE

ANALYZED BY KING CHEUNG

CERTIFIED BY PHU TIEN NGUYEN

IMPORTANT
Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall liability of Praxair Distribution, Inc. arising out of the use of the information contained herein exceed the fee established for providing such information.

APPENDIX B.3
TEST EQUIPMENT CALIBRATION DATA

2020-04-28: 1991-054

The Avogadro Group, LLC

EPA Method 5

522 Series Meter Box Calibration

6 mo. Orifice Calibration

English Meter Box Units, English K' Factor

Average Yd:	1.006
Average dH@:	1.684
Variation of Yd's:	PASS
Variation of ΔH @:	PASS
Vacuum Criteria:	PASS

Meter #: CB-13
Calibrated by: Jimmy Khoury
Date: 02/01/07
Barometric Pressure: 30.04 (in. Hg)
Theoretical Critical Vacuum: 14.17 (in. Hg)

!!!!!!!!
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

dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual -- Ambient Temperature -- Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.28	27.00	416.705	427.000	8.295	58.0	58.0	59.0	59.0	RG 40	0.2385	18.0	52.0	53.0	52.5
0.62	32.00	404.400	416.705	14.305	59.0	59.0	59.0	59.0	RG 46	0.3507	18.0	52.0	53.0	52.5
1.00	14.00	427.000	434.900	7.900	57.0	57.0	57.0	57.0	RG 55	0.4414	18.0	52.0	53.0	52.5
1.90	8.00	434.900	441.015	6.115	62.0	62.0	53.0	53.0	S503	0.6980	18.0	53.0	51.0	52.0
3.30	8.00	441.015	447.125	6.110	53.0	53.0	54.0	54.0	RG 73	0.7915	15.7	52.0	53.0	52.5

RESULTS

DRY GAS METER

VOLUME CORRECTED Vm(std) (cu ft)
8.483
14.528
6.117
6.352
6.358

ORIFICE

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
8.545	8.264
14.892	14.402
8.200	7.931
6.356	6.143
6.302	6.095

DRY GAS METER

CALIBRATION FACTOR Yd

Value (number)	Variation (number)
1.007	0.002
1.018	0.012
1.010	0.005
1.001	-0.005
0.991	-0.014

ORIFICE

CALIBRATION FACTOR dH@

Value (in H2O)	Variation (in H2O)
1.608	-0.077
1.645	-0.039
1.681	-0.003
1.750	0.066
1.737	0.053

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 H2O 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: John Kelly For Jimmy Khoury

Date: 2/01/07

2020-04-28: SSI-055

The Avogadro Group, LLC

EPA Method 5
522 Series Meter Box Calibration
6 mo. Orifice Calibration
English Meter Box Units, English K' Factor

Average Yd 0.986
Average dH@ 1.813
Variation of Yd's PASS
Variation of ΔH@ PASS

Meter #: CB 14
Calibrated by: TIMO
Date: 02/05/07
Barometric Pressure: 30.21 (in. Hg)
Theoretical Critical Vacuum: 14.25 (in. Hg)

!!!!!!!
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			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)
0.33	17.00	174.821	180.196	5.375	50.0	50.0	54.0	54.0	RG 46	0.2385	17.5	52.5	53.5	53.0
0.68	15.00	180.196	188.962	8.766	55.0	55.0	57.0	57.0	RG 48	0.3507	17.5	53.5	55.0	54.3
1.10	13.00	186.962	194.441	7.479	57.0	57.0	59.0	59.0	RG 65	0.4414	17.5	55.0	56.5	55.8
1.90	8.00	194.441	200.730	6.289	59.0	59.0	61.0	61.0	SS63	0.5986	17.5	56.5	56.5	56.5
3.40	6.00	200.730	206.927	6.197	61.0	61.0	61.0	61.0	RG 73	0.7915	17.5	55.0	56.6	55.8

RESULTS

DRY GAS METER	ORIFICE		DRY GAS METER		ORIFICE	
VOLUME CORRECTED	VOLUME CORRECTED	VOLUME NOMINAL	CALIBRATION FACTOR Yd		CALIBRATION FACTOR dH@	
Vm(std) (cu ft)	Vcr(std) (cu ft)	Vcr (cu ft)	Value (number)	Variation (number)	Value (in H2O)	Variation (in H2O)
5.599	5.408	5.208	0.966	-0.020	1.918	0.097
6.999	7.008	6.783	1.001	0.016	1.811	-0.002
7.715	7.633	7.387	0.989	0.004	1.847	0.034
6.475	6.366	6.170	0.983	-0.002	1.731	-0.082
6.391	6.317	6.114	0.988	0.003	1.765	-0.047

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: Timothy Owe

Date: 2-5-07

2020-04-28: SSI-056

The Avogadro Group, LLC

Pitot Tube Calibration Data Sheet

Calibration Date:	12/5/06	Performed by :	JP,DM	Pbar =	28.2
Calibration Tube:	Standard	ID Number	STD-1	5/16 O.D.	Cp(std)=0.99
Pitot Tube	S-Type	ID Number	10 (AP-5-1)	Condition:	Good

A-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.89	1.35	0.8038	0.0000
Run 2	0.89	1.35	0.8038	0.0000
Run 3	0.89	1.35	0.8038	0.0000
Avg.			0.8038	0.0000

B-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.88	1.35	0.7993	0.0000
Run 2	0.88	1.35	0.7993	0.0000
Run 3	0.88	1.35	0.7993	0.0000
Avg.			0.7993	0.0000

[a] $C_{p(s)}$ = Cp(std) * Sq.root(ΔPstd'/ΔPs')

[b] DEV. = $C_{p(S)}$-$C_{p'}$ (must be ≤ 0.01)

$C_p(A)$-$C_p(B)$ = 0.0045 (must be ≤ 0.01)

2020-04-28: SSI-057

The Avogadro Group, LLC

Pitot Tube Calibration Data Sheet

Calibration Date:	12/5/06	Performed by :	JP,DM	Pbar =	28.26
Calibration Tube:	Standard	ID Number	STD-1	5/16 O.D.	Cp(std)=0.99
Pitot Tube	S-Type	ID Number	12 (AP-4-7)	Condition:	Good

A-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.88	1.30	0.8145	0.0000
Run 2	0.88	1.30	0.8145	0.0000
Run 3	0.88	1.30	0.8145	0.0000
Avg.			0.8145	0.0000

B-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.88	1.25	0.8307	0.0000
Run 2	0.88	1.25	0.8307	0.0000
Run 3	0.88	1.25	0.8307	-0.0161
Avg.			0.8307	-0.0054

[a] $C_{p(s)}$ = Cp(std) * Sq.root(ΔPstd'/ΔPs')

[b] DEV. = $C_{p(S)}$-C_p, (must be ≤ 0.01)

C_p(A)-C_p(B) = -0.0161 (must be ≤ 0.01)

2020-04-28: SSI-058

The Avogadro Group, LLC

Pitot Tube Calibration Data Sheet

Calibration Date:	12/5/06	Performed by :	JP,DM	Pbar =	28.26
Calibration Tube:	Standard	ID Number	STD-1	5/16 O.D.	Cp(std)=0.99
Pitot Tube	S-Type	ID Number	47 (AP-4-2)	Condition:	Good

A-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.88	1.30	0.8145	0.0000
Run 2	0.88	1.30	0.8145	0.0000
Run 3	0.88	1.30	0.8145	0.0000
Avg.			0.8145	0.0000

B-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.88	1.30	0.8145	0.0000
Run 2	0.88	1.30	0.8145	0.0000
Run 3	0.88	1.30	0.8145	0.0000
Avg.			0.8145	0.0000

[a] $C_{p(s)}$ = Cp(std) * Sq.root(ΔPstd'/ΔPs')

[b] DEV. = $C_{p(s)}$-C_p, (must be ≤ 0.01)

C_p(A)-C_p(B) = 0.0000 (must be ≤ 0.01)

2020-04-28: SSI-059

The Avogadro Group, LLC

Pitot Tube Calibration Data Sheet

Calibration Date:	12/5/06	Performed by :	JP,DM	Pbar =	28.26
Calibration Tube:	Standard	ID Number	STD-1	5/16 O.D.	Cp(std)=0.99
Pitot Tube	S-Type	ID Number	48 (AP-4-3)	Condition:	Good

A-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.89	1.30	0.8191	0.0000
Run 2	0.89	1.30	0.8191	0.0000
Run 3	0.89	1.30	0.8191	0.0000
Avg.			0.8191	0.0000

B-side Calibration

	$\Delta P_{std'}$ cm(in.) H_2O	$\Delta P_{s'}$ cm(in.) h_2O	$C_{p(s)}$ [a]	DEV.[b]
Run 1	0.89	1.30	0.8191	0.0000
Run 2	0.89	1.30	0.8191	0.0000
Run 3	0.89	1.30	0.8191	0.0000
Avg.			0.8191	0.0000

[a]$C_{p(s)}$ = Cp(std) * Sq.root(ΔPstd'/ΔPs')

[b]DEV. = $C_{p(S)}$-C_p, (must be ≤ 0.01)

C_p(A)-C_p(B) = 0.0000 (must be ≤ 0.01)

2020-04-28: SSI-060

APPENDIX C
DATA SHEETS

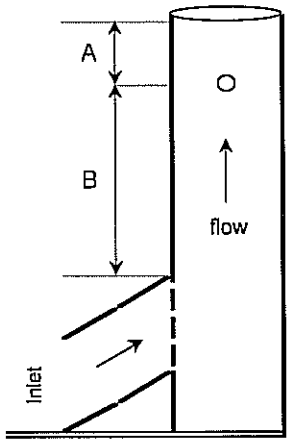
2020-04-28: 8-61-061

APPENDIX C.1
SAMPLE LOCATION

2020-04-28: 691-062

Schnitzer Steel Industries: Shredder
TRAVERSE POINT LAYOUT (PARTICULATE)
CIRCULAR STACKS OVER 24 INCHES

Stack diameter:	47.5	*inches*
Upstream diameter (A):	33.5	*inches*
Downstream diameter (B):	139.0	*inches*
Port length:	0.00	*inches*
Number of ports being used:	2	*see note*
Equivalent upstream diameter (A):	0.705	*Pass*
Equivalent downstream diameter (B):	2.926	*Pass*
All points at least 1.0" from stack wall:	0.998	*Fail - relocate*
Total points:	24	
Points per port:	12	

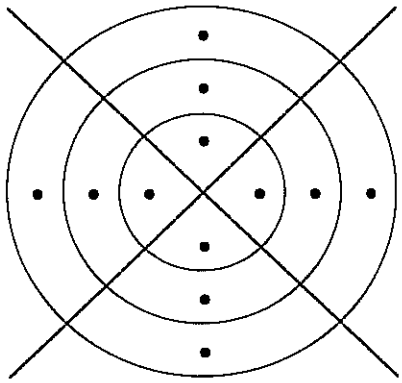


Typical vertical exhaust stack

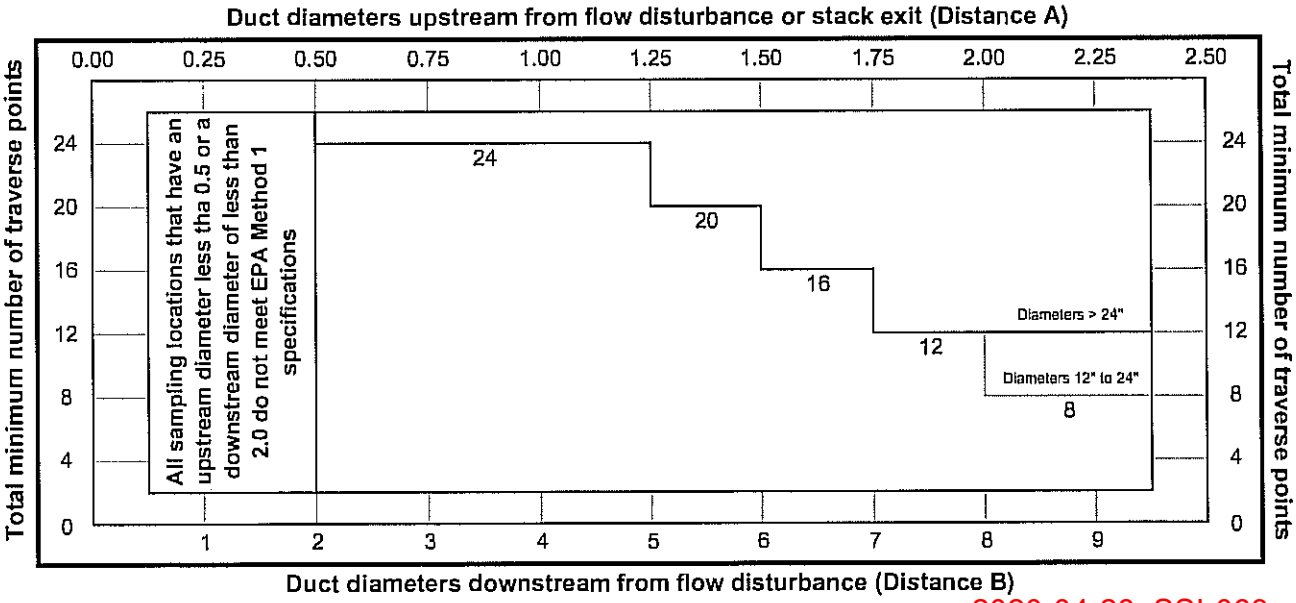
Point	% Diameter	Inside wall Distance (in)	Outside port Distance (in)
1	2.1	1.0	1.0
2	6.7	3.2	3.2
3	11.8	5.6	5.6
4	17.7	8.4	8.4
5	25.0	11.9	11.9
6	35.6	16.9	16.9
7	64.4	30.6	30.6
8	75.0	35.6	35.6
9	82.3	39.1	39.1
10	88.2	41.9	41.9
11	93.3	44.3	44.3
12	97.9	46.5	46.5

Note: No traverse point shall be within 1.0" of the stack walls (see Sections 11.3.1)

DUCT AREA = 12.306 ft^3



Example: Location of 12 points



2020-04-28: SSI-063

APPENDIX C.2
PROCESS DATA

2020-04-28: GSI-064

SCHNITZER STEEL PRODUCTS
OAKLAND, CA
AIR SOURCE TEST
02/28/07 - 03/02/07

SAMPLING EVENT	DATE	AVG THROUGHPUT	AVG H20 INJECTION MILL	% Fresh	% Recycle *	AVG SCRUBBER H20 INJECTION **
TOC/PM/Benz Run 1	02/28/07	[redacted] Tons/hr	[redacted] gal/min	[redacted]	[redacted]	80 gal/min
TOC/PM/Benz Run 2	02/28/07	[redacted] Tons/hr	[redacted] gal/min	[redacted]	[redacted]	80 gal/min
TOC/PM/Benz Run 3	02/28/07	[redacted] Tons/hr	[redacted] gal/min	[redacted]	[redacted]	80 gal/min
PCB/Hex Cr Run 1	03/01/07	[redacted] Tons/hr	[redacted] gal/min	[redacted]	[redacted]	80 gal/min
PCB/Hex Cr Run 2	03/02/01	[redacted] Tons/hr	[redacted] gal/min	[redacted]	[redacted]	80 gal/min
PCB/Hex Cr Run 3	03/02/01	[redacted] Tons/hr	[redacted] gal/min	[redacted]	[redacted]	80 gal/min

* Recycle H20 composed primarily of scrubber water recirculation as no significant stormwater generated during tests
** Scrubber receives fresh H20 only

2020-04-28: SSI-065

APPENDIX C.3
AVOGADRO CEMS DATA

2020-04-28: 661-066

Test Run 1 STRATA Version 2.01

	O2 %	CO2 %	
Start Averaging			
02-28-2007 13:04:18	0.043	-0.003	
02-28-2007 13:05:19	0.047	-0.002	
Average 23 samples	0.047	-0.004	— zero
02-28-2007 13:06:19	2.015	0.283	
Start Averaging			
02-28-2007 13:07:20	14.949	2.992	
Average 11 samples	14.952	2.997	— span (mid)
02-28-2007 13:08:20	14.876	2.989	
02-28-2007 13:09:21	14.809	2.977	
Start Averaging			
02-28-2007 13:10:21	20.689	0.251	
Average 11 samples	20.691	0.176	— 1-PM bag
02-28-2007 13:11:15	16.497	0.145	
02-28-2007 13:12:16	4.215	0.037	
Start Averaging			
02-28-2007 13:13:16	20.784	0.155	
Average 11 samples	20.786	0.153	— 2-PM bag
02-28-2007 13:14:17	6.511	0.046	
Start Averaging			
02-28-2007 13:15:17	14.138	0.089	
02-28-2007 13:16:18	20.792	0.142	
Average 14 samples	20.791	0.145	— 3-PM bag

Operator: Kevin Donahoe
Plant Name: Schnitzer Steel
Location: Shredder
Test Run 1 End

2020-04-28: SSI-067

Test Run 2 STRATA Version 2.01

	O2 %	CO2 %
03-01-2007 14:17:39	11.122	0.051
03-01-2007 14:18:40	20.508	0.088
Start Averaging		
03-01-2007 14:19:40	20.517	0.081
Average 10 samples	20.509	0.087
03-01-2007 14:20:40	12.968	0.057

- 1- Cr, PCB

Operator: Kevin Donahoe
Plant Name: Schnitzer Steel
Location: Shredder
Test Run 2 End

2020-04-28: SSI-068

Test Run 3 STRATA Version 2.01

	O2 %	CO2 %
03-02-2007 11:25:43	4.074	0.009
Start Averaging		
03-02-2007 11:26:44	20.460	0.113
Average 12 samples	20.462	0.111 - 2,3Cc, PCB

Operator: Kevin Donahoe
Plant Name: Schnitzer Steel
Location: Shredder
Test Run 3 End

2020-04-28: SSI-069

APPENDIX C.4
PARTICULATE MATTER FIELD DATA SHEETS

2020-04-28: GSI-070

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: SCHNITZER STEEL | UNIT: SH REDDER | TEST NO.: 1-PM | METHOD: 5/202 | PAGE 1 OF 2
SAMPLE LOCATION: Stack | TEST CONDITION: Full | AMB. TEMP., °F: | PROJECT #: 06178.0
OPERATOR/ASSISTANT: CA / ES | METER VOL. (START/END): / | DATE: 2-28-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.85
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2::	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	60
Per point:	2.5
Total of Traverse Points:	24 ~~12~~
ΔH = 5.06 x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	CB-14
	Yd value:	0.986
	ΔH@ value:	1.812
Pitot:	ID #:	048
	Cp value:	0.8191
Probe:	ID #:	048
	Material:	GLASS
Nozzle:	Diameter:	0.271
	Material:	GLASS
Filter:	Number:	5736
	Material:	GLASS

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	DI H_2O	711.0	679.8	31.2
#2	DI H_2O	668.0	667.4	0.6
#3	MT	511.2	510.3	0.9
#4	SILICA GEL	771.9	763.6	8.3
#5	Line Rinse	0.0	20.0	-20.0
#6				
#7				

POST TEST INFO: Total Weight Gain: =
Filter Appearance: Clean
Condensate Appearance: Clear
Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.002	15	OK	CA
Post-Test:	.001	4	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in	STATIC PRESS
12	9:00	0.29	1.46	347.548	74	—	53	257	250	49	—	3	-0.14
11	9:02 30	0.29	1.46	349.21	76		58	255	256	49		3	
10	9 05	0.30	1.57	350.93	75		58	254	255	49		3	
9	9 07 30	0.30	1.57	352.57	78		59	255	254	49		3	
8	9 10	0.31	1.56	354.22	81		60	255	254	49		3	
7	9 12 30	0.31	1.56	355.96	81		60	252	255	49		3	
6	9 15	0.28	1.41	357.84	80		62	254	255	50		3	
5	9 17 30	0.26	1.31	359.42	81		62	255	254	50		2	
4	9 20	0.23	1.16	361.05	81		63	254	254	50		1.5	
3	9 22 30	0.19	0.96	362.60	79		63	255	255	50		1.0	
2	9 25	0.18	0.91	364.14	77		63	254	254	50		1.0	
1	9 27 30	0.18	0.91	365.26	76		63	255	254	50		1.0	
PAUSE	9 30			366.581									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded: CA
Impingers Recovered: KD
Filter Loaded: KD
Filter Recovered: KD
Probe Wash: CA

TEST SUMMARY

Calculated by: KD
Checked by:
Sample Volume, ft^3: 38.830
Water Collected, g: 21.0
Meter Temperature, °F: 61.7
Meter Pressure (ΔH), iwg: 1.35
Velocity (ΔP rms), iwg: 0.2643
Stack Pressure., iwg: -0.14
Stack Temperature, °F: 79.1
O_2 / CO_2: 20.691 / 0.176
Comments:

2020-04-28: SSI-071

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT Schnitzer Steel | UNIT Shredder | TEST NO. 1-pm | METHOD 5 | PAGE 2 OF 2
SAMPLE LOCATION | TEST CONDITION | AMB. TEMP., °F | PROJECT # 06178.0
OPERATOR/ASSISTANT CA / ES | METER VOL. (START/END) / | DATE 2-28-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:
Assumed Stack Pressure:
Assumed Moisture Content:
Assumed O_2 / CO_2::
Assumed ΔP:
Assumed ΔH:
Stack Diameter, Inches:
Sample Time: Total:
Per point:
Total of Traverse Points:
ΔH = 5.06 x ΔP

EQUIPMENT INFO:

Meter: ID #:
Yd value:
ΔH@ value:
Pitot: ID #:
Cp value:
Probe: ID #:
Material:
Nozzle: Diameter:
Material:
Filter: Number:
Material:

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
# 1				=
# 2				=
# 3				=
# 4	SEE PAGE 1			=
# 5				=
# 6				=
# 7				=

POST TEST INFO: Total Weight Gain: =
Filter Appearance:
Condensate Appearance:
Silica Gel Spent? (Y/N):

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in	STATIC PRESS
12	9 33	0.26	1.31	366.581	78	—	61	254	255	50	—	1.5	-0.14
11	9 35 30	0.26	1.31	368.14	79		61	254	254	50		1.5	
10	9 38	0.30	1.57	369.70	81		62	255	255	50		2.5	
9	9 40 30	0.30	1.57	371.20	81		62	255	256	50		2.5	
8	9 43	0.31	1.56	373.15	80		63	256	256	50		2.5	
7	9 45 30	0.31	1.56	374.96	80		63	256	256	50		2.5	
6	9 48	0.32	1.61	376.74	81		64	256	255	50		2.5	
5	9 50 30	0.31	1.56	378.46	80		64	255	256	50		2.5	
4	9 53	0.28	1.41	380.26	80		64	254	255	50		2.5	
3	9 55 30	0.26	1.31	381.98	79		64	255	254	50		2.0	
2	9 58	0.21	1.06	383.69	80		64	254	256	50		0.5	
1	10 00 30	0.16	0.80	385.10	80		64	250	251	50		0.5	
END	10 03			386.378									

CHAIN OF CUSTODY INFORMATION
Impingers Loaded:
Impingers Recovered:
Filter Loaded:
Filter Recovered:
Probe Wash:
TEST SUMMARY
Calculated by:
Checked by:
Sample Volume, ft^3:
Water Collected, g:
Meter Temperature, °F:
Meter Pressure (ΔH), iwg:
Velocity (ΔP rms), iwg:
Stack Pressure., iwg:
Stack Temperature, °F:
O_2 / CO_2:
Comments:

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SAMPLE TRAIN TEST DATA

CLIENT: SCHNITZER STEEL
SAMPLE LOCATION:
OPERATOR/ASSISTANT: CA/ES

UNIT: SHREDDER
TEST NO.: 2-PM
METHOD: 5
TEST CONDITION: FULL
AMB. TEMP., °F:
METER VOL. (START/END): /

PAGE 1 OF 1
PROJECT # 06178.0
DATE 2-28-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.85
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	60
Per point:	2.5
Total of Traverse Points:	24
ΔH =	5.26 x ΔP

EQUIPMENT INFO:

Meter:	ID #:	CB-14
	Yd value:	0.986
	ΔH@ value:	1.813
Pitot:	ID #:	048
	Cp value:	0.8191
Probe:	ID #:	048
	Material:	GLASS
Nozzle:	Diameter:	0.271
	Material:	GLASS
Filter:	Number:	8645
	Material:	GLASS

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	DI H_2O	660.1	635.5	25.4
#2	DI H_2O	618.4	621.1	2.7
#3	MT	524.5	525.1	0.6
#4	SILICA GEL	734.1	742.3	8.2
#5	LINE RINSE	0.0	20.0	-20.0
#6				
#7				

POST TEST INFO: Total Weight Gain: = 16.9
Filter Appearance: Clean
Condensate Appearance: Clear
Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.004	20	OK	CA
Post-Test:	.001	3	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS.
12	10 38	0.26	1.21	386.863	80	—	59	250	250	49	—	1	-0.13
11	10 35 30	0.29	1.46	388.40	80		59	254	251	49		1	
10	10 38	0.30	1.51	389.96	80		60	254	257	49		1.5	
9	10 40 30	0.30	1.51	391.66	81		60	255	254	49		1.5	
8	10 43	0.29	1.46	393.41	81		61	254	256	49		1.0	
7	10 45 30	0.29	1.46	395.15	81		61	254	255	49		1.0	
6	10 48	0.30	1.57	396.82	81		62	255	256	49		1.0	
5	10 50 30	0.30	1.57	398.55	79		61	254	255	50		1.0	
4	10 53	0.29	1.46	400.31	78		61	255	254	50		1.0	
3	10 55 30	0.26	1.21	402.03	77		62	254	255	50		0.5	
2	10 58	0.22	1.11	403.64	74		62	256	255	50		0.5	
1	11 00 30	0.16	0.80	405.17	75		62	257	254	50		0.5	
PAUSE	11 03			406.437									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	CA
Impingers Recovered:	KD
Filter Loaded:	KD
Filter Recovered:	KD
Probe Wash:	CA/ES
TEST SUMMARY	
Calculated by:	KD
Checked by:	
Sample Volume, ft^3:	40.281
Water Collected, g:	16.9
Meter Temperature, °F:	62.3
Meter Pressure (ΔH), iwg:	1.40
Velocity (ΔP rms), iwg:	0.2775
Stack Pressure., iwg:	-0.13
Stack Temperature, °F:	79.8
O_2 / CO_2:	20.786 / 0.153
Comments:	

2020-04-28. SSI-073

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SAMPLE TRAIN TEST DATA

CLIENT Schnitzer Steel | UNIT Shredder | TEST NO. 2-PM | METHOD 5 | PAGE 2 OF 2

SAMPLE LOCATION | TEST CONDITION | AMB. TEMP., °F | PROJECT # 06178.0

OPERATOR/ASSISTANT CA / ES | METER VOL. (START/END) / | DATE 2-28-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:
Assumed Stack Pressure:
Assumed Moisture Content:
Assumed O_2 / CO_2::
Assumed ΔP:
Assumed ΔH:
Stack Diameter, inches:
Sample Time: Total:
Per point:
Total of Traverse Points:
ΔH = 5.06 x ΔP

EQUIPMENT INFO:

Meter: ID #:
Yd value:
ΔH@ value:
Pitot: ID #:
Cp value:
Probe: ID #:
Material:
Nozzle: Diameter:
Material:
Filter: Number:
Material:

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1			=	
#2			=	
#3			=	
#4			=	
#5			=	
#6			=	
#7			=	

SEE PAGE 1

POST TEST INFO: Total Weight Gain: =
Filter Appearance:
Condensate Appearance:
Silica Gel Spent? (Y/N):

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in	STATIC PRESS
12	11 06	0.30	1.51	406.437	80	—	63	256	254	50	—	1	
11	11 08 30	0.31	1.56	408.22	80		63	255	255	50		1	
10	11 11	0.33	1.66	409.94	80		63	254	256	50		1.5	
9	11 13 30	0.33	1.66	411.73	81		63	255	256	50		1.5	
8	11 16	0.33	1.66	413.60	81		63	254	255	50		1.5	
7	11 18 30	0.34	1.72	415.47	81		64	255	256	51		2.0	
6	11 21	0.33	1.66	417.32	81		64	256	256	51		2.0	
5	11 23 30	0.29	1.46	419.18	81		64	256	255	51		1.5	
4	11 26	0.25	1.26	420.01	80		64	256	255	51		1.0	
3	11 28 30	0.21	1.06	422.71	80		65	254	254	51		0.5	
2	11 31	0.21	1.06	424.20	80		65	255	255	51		0.5	
1	11 33 30	0.22	1.11	425.50	80		65	254	256	51		2.0	
END	11 36			427.144									

CHAIN OF CUSTODY INFORMATION
Impingers Loaded:
Impingers Recovered:
Filter Loaded:
Filter Recovered:
Probe Wash:
TEST SUMMARY
Calculated by:
Checked by:
Sample Volume, ft^3:
Water Collected, g:
Meter Temperature, °F:
Meter Pressure (ΔH), iwg:
Velocity (ΔP rms), iwg:
Stack Pressure., iwg:
Stack Temperature, °F:
O_2 / CO_2:
Comments:

2020-04-28: SSI-074

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: Schnitzer Steel
SAMPLE LOCATION:
OPERATOR/ASSISTANT: CA / ES

UNIT: Shredder
TEST NO.: 3-PM
METHOD: 5/202
TEST CONDITION: Normal
AMB. TEMP., °F:
METER VOL. (START/END):

PAGE 1 OF 2
PROJECT # 06178.0
DATE 2-26-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.88
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	60
Per point:	2.5
Total of Traverse Points:	24
ΔH = 5.06 x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	CB-14
	Yd value:	0.9860
	ΔH@ value:	1.813
Pitot:	ID #:	048
	Cp value:	0.8191
Probe:	ID #:	048
	Material:	Pyrex
Nozzle:	Diameter:	0.271
	Material:	Pyrex
Filter:	Number:	5725
	Material:	Glass Fiber

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	DI H_2O	680.7	652.0	28.7
#2	DI H_2O	658.7	658.8	-0.1
#3	DI H_2O	511.1	510.9	0.2
#4	Silica	779.0	777.7	1.3
#5	Line Rinse	0.0	20.0	-20.0
#6				
#7				

POST TEST INFO: Total Weight Gain: 16.1
Filter Appearance: Clean
Condensate Appearance: Clear
Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.002	15	OK	CA
Post-Test:	.001	4	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS.
12	12 06	0.32	1.61	427.662	80		61	250	250	50		2.5	-0.14
11	12 08 30	0.29	1.46	429.47	82		63	254	256	50		2.0	
10	12 11	0.31	1.56	431.24	82		63	256	256	50		2.5	
9	12 13 30	0.31	1.56	432.96	82		63	254	255	50		2.5	
8	12 16	0.33	1.66	434.73	82		65	253	256	50		3.0	
7	12 18 30	0.34	1.72	436.69	82		66	254	255	51		3.0	
6	12 21	0.34	1.72	438.44	81		66	253	254	50		3.0	
5	12 23 30	0.31	1.56	440.39	81		66	254	254	50		2.5	
4	12 26	0.29	1.46	442.21	80		66	255	255	50		2.5	
3	12 28 30	0.29	1.46	444.01	79		66	256	254	50		2.5	
2	12 31	0.26	1.31	445.63	81		67	255	256	51		2.0	
1	12 33 30	0.23	1.16	447.34	79		67	255	256	51		1.5	
PAUSE	12 36			448.796									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	KD
Impingers Recovered:	KD
Filter Loaded:	KD
Filter Recovered:	KD
Probe Wash:	CA / ES
TEST SUMMARY	
Calculated by:	KD
Checked by:	
Sample Volume, ft^3:	42.047
Water Collected, g:	16.1
Meter Temperature, °F:	65.0
Meter Pressure (ΔH), iwg:	1.51
Velocity (ΔP rms), iwg:	0.2968
Stack Pressure., iwg:	-0.14
Stack Temperature, °F:	80.4
O_2 / CO_2:	20.791 / 0.145
Comments:	

2020-04-28: SSI-075

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT Schnitzer Steel | UNIT Shredder | TEST NO. 3-PM | METHOD 5/202 | PAGE 2 OF
SAMPLE LOCATION | TEST CONDITION | AMB. TEMP., °F | PROJECT # 06178.0
OPERATOR/ASSISTANT GA / ES | METER VOL. (START/END) / | DATE 2-28-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2::	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	
Sample Time: Total:	
Per point:	
Total of Traverse Points:	
ΔH = 5.06 x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	
	Yd value:	
	ΔH@ value:	
Pitot:	ID #:	
	Cp value:	
Probe:	ID #:	
	Material:	
Nozzle:	Diameter:	
	Material:	
Filter:	Number:	
	Material:	

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1				=
#2				=
#3				=
#4				=
#5				=
#6				=
#7				=

SEE PAGE 1

POST TEST INFO: Total Weight Gain: =
Filter Appearance:
Condensate Appearance:
Silica Gel Spent? (Y/N):

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in	STATIC PRESS
12	12 38	0.32	1.61	448.796	75	—	66	256	255	51	—	2.0	
11	12 40 30	0.29	1.46	450.60	75		65	255	256	51		1.5	
10	12 43	0.32	1.61	452.25	78		65	254	256	51		1.0	
9	12 45 30	0.30	1.51	454.07	81		65	255	256	51		1.0	-0.13
8	12 48	0.31	1.66	455.91	83		64	256	255	51		2.0	
7	12 50 30	0.32	1.61	457.70	82		64	255	255	51		2.0	
6	12 53	0.35	1.77	459.44	80		65	254	255	51		2.5	
5	12 55 30	0.32	1.61	461.34	80		65	254	255	51		2.5	
4	12 58	0.29	1.46	463.10	81		65	253	254	51		2.0	
3	13 00 30	0.26	1.31	464.80	82		65	253	254	51		2.0	
2	13 03	0.24	1.21	466.63	82		66	254	254	51		2.0	
1	13 05 30	0.21	1.06	468.24	80		65	250	251	51		1.0	
END	13 08			469.709									

CHAIN OF CUSTODY INFORMATION	
Impingers Loaded:	
Impingers Recovered:	
Filter Loaded:	
Filter Recovered:	
Probe Wash:	
TEST SUMMARY	
Calculated by:	
Checked by:	
Sample Volume, ft^3:	
Water Collected, g:	
Meter Temperature, °F:	
Meter Pressure (ΔH), iwg:	
Velocity (ΔP rms), iwg:	
Stack Pressure., iwg:	
Stack Temperature, °F:	
O_2 / CO_2:	
Comments:	

2020-04-28: SSI-076

APPENDIX C.5
HEXAVALENT CHROMIUM FIELD DATA SHEETS

2020-04-28: 691-077

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: Schnitzer Steel
UNIT: Shredder
TEST NO.: 1-Cr
METHOD: CARB 425
PAGE 1 OF 2
SAMPLE LOCATION: Stack
TEST CONDITION: Normal
AMB. TEMP., °F:
PROJECT #: 04178.0
OPERATOR/ASSISTANT: CA / ES
METER VOL. (START/END): /
DATE: 3/1/07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.90
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	120
Per point:	5
Total of Traverse Points:	24
ΔH = 4795.06 x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	CB-14
	Yd value:	0.986
	ΔH@ value:	1.813
Pilot:	ID #:	048
	Cp value:	0.8191
Probe:	ID #:	048
	Material:	GLASS
Nozzle:	Diameter:	0.274
	Material:	GLASS
Filter:	Number:	—
	Material:	Teflon-Glass

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	0.1 N NaOH	679.4	653.1	=
#2	0.1 N NaOH	641.1	640.3	=
#3	MT	516.1	515.3	=
#4	Silica	801.8	790.1	=
#5	TARE	0	20.0	=
#6				=
#7				=

POST TEST INFO: Total Weight Gain: =
Filter Appearance: Clean
Condensate Appearance: Slight Cloudy
Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.009	15	OK	CA
Post-Test:	.007	11	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS
8	8 53	0.18	0.86	471.216	73		49	252		50		0.5	
	8 58	0.18	0.86	474.01	74		49	252		50		0.5	
	9 03	0.21	1.06	476.51	76		50	254		50		0.5	
	9 08	0.26	1.31	479.20	76		50	256		50		1.0	
	9 13	0.22	1.11	482.54	77		52	254		50		1.0	
	9 18	0.25	1.26	485.59	78		53	250		50		1.0	-0.15
	9 23	0.26	1.31	488.61	77		53	251		51		1.0	
	9 28	0.23	1.16	491.87	77		55	253		51		1.0	
	9 33	0.26	1.31	494.85	76		56	254		51		1.0	
	9 38	0.23	1.16	497.99	77		54	250		51		1.0	
	9 43	0.21	1.06	501.10	78		57	257		51		1.0	
	9 48	0.22	1.11	503.79	79		57	252		51		1.0	
	9 53			506.684									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	KD
Impingers Recovered:	KD
Filter Loaded:	KD
Filter Recovered:	KD
Probe Wash:	KD

TEST SUMMARY

Calculated by:	KD
Checked by:	[illegible]
Sample Volume, ft^3:	63.533
Water Collected, g:	19.4
Meter Temperature, °F:	55.4
Meter Pressure (ΔH), iwg:	1.25
Velocity (ΔP rms), iwg:	0.2465
Stack Pressure., iwg:	-0.15
Stack Temperature, °F:	78.1
O_2 / CO_2:	20.509 / 0.087
Comments:	

2020-04-28. SSI-078

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: SCHNITZER STEEL
UNIT: SHREDDER
TEST NO.: 1-CP
METHOD: CARB 425
PAGE 2 OF 2
PROJECT #: 060178.0
DATE: 3-1-07
SAMPLE LOCATION:
TEST CONDITION:
AMB. TEMP., °F:
OPERATOR/ASSISTANT:
METER VOL. (START/END): /

PRE-TEST DATA:

Barometric Pressure, in. Hg.:
Assumed Stack Pressure:
Assumed Moisture Content:
Assumed O_2 / CO_2::
Assumed ΔP:
Assumed ΔH:
Stack Diameter, Inches:
Sample Time: Total:
Per point:
Total of Traverse Points:
ΔH = 5.06 x ΔP

EQUIPMENT INFO:

Meter: ID #:
Yd value:
ΔH@ value:
Pitot: ID #:
Cp value:
Probe: ID #:
Material:
Nozzle: Diameter:
Material:
Filter: Number:
Material:

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1			=	
#2			=	
#3			=	
#4			=	
#5			=	
#6			=	
#7			=	

POST TEST INFO: Total Weight Gain: =
Filter Appearance:
Condensate Appearance:
Silica Gel Spent? (Y/N):

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SEE PAGE 1

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS
	10 03	0.24	1.34	506.684	80		56	253	—	50	—	1.0	
	10 08	0.25	1.26	509.91	80		56	254		50		1.0	
	10 13	0.24	1.21	512.87	80		56	254		51		1.0	
	10 18	0.25	1.26	516.10	81		57	254		51		1.0	
	10 23	0.31	1.56	519.37	81		58	254		51		1.5	
	10 28	0.34	1.72	522.64	79		59	255		51		1.5	
	10 33	0.31	1.56	526.37	81		60	254		51		1.5	
	10 38	0.27	1.36	530.13	82		62	255		51		1.0	
	10 43	0.28	1.41	533.40	79		62	253		51		1.0	
End	10 45			534.749									
	~~10 53~~												
	~~10 58~~												
	~~11 03~~	—	—										

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:
Impingers Recovered:
Filter Loaded:
Filter Recovered:
Probe Wash:

TEST SUMMARY

Calculated by:
Checked by:
Sample Volume, ft^3:
Water Collected, g:
Meter Temperature, °F:
Meter Pressure (ΔH), iwg:
Velocity (ΔP rms), iwg:
Stack Pressure., iwg:
Stack Temperature, °F:
O_2 / CO_2:

Comments: Shredder went down test was ~~paused~~ at 10:45. Concluded

2020-04-28: SSI-079

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: Schnitzer Steel
SAMPLE LOCATION: Stack
OPERATOR/ASSISTANT: CA / ES

UNIT: Shredder
TEST NO.: 2-C
TEST CONDITION: Full
METER VOL. (START/END):

METHOD: CARB 425
AMB. TEMP., °F:

PAGE 1 OF 2
PROJECT # 06178
DATE 3/2/07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.88
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	120
Per point:	5
Total of Traverse Points:	24
ΔH =	5.018

x ΔP

EQUIPMENT INFO:

Meter:	ID #:	CB-14
	Yd value:	0.986
	ΔH@ value:	1.813
Pitot:	ID #:	048
	Cp value:	0.8191
Probe:	ID #:	048
	Material:	Pyrex
Nozzle:	Diameter:	0.274
	Material:	Pyrex
Filter:	Number:	N/A
	Material:	Teflon-Glass

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	0.1N NaOH	669.9	635.7	= 34.2
#2	0.1N NaOH	641.0	640.8	= 0.2
#3	Empty	515.0	516.1	= -1.1
#4	Silica	815.2	801.8	= 13.4
#5	Rinse	0.0	20.0	= -20.0
#6				=
#7				=

POST TEST INFO: Total Weight Gain: = 26.7

Filter Appearance: Clean
Condensate Appearance: Slight cloudy
Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.003	15	OK	CA
Post-Test:	.001	4	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK T	METER TEMP IN	METER TEMP OUT	PROBE T	OVEN F	IMP F	COIL F	VAC in.	STATIC PRESS
12	7 53	0.15	0.76	547.137	74		44	250		50		1	
11	7 58	0.17	0.86	549.81	77		48	254		50		1	
10	8 03	0.19	0.96	552.30	77		47	254		50		1	
9	8 08	0.21	1.06	555.09	76		49	255		51		1	-0.14
8 24 8	8 13	0.20	1.01	557.91	78		52	254		51		1	
8 29 7	8 18	0.19	0.96	560.74	79		53	255		50		1	
8 34 6	8 23	0.21	1.06	563.44	80		55	255		50		1	
39 5	8 28	0.20	1.01	566.39	81		56	254		51		1	
44 4	8 33	0.19	0.96	569.15	81		57	255		51		1	
49 3	8 38	0.19	0.96	571.90	81		58	254		51		1	
54 2	8 43	0.20	1.01	574.69	80		59	255		51		1	
59 1	8 48	0.20	1.01	577.53	78		59	254		51		1	
9:04 P	8 53			580.397									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	KD
Impingers Recovered:	KD
Filter Loaded:	KD
Filter Recovered:	KD
Probe Wash:	KD
TEST SUMMARY	
Calculated by:	KD
Checked by:	ES
Sample Volume, ft^3:	73.815
Water Collected, g:	26.7
Meter Temperature, °F:	59.1
Meter Pressure (ΔH), iwg:	1.17
Velocity (ΔP rms), iwg	0.2580
Stack Pressure., iwg:	-0.14
Stack Temperature, °F:	78.0
O_2 / CO_2:	20.462 / 0.111

Comments:
PAUSE
8:09 - 8:20

2020-04-28: SSI-080

8:09

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: SCHNITZER STEEL
SAMPLE LOCATION:
OPERATOR/ASSISTANT: CH/ES

UNIT: SHREDDER TEST NO.: 2-CY
TEST CONDITION:
METER VOL. (START/END):

METHOD: CARB 425
AMB. TEMP., °F:

PAGE 2 OF 2
PROJECT #: 08178.0
DATE: 3-2-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	
Sample Time: Total:	
Per point:	
Total of Traverse Points:	
ΔH = 5.06 x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	
	Yd value:	
	ΔH@ value:	
Pitot:	ID #:	
	Cp value:	
Probe:	ID #:	
	Material:	
Nozzle:	Diameter:	
	Material:	
Filter:	Number:	
	Material:	

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
# 1				=
# 2				=
# 3				=
# 4				=
# 5				=
# 6				=
# 7				=

PAGE 2 OF 2

POST TEST INFO: Total Weight Gain: =
Filter Appearance:
Condensate Appearance:
Silica Gel Spent? (Y/N):

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS.
12	9:12	0.20	1.01	580.397	80		61	257		50		1.0	
11	917	0.19	0.96	583.56	80		62	254		50		1.0	
10	922	0.21	1.06	586.73	78		63	253		51		1.0	
9	927	0.20	1.01	589.05	78		64	256		51		1.0	
8	932	0.26	1.31	591.94	77		64	254		51		1.0	
7	937	0.29	1.46	595.19	77		65	255		51		1.0	
6	942	0.30	1.51	598.64	78		66	254		51		1.0	
5	947	0.35	1.77	602.31	77		67	256		50		1.0	
4	952	0.33	1.66	606.09	77		67	257		50		1.0	
3	957	0.32	1.61	609.73	76		67	256		51		1.0	
2	1002	0.29	1.46	613.38	76		68	255		51		1.0	
1	1007	0.3	0.86	617.32	76		68	256		51		1.0	
END	1012			620.952									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	
Impingers Recovered:	
Filter Loaded:	
Filter Recovered:	
Probe Wash:	
TEST SUMMARY	
Calculated by:	
Checked by:	
Sample Volume, ft^3:	
Water Collected, g:	
Meter Temperature, °F:	
Meter Pressure (ΔH), iwg:	
Velocity (ΔP rms), iwg:	
Stack Pressure., iwg:	
Stack Temperature, °F:	
O_2 / CO_2:	
Comments:	

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: Schnitzer Steel
SAMPLE LOCATION: Stack
OPERATOR/ASSISTANT: CA / ES

UNIT: Shredder
TEST NO.: 3-Cr
METHOD: CARB 425
TEST CONDITION: Normal
AMB. TEMP., °F:
METER VOL. (START/END):

PAGE 1 OF 2
PROJECT # 06178
DATE 3/2/07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.83
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	120
Per point:	5
Total of Traverse Points:	24
ΔH =	5.016 x ΔP

EQUIPMENT INFO:

Meter:	ID #:	CB-14
	Yd value:	0.9956
	ΔH@ value:	1.813
Pitot:	ID #:	047
	Cp value:	0.8145
Probe:	ID #:	047
	Material:	Pyrex
Nozzle:	Diameter:	0.274
	Material:	Pyrex
Filter:	Number:	—
	Material:	Glass

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	0.1N NaOH	645.2	620.5	24.7
#2	"	633.6	633.7	1.9
#3	Empty	458.3	457.4	0.9
#4	Silica	782.7	775.7	7.0
#5	Rinse	0.0	20.0	-20.0
#6				
#7				

POST TEST INFO: Total Weight Gain: = 14.5
Filter Appearance: Clean
Condensate Appearance: Slt. Cloudy
Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.006	15	OK	CA
Post-Test:	.004	10	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS
12	11 15	0.24	1.21	621.976	83		63	249		51		1.0	
11	11 20	0.22	1.11	624.96	80		65	251		51		1.0	
10	11 25	0.25	1.26	627.82	77		66	252		57		1.0	
9	11 30	0.28	1.41	630.91	77		67	253		51		1.0	
8	11 35	0.32	1.61	634.31	79		67	254		51		1.0	-0.71
7	11 40	0.31	1.56	638.14	78		67	254		51		1.0	
6	11 45	0.31	1.56	641.44	78		68	255		51		1.0	
5	11 50	0.34	1.72	644.98	78		69	255		57		1.0	
4	11 55	0.34	1.72	648.69	79		70	256		52		1.0	
3	12 00	0.33	1.66	652.50	78		70	255		52		1.0	
2	12 05	0.32	1.61	656.11	78		71	254		52		1.0	
1	12 09			658.491									
P	~~12 15~~												

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	KD
Impingers Recovered:	KD
Filter Loaded:	KD
Filter Recovered:	KD
Probe Wash:	KD

TEST SUMMARY

Calculated by:	KD
Checked by:	
Sample Volume, ft^3:	36.515
Water Collected, g:	14.5
Meter Temperature, °F:	67.5
Meter Pressure (ΔH), iwg:	1.49
Velocity (ΔP rms), iwg:	0.2949
Stack Pressure., iwg:	-0.71
Stack Temperature, °F:	253.5
O_2 / CO_2:	20.462 / 0.111

Comments: 12 09 - Run concluded due to equip. failure

2020-04-28. SSI-082

APPENDIX C.6
POLYCHLORINATED BIPHENYL FIELD DATA SHEETS

2020-04-28: GSI-083

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT: Schnitzer Steel
SAMPLE LOCATION:
OPERATOR/ASSISTANT: CA / CS

UNIT: Shredder
TEST NO.: 1-PCB
METHOD: CARB 428
TEST CONDITION: Normal
AMB. TEMP., °F:
METER VOL. (START/END): /

PAGE 1 OF 2
PROJECT #: 20178.0
DATE: 3/1/07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.91
Assumed Stack Pressure:	/
Assumed Moisture Content:	/
Assumed O_2 / CO_2:	/
Assumed ΔP:	/
Assumed ΔH:	/
Stack Diameter, Inches:	47.5
Sample Time: Total:	120
Per point:	5
Total of Traverse Points:	24
ΔH = 4.79 ~~5.06~~ x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	CB-13
	Yd value:	1.006
	ΔH@ value:	1.684
Pitot:	ID #:	012
	Cp value:	0.8145
Probe:	ID #:	012
	Material:	GLASS
Nozzle:	Diameter:	0.267
	Material:	GLASS
Filter:	Number:	N/A
	Material:	Glass

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	Empty	560.4	553.6	= 6.8
#2	Org. Free H_2O	600.8	603.0	= -2.2
#3	Empty	465.7	465.1	= 0.6
#4	Silica	802.1	791.0	= 11.1
#5				=
#6				=
#7				=

POST TEST INFO: Total Weight Gain: = 16.3
Filter Appearance: Clean
Condensate Appearance: Clear
Silica Gel Spent? (Y/N): N/A

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.002	15	OK	CA
Post-Test:	.003	6	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS.
12	8:49	0.21	1.00	778.764	74		49	250	254	50	50	1.0	
11	8:54	0.21	1.00	781.90	74		50	251	254	50	50	1.0	
10	8:59	0.28	1.34	785.02	74		50	252	254	50	49	1.0	
9	9:04	0.29	1.38	787.80	73		49	253	253	49	49	1.0	
8	9:09	0.29	1.38	791.04	74		52	254	254	49	48	1.0	
7	9:14	0.30	1.43	794.16	75		53	250	253	49	48	1.5	-0.15
6	9:19	0.27	1.29	797.32	78		54	254	254	49	48	1.5	
5	9:24	0.25	1.19	800.48	77		55	255	254	50	48	1.0	
4	9:29	0.24	1.14	803.55	78		56	254	254	50	48	1.0	
3	9:34	0.30	1.43	806.62	77		56	254	253	50	48	2.0	
2	9:39	0.26	1.24	809.75	77		57	250	255	50	47	1.5	
1	9:44	0.25	1.19	812.87	78		57	253	254	50	47	1.5	
P	9:49			815.934									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded:	KD
Impingers Recovered:	KD
Filter Loaded:	KD
Filter Recovered:	KD
Probe Wash:	KD

TEST SUMMARY

Calculated by:	KD
Checked by:	[illegible]
Sample Volume, ft^3:	63.895
Water Collected, g:	16.3
Meter Temperature, °F:	55.8
Meter Pressure (ΔH), iwg:	1.25
Velocity (ΔP rms), iwg:	0.2607
Stack Pressure., iwg:	-0.15
Stack Temperature, °F:	77.3
O_2 / CO_2:	20.509 / 0.087

Comments: Test paused at 10:45. Repairs took several hours, so run was concluded.

2020-04-28: SSI-084

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT _____ UNIT _____ TEST NO. 1-PCB METHOD CARB 428 PAGE 2 OF 2

SAMPLE LOCATION _____ TEST CONDITION _____ AMB. TEMP., °F _____ PROJECT # 06178.0

OPERATOR/ASSISTANT _____ METER VOL. (START/END) _____ / _____ DATE ~~3-0~~ 3-1-07

PRE-TEST DATA:		EQUIPMENT INFO:		Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
Barometric Pressure, in. Hg.:		Meter: ID #:		# 1				=
Assumed Stack Pressure:		Yd value:		# 2				=
Assumed Moisture Content:		ΔH@ value:		# 3				=
Assumed O_2 / CO_2::		Pitot: ID #:		# 4				=
Assumed ΔP:		Cp value:		# 5				=
Assumed ΔH:		Probe: ID #:		# 6				=
Stack Diameter, Inches:		Material:		# 7				=
Sample Time: Total:		Nozzle: Diameter:		POST TEST INFO:		Total Weight Gain:		=
Per point:		Material:		Filter Appearance:				
Total of Traverse Points:		Filter: Number:		Condensate Appearance:				
ΔH = 4.79 x ΔP		Material:		Silica Gel Spent? (Y/N):				

SEE PAGE 1

SAMPLE LEAK CHECK:	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP. °F	COIL °F	VAC in.	STATIC PRESS	CHAIN OF CUSTODY INFORMATION
	10 02	0.25	1.19	815.934	78		56	250	254	50	47	2.0		Impingers Loaded:
	10 07	0.18	0.86	819.16	77		57	251	253	50	48	1.0		Impingers Recovered:
	10 12	0.18	0.84	822.58	78		57	250	253	51	47	1.0		Filter Loaded:
	10 17	0.23	1.18	824.15	79		58	254	255	51	47	2.0		Filter Recovered:
	10 22	0.29	1.38	827.69	80		59	253	254	51	48	2.0		Probe Wash:
	10 27	0.33	1.58	830.607	81		60	254	255	51	48	4.0		TEST SUMMARY
	10 32	0.30	1.43	834.11	80		61	255	254	51	49	3.0		Calculated by:
	10 37	0.29	1.38	837.44	81		62	254	255	51	49	2.5		Checked by:
	10 42	0.31	1.48	840.69	81		62	255	254	52	50	3.0		Sample Volume, ft^3:
	10 45			842.659										Water Collected, g:
	10 52													Meter Temperature, °F:
	10 57													Meter Pressure (ΔH), iwg:
	11 02													Velocity (ΔP rms), iwg:
														Stack Pressure., iwg:
														Stack Temperature, °F:
														O_2 / CO_2:
														Comments:

2020-04-28: SSI-085

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT Schnitzer Steel | UNIT Shredder | TEST NO. 2-PCB | METHOD CARB 428 | PAGE 1 OF 2

SAMPLE LOCATION | TEST CONDITION | AMB. TEMP., °F | PROJECT # 026175.0

OPERATOR/ASSISTANT OA / ES | METER VOL. (START/END) / | DATE 3/2/07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.88
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2::	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	120
Per point:	5
Total of Traverse Points:	24
ΔH = 4.79	x ΔP

EQUIPMENT INFO:

Meter:	ID #:	CB-13
	Yd value:	1.006
	ΔH@ value:	1.6084
Pitot:	ID #:	012
	Cp value:	0.8145
Probe:	ID #:	012
	Material:	Pyrex
Nozzle:	Diameter:	0.267
	Material:	Pyrex
Filter:	Number:	—
	Material:	Glass

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	Empty	610.3	607.2	= 3.1
#2	0.5% H_2O_2	553.7	554.2	= -0.5
#3	Empty	467.1	467.0	= 0.1
#4	Silica	814.9	802.0	= 12.9
#5				=
#6				=
#7				=

POST TEST INFO: Total Weight Gain: = 13.6

Filter Appearance: Clear

Condensate Appearance: Clear

Silica Gel Spent? (Y/N): No

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.009	15	OK	CA
Post-Test:	.007	3	OK	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS
	7:52	0.30	1.43	854.898	72		49	250	249	49	46	1.0	-0.14
11	7 57	0.29	1.38	858.04	77		52	253	254	49	45	1.0	
10	8 02	0.29	1.38	861.12	78		54	253	254	49	45	1.0	
9	8 07	0.34	1.62	864.26	78		57	254	254	49	45	1.0	
8	8 12	0.31	1.48	867.73	81		60	253	255	49	45	1.0	
7	8 17	0.30	1.43	871.05	78		61	254	254	49	45	1.0	
6	8 22	0.25	1.19	874.30	80		62	253	254	50	46	1.0	
5	8 27	0.21	1.00	877.36	81		63	254	254	50	46	1.0	
4	8 32	0.19	0.91	880.31	81		64	255	255	50	46	1.0	
3	8 37	0.22	1.05	882.87	81		64	254	255	50	45	1.0	
2	8 42	0.21	1.00	885.66	80		65	255	254	51	45	1.0	
1	8 47	0.19	0.91	888.47	80		65	254	255	51	45	1.0	
P	8 52			891.079									

CHAIN OF CUSTODY INFORMATION

Impingers Loaded: KD

Impingers Recovered: KD

Filter Loaded: KD

Filter Recovered: KD

Probe Wash: KD

TEST SUMMARY

Calculated by: KD

Checked by: BS

Sample Volume, ft^3: 73.335

Water Collected, g: 15.6

Meter Temperature, °F: 63.7

Meter Pressure (ΔH), iwg: 1.25

Velocity (ΔP rms), iwg: 0.2609

Stack Pressure., iwg: -0.14

Stack Temperature, °F: 78.5

O_2 / CO_2: 20.462 / 0.111

Comments:

PAUSE 8:09 - 8:19

2020-04-28: SSI-086

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT Schnitzer Steel | UNIT Shredder | TEST NO. 2-PCB | METHOD CARB 428 | PAGE 2 OF 2

SAMPLE LOCATION | TEST CONDITION | AMB. TEMP., °F | PROJECT # 06178.0

OPERATOR/ASSISTANT CA/ES | METER VOL. (START/END) / | DATE 3-2-07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:
Assumed Stack Pressure:
Assumed Moisture Content:
Assumed O_2 / CO_2:
Assumed ΔP:
Assumed ΔH:
Stack Diameter, Inches:
Sample Time: Total:
Per point:
Total of Traverse Points:
ΔH = 4.79 x ΔP

EQUIPMENT INFO:

Meter: ID #:
Yd value:
ΔH@ value:
Pitot: ID #:
Cp value:
Probe: ID #:
Material:
Nozzle: Diameter:
Material:
Filter: Number:
Material:

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1				=
#2				=
#3				=
#4				=
#5				=
#6				=
#7				=

SEE PAGE 1

POST TEST INFO: Total Weight Gain: =
Filter Appearance:
Condensate Appearance:
Silica Gel Spent? (Y/N):

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:				
Post-Test:				

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in.	STATIC PRESS.
12	911	0.24	1.21	891.078	80		65	254	256	51	46	1.0	
11	916	0.24	1.14	894.21	82		66	255	255	51	46	1.0	
10	921	0.26	1.24	897.14	80		66	254	256	51	47	1.0	
9	926	0.28	1.34	900.20	79		67	256	254	51	47	1.0	
8	931	0.26	1.24	903.30	78		68	256	255	51	47	1.0	
7	936	0.29	1.38	906.28	78		68	254	256	51	46	1.0	
6	941	0.28	1.34	909.42	79		68	257	255	51	46	1.0	
5	946	0.32	1.53	912.68	77		69	256	254	51	46	1.0	
4	951	0.30	1.43	915.98	78		69	251	255	52	47	1.0	
3	956	0.26	1.24	919.37	76		69	253	256	52	47	1.0	
2	1001	0.23	1.10	922.57	75		69	254	256	52	47	1.0	
1	1006	0.22	1.05	925.50	74		69	255	254	52	47	1.0	
END	1011			928.233									

CHAIN OF CUSTODY INFORMATION
Impingers Loaded:
Impingers Recovered:
Filter Loaded:
Filter Recovered:
Probe Wash:
TEST SUMMARY
Calculated by:
Checked by:
Sample Volume, ft^3:
Water Collected, g:
Meter Temperature, °F:
Meter Pressure (ΔH), iwg:
Velocity (ΔP rms), iwg:
Stack Pressure., iwg:
Stack Temperature, °F:
O_2 / CO_2:
Comments:

2020-04-28: SSI-087

The Avogadro Group, LLC

SAMPLE TRAIN TEST DATA

CLIENT Schnitzer Steel | UNIT Shredder | TEST NO. 3-PCB | METHOD CARB 428 | PAGE 1 OF 2
SAMPLE LOCATION | TEST CONDITION | AMB. TEMP., °F | PROJECT # 061778
OPERATOR/ASSISTANT CA/ES | METER VOL. (START/END) / | DATE 3/2/07

PRE-TEST DATA:

Barometric Pressure, in. Hg.:	29.83
Assumed Stack Pressure:	
Assumed Moisture Content:	
Assumed O_2 / CO_2:	
Assumed ΔP:	
Assumed ΔH:	
Stack Diameter, Inches:	47.5
Sample Time: Total:	120
Per point:	5
Total of Traverse Points:	24
ΔH = 4.79 x ΔP	

EQUIPMENT INFO:

Meter:	ID #:	CB-13
	Yd value:	1.006
	ΔH@ value:	1.684
Pitot:	ID #:	010
	Cp value:	0.8038
Probe:	ID #:	010
	Material:	Pyrex
Nozzle:	Diameter:	0.267
	Material:	Pyrex
Filter:	Number:	
	Material:	Glass

Imp.	Reagent	Wt.(End)	Wt.(Start)	Wt.(g)
#1	Empty	463.0	463.4 =	-0.4
#2	Dry, Free H_2O	652.1	652.7 =	-0.6
#3	Empty	459.2	458.6 =	0.6
#4	Silica	743.5	735.0 =	8.5
#5			=	
#6			=	
#7			=	

POST TEST INFO: Total Weight Gain: = 8.1
Filter Appearance: Clean
Condensate Appearance: Clear
Silica Gel Spent? (Y/N): N

SAMPLE TRAIN LEAK CHECK:

	CFM	Vac.	Pitot	Initials
Pre-Test:	.006	12	ok	CA
Post-Test:	.003	9	ok	CA

PRE-TEST CALIBRATION CHECK:

	Time	ΔH	Meter Vol.	Meter In	Meter Out
Initial:					
Final:					

SAMPLE POINT	TIME	ΔP	ΔH	METER READING	STACK °F	METER TEMP IN	METER TEMP OUT	PROBE °F	OVEN °F	IMP °F	COIL °F	VAC in	STATIC PRESS
12	11 14	0.22	1.05	928.657	83	—	65	254	254	50	46	1.0	
11	11 19	0.24	1.14	931.50	81		66	256	254	50	46	1.0	-0.5
10	11 24	0.24	1.14	934.62	80		67	255	254	50	46	1.0	
9	11 29	0.26	1.24	937.34	80		68	253	256	50	46	1.0	
8	11 34	0.30	1.43	940.41	81		67	255	255	51	46	1.0	
7	11 39	0.34	1.62	943.73	80		68	254	256	51	46	1.0	
6	11 44	0.30	1.43	947.19	79		69	255	254	51	47	1.0	
5	11 49	0.31	1.48	950.56	77		69	253	256	51	47	1.0	
4	11 54	0.28	1.34	953.97	77		69	254	256	51	47	1.0	
3	11 59	0.27	1.29	957.32	75		69	255	254	51	47	1.0	
2	12 04	0.25	1.19	960.64	71		70	256	254	52	47	1.0	
1	12 09	0.20	0.95	963.82									
P	12 14												

CHAIN OF CUSTODY INFORMATION

Impingers Loaded: KD
Impingers Recovered: KD
Filter Loaded: KD
Filter Recovered: KD
Probe Wash: KD

TEST SUMMARY

Calculated by: ES
Checked by:
Sample Volume, ft^3: 35.163
Water Collected, g: 8.1
Meter Temperature, °F: 67.9
Meter Pressure (ΔH), iwg: 1.281
Velocity (ΔP rms), iwg: 0.2661
Stack Pressure., iwg: -0.15
Stack Temperature, °F: 78.5
O_2 / CO_2: 20.4/0.1/0.111
Comments: 12:09

2020-04-28: SSI-088

APPENDIX D
LABORATORY DATA

2020-04-28: GSI-089

APPENDIX D.1
PARTICULATE MATTER LABORATORY DATA

2020-04-28 GSI-090

The Avogadro Group, LLC

Air Quality Consulting and Source Emissions Testing

PARTICULATE MATTER RESULTS

Client: Schnitzer Steel

Project: # 06178.0

Test No.:	1-PM-1	2-PM-1	3-PM-1
Front-Half Particulate Catch			
Filter catch, net mg	1.03	0.50	0.50
Probe / nozzle rinse (acetone), net mg	1.97	2.40	0.90
Total filterable particulate matter catch, net mg	*3.00*	*2.90*	*1.40*
Back-Half Particulate Catch			
Aqueous rinse (ASTM Type II water), net mg	1.80	0.83	0.73
Organic rinse (methylene chloride), net mg	0.50	0.50	0.50
Total condensible particulate matter catch, net mg	*2.30*	*1.33*	*1.23*
Total Particulate Matter Catch, net mg	**5.30**	**4.23**	**2.63**

Note: The results were blank -corrected according to the test methods.

Note: Results measuring <0.50mg are reported as 0.50mg per BAAQMD.

Prepared by: _____ Date: 3/16/07

Robert Odell
Laboratory Technician

Reviewed by: _____ Date: 3/16/07

Michele Hoffmann
Laboratory Manager

2825 VERNE ROBERTS CIRCLE; ANTIOCH, CA 94509 (925) 680-4300 Main (925) 680-4416 Fax

2020-04-28: SSI-091

AVOGADRO PARTICULATE MATTER RESULTS
Client: Schnitzer Steel
Project: # 06178.0

Test Number	Sample Fraction	Total Volume (ml)	Lab Number (ID)	Tare Sequence (#)	Tare Weight (g)	Final Weight (g)	Difference from prev. weight (mg)	Raw Gain Weight (mg)	Blank Residue (%)	Blank Correction (mg)	Maximum Correction (mg)	Final Results (mg)
FB-PM	Organic	250	777-250	Tare 1	106.8477	106.8480	–	0.30	–	–	–	–
	$MeCl_2$			Tare 2	106.8477	106.8476	0.40	-0.10	–	–	–	–
	(B½)			Tare 3	106.8474	106.8480	0.40	0.60	–	–	–	–
				Average	**106.8476**	**106.8479**	–	**0.27**	0.0001%	N/A	N/A	N/A
1-PM-1	Organic	235	110-250	Tare 1	113.2254	113.2248	–	-0.60	–	–	–	–
	$MeCl_2$			Tare 2	113.2251	113.2247	0.10	-0.40	–	–	–	–
	(B½)			Tare 3	113.2249	113.2246	0.10	-0.30	–	–	–	–
				Average	**113.2251**	**113.2247**	–	**-0.43**	0.0001%	0.25	3.12	**0.00**
2-PM-1	Organic	235	59-250	Tare 1	111.0257	111.0262	–	0.50	–	–	–	–
	$MeCl_2$			Tare 2	111.0260	111.0260	0.20	0.00	–	–	–	–
	(B½)			Tare 3	111.0262	111.0258	0.20	-0.40	–	–	–	–
				Average	**111.0260**	**111.0260**	–	**0.03**	0.0001%	0.25	3.12	**0.00**
3-PM-1	Organic	235	811-250	Tare 1	107.2264	107.2270	–	0.60	–	–	–	–
	$MeCl_2$			Tare 2	107.2264	107.2270	0.00	0.60	–	–	–	–
	(B½)			Tare 3	107.2266	107.2267	0.30	0.10	–	–	–	–
				Average	**107.2265**	**107.2269**	–	**0.43**	0.0001%	0.25	3.12	**0.18**

Note: The organic fractions were blank-corrected according to EPA Method 202. Blank values of greater than 0.001 percent of the weight of $MeCl_2$ used cannot be subtracted from the sample weight.

FB-PM	Aqueous	193.2	1300	Tare 1	71.3840	71.3840	–	0.00	–	–	–	–
	Water			Tare 2	71.3835	71.3839	0.10	0.40	–	–	–	–
	(B½)			Tare 3	71.3838	71.3836	0.30	-0.20	–	–	–	–
				Average	**71.3838**	**71.3838**	–	**0.07**	0.0000%	N/A	N/A	N/A
1-PM-1	Aqueous	301.3	669	Tare 1	69.4376	69.4394	–	1.80	–	–	–	–
	Water			Tare 2	69.4373	69.4393	0.10	2.00	–	–	–	–
	(B½)			Tare 3	69.4374	69.4392	0.10	1.80	–	–	–	–
				Average	**69.4374**	**69.4393**	–	**1.87**	0.0000%	0.07	N/A	**1.80**
2-PM-1	Aqueous	322.1	853	Tare 1	71.1599	71.1609	–	1.00	–	–	–	–
	Water			Tare 2	71.1597	71.1608	0.10	1.10	–	–	–	–
	(B½)			Tare 3	71.1600	71.1606	0.20	0.60	–	–	–	–
				Average	**71.1599**	**71.1608**	–	**0.90**	0.0000%	0.07	N/A	**0.83**
3-PM-1	Aqueous	289.5	637	Tare 1	75.2412	75.2419	–	0.70	–	–	–	–
	Water			Tare 2	75.2407	75.2417	0.20	1.00	–	–	–	–
	(B½)			Tare 3	75.2409	75.2416	0.10	0.70	–	–	–	–
				Average	**75.2409**	**75.2417**	–	**0.80**	0.0000%	0.07	N/A	**0.73**

Note: The aqueous fractions were blank-corrected according to EPA Method 202. ASTM Type II water was used for the reagent and rinses.

2020-04-28: SSI-092

AVOGADRO PARTICULATE MATTER RESULTS
Client: Schnitzer Steel
Project: # 06178.0

Test Number	Sample Fraction	Sample Amount (g)	Lab Number (ID)	Tare Sequence (#)	Tare Weight (g)	Final Weight (g)	Difference from prev. weight (mg)	Raw Gain Weight (mg)	Blank Residue (%)	Blank Correction (mg)	Maximum Correction (mg)	Final Results (mg)
1-PM-1	Filter	N/A	5736	Tare 1	0.4082	0.4093	–	1.10	–	–	–	–
	(F½)			Tare 2	0.4083	0.4091	0.20	0.80	–	–	–	–
				Tare 3	0.4083	0.4095	0.40	1.20	–	–	–	–
				Average	**0.4083**	**0.4093**	–	**1.03**	N/A	N/A	N/A	**1.03**
2-PM-1	Filter	N/A	5645	Tare 1	0.4102	0.4097	–	-0.50	–	–	–	–
	(F½)			Tare 2	0.4103	0.4096	0.10	-0.70	–	–	–	–
				Tare 3	0.4103	0.4100	0.40	-0.30	–	–	–	–
				Average	**0.4103**	**0.4098**	–	**-0.50**	N/A	N/A	N/A	**0.00**
3-PM-1	Filter	N/A	5725	Tare 1	0.4107	0.4109	–	0.20	–	–	–	–
	(F½)			Tare 2	0.4111	0.4106	0.30	-0.50	–	–	–	–
				Tare 3	0.4108	0.4108	0.20	0.00	–	–	–	–
				Average	**0.4109**	**0.4108**	–	**-0.10**	N/A	N/A	N/A	**0.00**

Note: The filters were not blank-corrected according to EPA Methods 5 / 17.

FB-PM	Probe/Nozzle	143.1	1313-150	Tare 1	79.5388	79.5391	–	0.30	–	–	–	–
	Acetone			Tare 2	79.5386	79.5387	0.40	0.10	–	–	–	–
	(F½)			Tare 3	79.5390	79.5386	0.10	-0.40	–	–	–	–
				Average	**79.5388**	**79.5388**	–	**0.00**	0.0000%	N/A	N/A	N/A
1-PM-1	Probe/Nozzle	125.4	1320-150	Tare 1	78.6547	78.6571	–	2.40	–	–	–	–
	Acetone			Tare 2	78.6552	78.6571	0.00	1.90	–	–	–	–
	(F½)			Tare 3	78.6552	78.6568	0.30	1.60	–	–	–	–
				Average	**78.6550**	**78.6570**	–	**1.97**	0.0000%	0.00	1.25	**1.97**
2-PM-1	Probe/Nozzle	136.5	97A-150	Tare 1	69.9233	69.9261	–	2.80	–	–	–	–
	Acetone			Tare 2	69.9237	69.9258	0.30	2.10	–	–	–	–
	(F½)			Tare 3	69.9234	69.9257	0.10	2.30	–	–	–	–
				Average	**69.9235**	**69.9259**	–	**2.40**	0.0000%	0.00	1.37	**2.40**
3-PM-1	Probe/Nozzle	132.1	65-150	Tare 1	69.0573	69.0585	–	1.20	–	–	–	–
	Acetone			Tare 2	69.0577	69.0582	0.30	0.50	–	–	–	–
	(F½)			Tare 3	69.0573	69.0583	0.10	1.00	–	–	–	–
				Average	**69.0574**	**69.0583**	–	**0.90**	0.0000%	0.00	1.32	**0.90**

Note: The acetone fractions were blank-corrected according to EPA Methods 5 / 17. Blank values of greater than 0.001 percent of the weight of acetone used cannot be subtracted from the sample weight.

2020-04-28: SSI-093

CHAIN OF CUSTODY

Client/Project Name	Project Location/Sample Location	ANALYSES
Schnitzer Steel	Shredder.	
Project No. 06178.0 ☒ Lump-sum ☐ T&M ☒ California ☐ Medford ☐ Portland	BAAQMD: ☒ Yes ☐ No / P.O. No.	Full 202? ☐ Yes ☐ No
Sampler: (Signature) [signature]	Send Analytical Report To: Shawn Velezen + Kevin Dondue	

Sample No./ Identification	Date	# of Containers	Lab Sample Number	Type of Sample	EPA 5/202			Remarks
1-PM	2/28	4		Filt. + Condens.	X			Containers:
2-PM	2/28	4		Particulate Matter	X			1. Filter
3-PM	2/28	4			X			2. P/N F1/2 Filt.
FB-PM	2/28	3			X			3. Impingers, line
								4. Org Rinse-Meth.

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	3/2/07	17:35	[signature]	3/5/07	1331
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

Sample Collected By:

The Avogadro Group, LLC

2825 Verne Roberts Circle
Antioch, CA 94509

(925) 680-4300 * (925) 680-4416 FAX

Analytical report due date: _____

White: Project Mgr. **Yellow**: Originator **Pink**: Laboratory

2020-04-28: SSI-094

APPENDIX D.2
HEXAVALENT CHROMIUM LABORATORY DATA

2020-04-28 SSI-095

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

The Avogadro Group
2825 Verne Roberts Circle
Antioch, CA 94509

Date: 27-MAR-07
Lab Job Number: 193221
Project ID: STANDARD
Location: Schnitzer Steel

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signatures. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis.

Reviewed by: _____
Project Manager

Reviewed by: _____
Operations Manager

This package may be reproduced only in its entirety.

NELAP # 01107CA

2020-04-28: SSI-096

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	193221
Client:	The Avogadro Group
Location:	Schnitzer Steel
Request Date:	03/07/07
Samples Received:	03/07/07

This hardcopy data package contains sample and QC results for twelve water samples and four air samples, requested for the above referenced project on 03/07/07. The samples were received cold and intact.

Metals (EPA 6010B):
No analytical problems were encountered.

Ion Chromatography (EPA 7199):
No analytical problems were encountered.

2020-04-28: SSI-097

Curtis & Tompkins, Ltd.

Chromium

Lab #:	193221	Location:	Schnitzer Steel
Client:	The Avogadro Group	Prep:	CARB 425
Project#:	STANDARD	Analysis:	EPA 6010B
Analyte:	Chromium	Sampled:	03/01/07
Matrix:	Air	Received:	03/07/07
Units:	ug/s	Prepared:	03/19/07
Diln Fac:	1.000	Analyzed:	03/19/07
Batch#:	123250		

Field ID	Type	Lab ID	Result	RL
1-CR	SAMPLE	193221-001	17	0.50
2-CR	SAMPLE	193221-005	4.0	0.50
3-CR	SAMPLE	193221-009	0.98	0.50
FB-CR	SAMPLE	193221-013	0.94	0.50
	BLANK	QC379817	ND	0.50

ND= Not Detected
RL= Reporting Limit

4.0

2020-04-28: SSI-098

Curtis & Tompkins, Ltd.

Batch QC Report

Chromium

Lab #:	193221	Location:	Schnitzer Steel
Client:	The Avogadro Group	Prep:	CARB 425
Project#:	STANDARD	Analysis:	EPA 6010B
Analyte:	Chromium	Batch#:	123250
Field ID:	1-CR	Sampled:	03/01/07
MSS Lab ID:	193221-001	Received:	03/07/07
Matrix:	Air	Prepared:	03/19/07
Units:	ug/s	Analyzed:	03/19/07
Diln Fac:	1.000		

Type	Lab ID	MSS Result	Spiked	Result	RL	%REC	Limits	RPD	Lim
SDUP	QC379818	17.40		17.23	0.5000			1	20
SSPIKE	QC379819	17.40	200.0	182.8		83	80-120		

RL= Reporting Limit
RPD= Relative Percent Difference

5.0

2020-04-28: SSI-099

Curtis & Tompkins, Ltd.

Lab Number:	**193221**	Date Received:	3/7/2007
Client:	**The Avogadro Group**	Date Analyzed:	3/14/2007
Project:	**Schnitzer Steel**	Batch:	123172

Analysis: **Hexavalent Chromium**
Method: **EPA 7199**

LAB ID	FIELD ID	Result(ug/L)	Volume(mL)	Result (ug/s)	RL (ug/s)
193221-002	1-CR PROBE	ND	110	ND	0.06
193221-003	1-CR IMP 1 & FILTER	0.6910	140	0.10	0.07
193221-004	1-CR IMP 2	ND	100	ND	0.05
193221-006	2-CR PROBE	0.6411	110	0.07	0.06
193221-007	2-CR IMP 1 & FILTER	ND	140	ND	0.07
193221-008	2-CR IMP 2	ND	100	ND	0.05
193221-010	3-CR PROBE	0.6540	110	0.07	0.06
193221-011	3-CR IMP 1 & FILTER	ND	120	ND	0.06
193221-012	3-CR IMP 2	ND	100	ND	0.05
193221-014	FB-CR PROBE	0.6518	120	0.08	0.06
193221-015	FB-CR IMP 1 & FILTER	ND	170	ND	0.09
193221-016	FB-CR IMP 2	ND	160	ND	0.08
QC379494	Method Blank	ND	120	ND	0.06

ND = Not detected at or above reporting limit.
RL = Reporting Limit

QC Summary	Recovery	RPD
Matrix Spike (of CT# 193221-003)	99	
Matrix Spike Duplicate	93	6
Blank Spike	99	
Blank Spike Duplicate	99	1

2020-04-28: SSI-100

Curtis & Tompkins, Ltd.

Hexavalent Chromium

Lab #:	193221	Location:	Schnitzer Steel
Client:	The Avogadro Group	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7199
Analyte:	Hexavalent Chromium	Diln Fac:	1.000
Matrix:	Water	Batch#:	123172
Units:	ug/L	Received:	03/07/07

Field ID	Type	Lab ID	Result	RL	Sampled	Analyzed
1-CR-PROBE	SAMPLE	193221-002	ND	0.50	03/02/07	03/14/07 15:52
1-CR-IMP 1 & FILTER	SAMPLE	193221-003	0.69	0.50	03/02/07	03/14/07 16:04
1-CR-IMP 2	SAMPLE	193221-004	ND	0.50	03/01/07	03/14/07 17:13
2-CR-PROBE	SAMPLE	193221-006	0.64	0.50	03/01/07	03/14/07 17:25
2-CR-IMP 1 & FILTER	SAMPLE	193221-007	ND	0.50	03/01/07	03/14/07 16:15
2-CR-IMP 2	SAMPLE	193221-008	ND	0.50	03/01/07	03/14/07 17:37
3-CR-PROBE	SAMPLE	193221-010	0.65	0.50	03/01/07	03/14/07 17:48
3-CR-IMP 1 & FILTER	SAMPLE	193221-011	ND	0.50	03/01/07	03/14/07 18:00
3-CR-IMP 2	SAMPLE	193221-012	ND	0.50	03/01/07	03/14/07 18:12
FB-CR-PROBE	SAMPLE	193221-014	0.65	0.50	03/01/07	03/14/07 18:23
FB-CR-IMP 1 & FILTER	SAMPLE	193221-015	ND	0.50	03/01/07	03/14/07 18:35
FB-CR-IMP 2	SAMPLE	193221-016	ND	0.50	03/01/07	03/14/07 18:46
	BLANK	QC379494	ND	0.50		03/14/07 13:33

ND= Not Detected
RL= Reporting Limit

2.0

2020-04-28: SSI-101

Curtis & Tompkins, Ltd.

Batch QC Report

Hexavalent Chromium

Lab #:	193221	Location:	Schnitzer Steel
Client:	The Avogadro Group	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7199
Analyte:	Hexavalent Chromium	Units:	ug/L
Field ID:	1-CR-IMP 1 & FILTER	Batch#:	123172
MSS Lab ID:	193221-003	Sampled:	03/02/07
Matrix:	Water	Received:	03/07/07

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim	Diln Fac	Analyzed
BS	QC379495		20.00	19.85	99	90-110			1.000	03/14/07 13:45
BSD	QC379496		20.00	19.73	99	90-110	1	20	1.000	03/14/07 13:56
MS	QC379497	0.6910	10.00	10.61	99	85-115			1.010	03/14/07 16:27
MSD	QC379498		10.00	9.943	93	85-115	6	20	1.010	03/14/07 16:39

RPD= Relative Percent Difference

3.0

2020-04-28: SSI-102

CHAIN OF CUSTODY

Client/Project Name	Project Location/Sample Location	ANALYSES
Schnitzer Steel	Shredder	
Project No. 06178.0 ☐ Lump-sum ☐ T&M ☒ California ☐ Medford	P.O. No.	
Sampler: (Signature) Kevin Tilla	Send Analytical Report To: Shawn Velezan or Kevin D.	

Sample No./ Identification	Date	# of Containers	Lab Sample Number	Type of Sample	CARB 425			Remarks
1-Cr	3/1	3		Hex + Total	X			low detection
2-Cr	3/2	1		Chromium	X			option:
3-Cr	3/2	1		in NaOH soln.	X			Containers
FB-Cr	3/1	1			X			1. probe
								2. Imp. 1 +
								filter
								3. Imp 2
								Analyze
								each for
								both Hex + total
								(split in half)

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Kevin Tilla	3/2/07	1745	[signature] rec'd intact + frozen	3/7/7	1100
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

Sample Collected By:

The Avogadro Group, LLC
737 Arnold Drive, Suite D
Martinez, CA 94553
(925) 680-4300 * (925) 680-4416 FAX

Analytical report due date: _____

White: Originator Yellow: Laboratory

APPENDIX D.3
POLYCHLORINATED BIPHENYL LABORATORY DATA

2020-04-28: GSI-104

Vista
Analytical Laboratory

March 15, 2007

Vista Project I.D.: 28774

Mr. Shawn M. Nelezen
The Avogadro Group, LLC
2825 Verne Roberts Circle
Antioch, CA 94509

Dear Mr. Nelezen,

Enclosed are the results for the four MM5 samples received at Vista Analytical Laboratory on March 07, 2007 under your Project Name "Schnitzer Steel 06178.0". These samples were extracted and analyzed using CARB Method 428 for PCB homologue totals. A standard turnaround time was provided for this work.

The results flagged with an asterisk were taken from a dilution of the extract.

The following report consists of a Sample Inventory (Section I), Analytical Results (Section II) and the Appendix, which contains the chain-of-custody, a list of data qualifiers and abbreviations, Vista's current certifications, and copies of the raw data (if requested).

Vista Analytical Laboratory is committed to serving you effectively. If you require additional information, please contact me at 916-673-1520 or by email at mmaier@vista-analytical.com. Thank you for choosing Vista as part of your analytical support team.

Sincerely,

Martha Maier

Martha M. Maier
Laboratory Director

ACCREDITED IN ACCORDANCE WITH nelac

Vista Analytical Laboratory certifies that the report herein meets all the requirements set forth by NELAC for those applicable test methods. Results relate only to the samples as received by the laboratory. This report should not be reproduced except in full without the written approval of Vista Analytical Laboratory.

nelap

Vista

Section I: Sample Inventory Report

Date Received: 3/7/2007
Project No.: 28774
Project Name: Schnitzer Steel 06178.0

Lab. Sample ID	Client Sample ID	Component ID
001	1-PCB	FILTER
		Impinger 1 Contents/Rinse
		Impinger 2/3 Cont/Rinse
		Probe Rinse
		Sample Line, Cond Rinse
		XAD
002	2-PCB	FILTER
		Impinger 1 Contents/Rinse
		Impinger 2/3 Cont/Rinse
		Probe Rinse
		Sample Line, Cond Rinse
		XAD
003	3-PCB	FILTER
		Impinger 1 Contents/Rinse
		Impinger 2/3 Cont/Rinse
		Probe Rinse
		Sample Line, Cond Rinse
		XAD
004	FB-PCB	FILTER
		Impinger 1 Contents/Rinse
		Impinger 2/3 Cont/Rinse
		Probe Rinse
		Sample Line, Cond Rinse
		XAD

Smpinvgmm5.rpt

2020-04-28: SSI-106

SECTION II

Vista

Method Blank | **CARB Method 428**

Matrix: MM5
Sample Size: Sample
QC Batch No.: 8918
Date Extracted: 8-Mar-07

Lab Sample: 0-MB001
Date Analyzed DB-1: 9-Mar-07

Analyte	Conc. (ng/Sample)	RL [a]	Qualifiers
Total monoCB	ND	0.0500	
Total diCB	ND	0.166	I
Total triCB	ND	0.0500	
Total tetraCB	0.0558	0.0500	
Total pentaCB	ND	0.0500	
Total hexaCB	ND	0.0500	
Total heptaCB	ND	0.0500	
Total octaCB	ND	0.0500	
Total nonaCB	ND	0.0500	
Total decaCB	ND	0.0500	
Total PCB	0.0558	0.166	I

	Labeled Standard	%R	LCL-UCL [b]	Qualifiers
IS	13C-PCB-1	64.8	40 - 120	
	13C-PCB-3	71.9	40 - 120	
	13C-PCB-4	70.8	40 - 120	
	13C-PCB-9	69.9	40 - 120	
	13C-PCB-19	64.3	40 - 120	
	13C-PCB-28	79.9	40 - 120	
	13C-PCB-32	64.0	40 - 120	
	13C-PCB-37	80.3	40 - 120	
	13C-PCB-54	80.0	40 - 120	
	13C-PCB-77	82.1	40 - 120	
	13C-PCB-81	83.2	40 - 120	
	13C-PCB-95	83.6	40 - 120	
	13C-PCB-101	83.3	40 - 120	
	13C-PCB-104	84.5	40 - 120	
	13C-PCB-105	86.6	40 - 120	
	13C-PCB-114	89.1	40 - 120	
	13C-PCB-118	86.0	40 - 120	
	13C-PCB-123	91.0	40 - 120	
	13C-PCB-126	92.8	40 - 120	
	13C-PCB-153	75.7	40 - 120	
	13C-PCB-155	75.2	40 - 120	
	13C-PCB-156	81.3	40 - 120	
	13C-PCB-157	80.7	40 - 120	
	13C-PCB-167	78.7	40 - 120	
	13C-PCB-169	94.3	40 - 120	
	13C-PCB-170	73.3	40 - 120	
	13C-PCB-180	71.4	40 - 120	
	13C-PCB-188	64.9	40 - 120	
	13C-PCB-189	71.7	40 - 120	

2020-04-28: SSI-108

Vista

Method Blank				CARB Method 428			
Matrix: MM5	QC Batch No.: 8918			Lab Sample: 0-MB001			
Sample Size: Sample	Date Extracted: 8-Mar-07			Date Analyzed DB-1: 9-Mar-07			
Analyte	**Conc. (ng/Sample)**	**RL** [a]	**Qualifiers**	**Labeled Standard**	**%R**	**LCL-UCL** [b]	**Qualifiers**
				13C-PCB-194	82.3	40 - 120	
				13C-PCB-202	66.3	40 - 120	
				13C-PCB-206	81.5	40 - 120	
				13C-PCB-208	73.7	40 - 120	
				13C-PCB-209	71.3	40 - 120	
				PS 13C-PCB-52	103	40 - 120	
				13C-PCB-178	99.3	40 - 120	

a. Reporting limit.

b. Lower control limit - upper control limit.

Analyst: RAS Page 2 of 2 Approved By: Martha M. Maier 15-Mar-2007 11:01

Vista

OPR Results — CARB Method 428

Matrix:	MM5	QC Batch No.:	8918	Lab Sample:	0-OPR001
Sample Size:	Sample	Date Extracted:	8-Mar-07	Date Analyzed DB-1:	9-Mar-07

Analyte	Spike Conc.	Conc. (ng/mL)	OPR Limits
PCB-3	50.0	54.7	25 - 75
PCB-15	100	109	50 - 150
PCB-28	50.0	48.4	25 - 75
PCB-77	50.0	46.8	25 - 75
PCB-106/118	100	111	50 - 150
PCB-156	50.0	49.2	25 - 75
PCB-180	50.0	50.4	25 - 75
PCB-202	50.0	51.2	25 - 75
PCB-207	50.0	53.9	25 - 75
PCB-209	50.0	52.7	25 - 75

	Labeled Standard	%R	LCL-UCL	Qualifier
IS	13C-PCB-1	69.5	40 - 120	
	13C-PCB-3	75.5	40 - 120	
	13C-PCB-4	74.0	40 - 120	
	13C-PCB-9	72.4	40 - 120	
	13C-PCB-19	69.6	40 - 120	
	13C-PCB-28	82.7	40 - 120	
	13C-PCB-32	69.2	40 - 120	
	13C-PCB-37	82.1	40 - 120	
	13C-PCB-54	86.4	40 - 120	
	13C-PCB-77	81.0	40 - 120	
	13C-PCB-81	83.5	40 - 120	
	13C-PCB-95	87.0	40 - 120	
	13C-PCB-101	86.4	40 - 120	
	13C-PCB-104	88.2	40 - 120	
	13C-PCB-105	96.6	40 - 120	
	13C-PCB-114	95.5	40 - 120	
	13C-PCB-118	84.8	40 - 120	
	13C-PCB-123	83.1	40 - 120	
	13C-PCB-126	91.7	40 - 120	
	13C-PCB-153	88.1	40 - 120	
	13C-PCB-155	77.9	40 - 120	
	13C-PCB-156	82.4	40 - 120	
	13C-PCB-157	82.0	40 - 120	
	13C-PCB-167	80.4	40 - 120	
	13C-PCB-169	85.2	40 - 120	
	13C-PCB-170	74.2	40 - 120	
	13C-PCB-180	73.9	40 - 120	
	13C-PCB-188	79.6	40 - 120	
	13C-PCB-189	75.3	40 - 120	
	13C-PCB-194	82.7	40 - 120	
	13C-PCB-202	70.8	40 - 120	
	13C-PCB-206	80.9	40 - 120	
	13C-PCB-208	75.8	40 - 120	
	13C-PCB-209	77.4	40 - 120	

Chemist: RAS

Page 1 of 1

Approved by: Martha M. Maier 15-Mar-2007 11:01

2020-04-28: SSI-110

Vista

Sample ID: 1-PCB | **CARB Method 428**

Client Data
Name: The Avogadro Group, LLC
Project: Schnitzer Steel 06178.0
Date Collected: 1-Mar-07
Time Collected: NA

Sample Data
Matrix: MM5
Sample Size: Sample

Laboratory Data
Lab Sample: 28774-001
QC Batch No.: 8918
Date Analyzed DB-1: 9-Mar-07
Date Received: 7-Mar-07
Date Extracted: 8-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers
Total monoCB	963	0.250	*
Total diCB	5430	0.100	
Total triCB	3140	0.0500	
Total tetraCB	492	0.0500	B
Total pentaCB	29.7	0.0500	
Total hexaCB	6.55	0.0500	
Total heptaCB	1.25	0.173	I
Total octaCB	0.518	0.0500	
Total nonaCB	0.114	0.0500	
Total decaCB	ND	0.0500	
Total PCB	10000	0.250	B,I,*

	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
IS	13C-PCB-1	37.2	40 - 120	H,*
	13C-PCB-3	43.0	40 - 120	*
	13C-PCB-4	40.7	40 - 120	
	13C-PCB-9	53.4	40 - 120	
	13C-PCB-19	36.5	40 - 120	H
	13C-PCB-28	82.7	40 - 120	
	13C-PCB-32	56.3	40 - 120	
	13C-PCB-37	102	40 - 120	
	13C-PCB-54	62.8	40 - 120	
	13C-PCB-77	95.3	40 - 120	
	13C-PCB-81	94.5	40 - 120	
	13C-PCB-95	84.4	40 - 120	
	13C-PCB-101	87.9	40 - 120	
	13C-PCB-104	77.8	40 - 120	
	13C-PCB-105	104	40 - 120	
	13C-PCB-114	102	40 - 120	
	13C-PCB-118	92.0	40 - 120	
	13C-PCB-123	92.6	40 - 120	
	13C-PCB-126	110	40 - 120	
	13C-PCB-153	91.0	40 - 120	
	13C-PCB-155	74.3	40 - 120	
	13C-PCB-156	95.9	40 - 120	
	13C-PCB-157	95.4	40 - 120	
	13C-PCB-167	94.4	40 - 120	
	13C-PCB-169	102	40 - 120	
	13C-PCB-170	82.8	40 - 120	
	13C-PCB-180	83.1	40 - 120	

2020-04-28: SSI-111

Vista

Sample ID: 1-PCB		CARB Method 428
Client Data Name: The Avogadro Group, LLC Project: Schnitzer Steel 06178.0 Date Collected: 1-Mar-07 Time Collected: NA	**Sample Data** Matrix: MM5 Sample Size: Sample	**Laboratory Data** Lab Sample: 28774-001 Date Received: 7-Mar-07 QC Batch No.: 8918 Date Extracted: 8-Mar-07 Date Analyzed DB-1: 9-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
				13C-PCB-188	75.3	40 - 120	
				13C-PCB-189	86.0	40 - 120	
				13C-PCB-194	93.0	40 - 120	
				13C-PCB-202	71.2	40 - 120	
				13C-PCB-206	87.9	40 - 120	
				13C-PCB-208	86.0	40 - 120	
				13C-PCB-209	77.7	40 - 120	
				PS 13C-PCB-52	83.1	40 - 120	
				13C-PCB-178	95.9	40 - 120	

a. Reporting limit.

b. Lower control limit - upper control limit.

Analyst: RAS	Page 2 of 2	Approved By:	Martha M. Maier 15-Mar-2007 11:01

Vista

Sample ID: 2-PCB | **CARB Method 428**

Client Data
Name: The Avogadro Group, LLC
Project: Schnitzer Steel 06178.0
Date Collected: 2-Mar-07
Time Collected: NA

Sample Data
Matrix: MM5
Sample Size: Sample

Laboratory Data
Lab Sample: 28774-002
QC Batch No.: 8918
Date Analyzed DB-1: 9-Mar-07
Date Received: 7-Mar-07
Date Extracted: 8-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers
Total monoCB	329	0.250	*
Total diCB	3520	0.100	
Total triCB	4110	0.0500	
Total tetraCB	1510	0.0500	B
Total pentaCB	191	0.212	I
Total hexaCB	44.6	0.0500	
Total heptaCB	6.55	0.159	I
Total octaCB	1.35	0.143	I
Total nonaCB	0.299	0.0500	
Total decaCB	0.0586	0.0500	
Total PCB	9720	0.250	B,I,*

	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
IS	13C-PCB-1	40.0	40 - 120	*
	13C-PCB-3	44.0	40 - 120	*
	13C-PCB-4	53.6	40 - 120	
	13C-PCB-9	64.2	40 - 120	
	13C-PCB-19	32.0	40 - 120	H
	13C-PCB-28	72.7	40 - 120	
	13C-PCB-32	45.7	40 - 120	
	13C-PCB-37	106	40 - 120	
	13C-PCB-54	53.2	40 - 120	
	13C-PCB-77	102	40 - 120	
	13C-PCB-81	105	40 - 120	
	13C-PCB-95	85.8	40 - 120	
	13C-PCB-101	87.1	40 - 120	
	13C-PCB-104	76.6	40 - 120	
	13C-PCB-105	111	40 - 120	
	13C-PCB-114	113	40 - 120	
	13C-PCB-118	96.9	40 - 120	
	13C-PCB-123	93.0	40 - 120	
	13C-PCB-126	120	40 - 120	
	13C-PCB-153	95.8	40 - 120	
	13C-PCB-155	68.8	40 - 120	
	13C-PCB-156	105	40 - 120	
	13C-PCB-157	106	40 - 120	
	13C-PCB-167	103	40 - 120	
	13C-PCB-169	109	40 - 120	
	13C-PCB-170	86.8	40 - 120	
	13C-PCB-180	87.7	40 - 120	

Vista

Sample ID: 2-PCB		CARB Method 428
Client Data Name: The Avogadro Group, LLC Project: Schnitzer Steel 06178.0 Date Collected: 2-Mar-07 Time Collected: NA	**Sample Data** Matrix: MM5 Sample Size: Sample	**Laboratory Data** Lab Sample: 28774-002 Date Received: 7-Mar-07 QC Batch No.: 8918 Date Extracted: 8-Mar-07 Date Analyzed DB-1: 9-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
				13C-PCB-188	72.1	40 - 120	
				13C-PCB-189	86.1	40 - 120	
				13C-PCB-194	100	40 - 120	
				13C-PCB-202	70.7	40 - 120	
				13C-PCB-206	98.1	40 - 120	
				13C-PCB-208	92.3	40 - 120	
				13C-PCB-209	85.0	40 - 120	
				PS 13C-PCB-52	72.6	40 - 120	
				13C-PCB-178	89.7	40 - 120	

a. Reporting limit.

b. Lower control limit - upper control limit.

Analyst: RAS Page 2 of 2 Approved By: Martha M. Maier 15-Mar-2007 11:01

Vista

Sample ID: 3-PCB | **CARB Method 428**

Client Data
Name: The Avogadro Group, LLC
Project: Schnitzer Steel 06178.0
Date Collected: 2-Mar-07
Time Collected: NA

Sample Data
Matrix: MM5
Sample Size: Sample

Laboratory Data
Lab Sample: 28774-003
QC Batch No.: 8918
Date Analyzed DB-1: 9-Mar-07
Date Received: 7-Mar-07
Date Extracted: 8-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers
Total monoCB	160	0.0500	
Total diCB	1340	0.100	
Total triCB	1560	0.0500	
Total tetraCB	408	0.0500	B
Total pentaCB	48.3	0.0500	
Total hexaCB	9.75	0.0500	
Total heptaCB	1.51	0.0614	I
Total octaCB	0.267	0.0500	
Total nonaCB	ND	0.0500	
Total decaCB	ND	0.0500	
Total PCB	3530	0.100	B,I

	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
IS	13C-PCB-1	39.4	40 - 120	H
	13C-PCB-3	46.2	40 - 120	
	13C-PCB-4	57.2	40 - 120	
	13C-PCB-9	65.1	40 - 120	
	13C-PCB-19	47.4	40 - 120	
	13C-PCB-28	71.4	40 - 120	
	13C-PCB-32	53.3	40 - 120	
	13C-PCB-37	75.7	40 - 120	
	13C-PCB-54	63.8	40 - 120	
	13C-PCB-77	85.9	40 - 120	
	13C-PCB-81	84.2	40 - 120	
	13C-PCB-95	74.3	40 - 120	
	13C-PCB-101	75.9	40 - 120	
	13C-PCB-104	70.7	40 - 120	
	13C-PCB-105	93.3	40 - 120	
	13C-PCB-114	94.3	40 - 120	
	13C-PCB-118	81.5	40 - 120	
	13C-PCB-123	83.0	40 - 120	
	13C-PCB-126	99.6	40 - 120	
	13C-PCB-153	81.3	40 - 120	
	13C-PCB-155	61.6	40 - 120	
	13C-PCB-156	85.6	40 - 120	
	13C-PCB-157	84.7	40 - 120	
	13C-PCB-167	83.4	40 - 120	
	13C-PCB-169	92.3	40 - 120	
	13C-PCB-170	72.9	40 - 120	
	13C-PCB-180	70.9	40 - 120	

2020-04-28: SSI-115

Vista

Sample ID: 3-PCB		CARB Method 428
Client Data Name: The Avogadro Group, LLC Project: Schnitzer Steel 06178.0 Date Collected: 2-Mar-07 Time Collected: NA	**Sample Data** Matrix: MM5 Sample Size: Sample	**Laboratory Data** Lab Sample: 28774-003 Date Received: 7-Mar-07 QC Batch No.: 8918 Date Extracted: 8-Mar-07 Date Analyzed DB-1: 9-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
				13C-PCB-188	63.0	40 - 120	
				13C-PCB-189	76.1	40 - 120	
				13C-PCB-194	81.2	40 - 120	
				13C-PCB-202	60.4	40 - 120	
				13C-PCB-206	74.8	40 - 120	
				13C-PCB-208	74.1	40 - 120	
				13C-PCB-209	65.3	40 - 120	
				PS 13C-PCB-52	81.8	40 - 120	
				13C-PCB-178	93.1	40 - 120	

a. Reporting limit.

b. Lower control limit - upper control limit.

Analyst: RAS Page 2 of 2 Approved By: Martha M. Maier 15-Mar-2007 11:01

2020-04-28: SSI-116

Vista

Sample ID: FB-PCB | **CARB Method 428**

Client Data
Name: The Avogadro Group, LLC
Project: Schnitzer Steel 06178.0
Date Collected: 1-Mar-07
Time Collected: NA

Sample Data
Matrix: MM5
Sample Size: Sample

Laboratory Data
Lab Sample: 28774-004
QC Batch No.: 8918
Date Analyzed DB-1: 9-Mar-07
Date Received: 7-Mar-07
Date Extracted: 8-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers
Total monoCB	0.0719	0.0500	
Total diCB	0.477	0.215	I
Total triCB	2.27	0.0500	
Total tetraCB	1.11	0.0500	B
Total pentaCB	0.112	0.0500	
Total hexaCB	ND	0.0500	
Total heptaCB	ND	0.0500	
Total octaCB	ND	0.0500	
Total nonaCB	ND	0.0500	
Total decaCB	ND	0.0500	
Total PCB	4.04	0.215	B,I

	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
IS	13C-PCB-1	56.5	40 - 120	
	13C-PCB-3	63.1	40 - 120	
	13C-PCB-4	61.5	40 - 120	
	13C-PCB-9	65.3	40 - 120	
	13C-PCB-19	59.4	40 - 120	
	13C-PCB-28	72.5	40 - 120	
	13C-PCB-32	63.2	40 - 120	
	13C-PCB-37	79.8	40 - 120	
	13C-PCB-54	84.4	40 - 120	
	13C-PCB-77	92.6	40 - 120	
	13C-PCB-81	89.1	40 - 120	
	13C-PCB-95	89.6	40 - 120	
	13C-PCB-101	88.3	40 - 120	
	13C-PCB-104	91.1	40 - 120	
	13C-PCB-105	105	40 - 120	
	13C-PCB-114	104	40 - 120	
	13C-PCB-118	94.2	40 - 120	
	13C-PCB-123	96.9	40 - 120	
	13C-PCB-126	110	40 - 120	
	13C-PCB-153	90.6	40 - 120	
	13C-PCB-155	81.7	40 - 120	
	13C-PCB-156	97.4	40 - 120	
	13C-PCB-157	96.6	40 - 120	
	13C-PCB-167	91.9	40 - 120	
	13C-PCB-169	108	40 - 120	
	13C-PCB-170	87.2	40 - 120	
	13C-PCB-180	86.1	40 - 120	

2020-04-28: SSI-117

Vista

Sample ID: FB-PCB		CARB Method 428
Client Data Name: The Avogadro Group, LLC Project: Schnitzer Steel 06178.0 Date Collected: 1-Mar-07 Time Collected: NA	**Sample Data** Matrix: MM5 Sample Size: Sample	**Laboratory Data** Lab Sample: 28774-004 Date Received: 7-Mar-07 QC Batch No.: 8918 Date Extracted: 8-Mar-07 Date Analyzed DB-1: 9-Mar-07

Analyte	Conc. (ng/Sample)	RL[a]	Qualifiers	Labeled Standard	%R	LCL-UCL[b]	Qualifiers
				13C-PCB-188	81.5	40 - 120	
				13C-PCB-189	94.7	40 - 120	
				13C-PCB-194	90.7	40 - 120	
				13C-PCB-202	78.4	40 - 120	
				13C-PCB-206	90.9	40 - 120	
				13C-PCB-208	79.6	40 - 120	
				13C-PCB-209	82.0	40 - 120	
				PS 13C-PCB-52	101	40 - 120	
				13C-PCB-178	93.8	40 - 120	

a. Reporting limit.

b. Lower control limit - upper control limit.

Analyst: RAS Page 2 of 2 Approved By: Martha M. Maier 15-Mar-2007 11:01

2020-04-28: SSI-118

APPENDIX

DATA QUALIFIERS & ABBREVIATIONS

B	This compound was also detected in the method blank.
D	The amount reported is the maximum possible concentration due to possible chlorinated diphenylether interference.
E	The reported value exceeds the calibration range of the instrument.
H	The signal-to-noise ratio is greater than 10:1.
I	Chemical interference
J	The amount detected is below the Lower Calibration Limit of the instrument.
*	See Cover Letter
Conc.	Concentration
DL	Sample-specific estimated Detection Limit
MDL	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero in the matrix tested.
EMPC	Estimated Maximum Possible Concentration
NA	Not applicable
RL	Reporting Limit – concentrations that corresponds to low calibration point
ND	Not Detected
TEQ	Toxic Equivalency

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

CERTIFICATIONS

Accrediting Authority	Certificate Number
State of Alaska, DEC	CA413-02
State of Arizona	AZ0639
State of Arkansas, DEQ	05-013-0
State of Arkansas, DOH	Reciprocity through CA
State of California – NELAP Primary AA	02102CA
State of Colorado	
State of Connecticut	PH-0182
State of Florida, DEP	E87777
Commonwealth of Kentucky	90063
State of Louisiana, Health and Hospitals	LA050001
State of Louisiana, DEQ	01977
State of Maine	CA0413
State of Michigan	81178087
State of Mississippi	Reciprocity through CA
Naval Facilities Engineering Service Center	
State of Nevada	CA413
State of New Jersey	CA003
State of New Mexico	Reciprocity through CA
State of New York, DOH	11411
State of North Carolina	06700
State of North Dakota, DOH	R-078
State of Oklahoma	D9919
State of Oregon	CA200001-002
State of Pennsylvania	68-00490
State of South Carolina	87002001
State of Tennessee	02996
State of Texas	TX247-2005A
U.S. Army Corps of Engineers	
State of Utah	9169330940
Commonwealth of Virginia	00013
State of Washington	C1285
State of Wisconsin	998036160
State of Wyoming	8TMS-Q

28774, 4.8°C

CHAIN OF CUSTODY

Client/Project Name	Project Location/Sample Location	ANALYSES	
Schnitzer Steel	Shredder		
Project No. 061786 ☒ Lump-sum ☐ T&M ☒ California ☐ Medford ☐ Portland	BAAQMD: ☐ Yes ☐ No / P.O. No.		Full 202? ☐ Yes ☐ No
Sampler: (Signature) Kevin Parke	Send Analytical Report To: Shawn Velezen + Kevin Denoke		

Sample No./ Identification	Date	# of Containers	Lab Sample Number	Type of Sample	CARB 428			Remarks
1-PCB	3/1	6		PCB	X			Containers
2-PCB	3/2	↓			X			1a, filter
3-PCB	3/2				X			1b, sorbent
FB-PCB	3/1				X			2, Probe Rinse
								3, Sample line, Condenser rinses
								4, Impinger 1 contents + rinses
								5, Impingers 2+3 contents + rinses

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Kevin Parke	3/2/07	1745	[illegible]	3/8/07	1700
[illegible]	3/7/07	0850	Kellman A. Benedict	3/7/07	0851

Sample Collected By:

The Avogadro Group, LLC
2825 Verne Roberts Circle
Antioch, CA 94509
(925) 680-4300 * (925) 680-4416 FAX

Analytical report due date: _____

White: Project Mgr. **Yellow**: Originator **Pink**: Laboratory

2020-04-28: SSI-122

SAMPLE LOG-IN CHECKLIST

Alta Project #: 28774 TAT Standard

Samples Arrival:	Date/Time 3/7/07 0850	Initials: BLB	Location: WR-2 Shelf/Rack: N/A
Logged In:	Date/Time 3/7/07 1022	Initials: FEB	Location: ~~WR-2~~ FEB 3.7.07 Shelf/Rack: R-1 N/A

Delivered By:	FedEx	UPS	Cal	DHL	Hand Delivered	Other
Preservation:	Ice	Blue Ice	Dry Ice	None		
Temp °C 4.8	Time: 0849		Thermometer ID: IR-1			

	YES	NO	NA
Adequate Sample Volume Received?	✓		
Holding Time Acceptable?	✓		
Shipping Container(s) Intact?	✓		
Shipping Custody Seals Intact?	✓		
Shipping Documentation Present?			✓
Airbill / Trk #			✓
Sample Container Intact?	✓		
Sample Custody Seals Intact?			✓
Chain of Custody / Sample Documentation Present?	✓		
COC Anomaly/Sample Acceptance Form completed?		✓	
If Chlorinated or Drinking Water Samples, Acceptable Preservation?			✓

$Na_2S_2O_3$ Preservation Documented?			COC	Sample Container	None
Shipping Container	Alta	Client	Retain	Return	Dispose

Comments:

28774, 4.8°C

CHAIN OF CUSTODY

Client/Project Name	Project Location/Sample Location	ANALYSES
Schnitzer Steel	Shredder	

Project No.	BAAQMD:	P.O. No.	Full 202?
06178.0 ☒ Lump-sum ☐ T&M ☒ California ☐ Medford ☐ Portland	☐ Yes ☐ No		☐ Yes ☐ No

Sampler: (Signature)	Send Analytical Report To:
[illegible]	Shawn Nelezen + Kevin Daniel

Sample No./ Identification	Date	# of Containers	Lab Sample Number	Type of Sample	CARB 428			Remarks
1-PCB	3/1	6		PCB	X			Containers
2-PCB	3/2	↓			X			1a, filter
3-PCB	3/2				X			1b, sorbent
FB-PCB	3/1				X			2, Probe Rinse
								3, sample line, condenser rinses
								4, Impinger 1 contents + rinses
								5, Impingers 2+3 contents + rinses

EXACT COPY OF ORIGINAL
Init FEB 3/7/07

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible]	3/2/07	1745	[illegible]	3/6/07	1700
[illegible]	3/7/07	0850	Bettina Benedict	3/7/07	0851

Sample Collected By:

The Avogadro Group, LLC
2825 Verne Roberts Circle
Antioch, CA 94509
(925) 680-4300 * (925) 680-4416 FAX

Analytical report due date: _____

White: Project Mgr. **Yellow**: Originator **Pink**: Laboratory

2020-04-28: SSI-124

APPENDIX D.4
BENZENE LABORATORY DATA

2020-04-28 SSI-125

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Air Toxics Ltd. Introduces the Electronic Report

Thank you for choosing Air Toxics Ltd. To better serve our customers, we are providing your report by e-mail. This document is provided in Portable Document Format which can be viewed with Acrobat Reader by Adobe.

This electronic report includes the following:

- Work order Summary;
- Laboratory Narrative;
- Results; and
- Chain of Custody (copy).

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630

(916) 985-1000 .FAX (916) 985-1020
Hours 8:00 A.M to 6:00 P.M. Pacific

2020-04-28: SSI-126

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0703154

Work Order Summary

CLIENT:	Mr. Shawn Nelezen The Avogadro Group 2825 Verne Roberts Circle Antioch, CA 94509	**BILL TO:**	Mr. Shawn Nelezen The Avogadro Group 2825 Verne Roberts Circle Antioch, CA 94509
PHONE:	925-680-4397	**P.O. #**	
FAX:	925-429-9052	**PROJECT #**	06178.0 Schnitzer Steel
DATE RECEIVED:	03/07/2007	**CONTACT:**	Sarah Nguyen
DATE COMPLETED:	03/20/2007		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	1-POC	Mod. Method TO-15	9.0 "Hg
01AA	1-POC Duplicate	Mod. Method TO-15	9.0 "Hg
02A	2-POC	Mod. Method TO-15	9.0 "Hg
03A	3-POC	Mod. Method TO-15	8.0 "Hg
04A	Lab Blank	Mod. Method TO-15	NA
05A	CCV	Mod. Method TO-15	NA
06A	LCS	Mod. Method TO-15	NA

CERTIFIED BY: Linda S. Truman

Laboratory Director

DATE: 03/20/07

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004
NY NELAP - 11291, UT NELAP - 9166389892
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/06, Expiration date: 06/30/07
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

This report shall not be reproduced, except in full, without the written approval of Air Toxics Ltd.

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

2020-04-28: SSI-127

LABORATORY NARRATIVE
Mod. Method TO-15
The Avogadro Group
Workorder# 0703154

Three 6 Liter Summa Canister samples were received on March 07, 2007. The laboratory performed the analysis via Modified Method TO-15 using GC/MS in the full scan mode. The method involves direct injection of up to a 40 mL sample aliquot into a vapor management system. Following dehumidification the sample passes directly into the GC/MS for analysis.

Method modifications taken to run these samples are summarized in the below table. Specific project requirements may over-ride the ATL modifications.

Requirement	*TO-15*	*ATL Modifications*
Daily CCV	+- 30% Difference	</= 30% Difference with two allowed out up to </=40%.; flag and narrate outliers
Sample collection media	Summa canister	ATL recommends use of summa canisters to insure data defensibility, but will report results from Tedlar bags at client request
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction no performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

2020-04-28: SSI-128

b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

2020-04-28: SSI-129

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Summary of Detected Compounds
MODIFIED TO-15 GC/MS

Client Sample ID: 1-POC

Lab ID#: 0703154-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.6	99	30	320

Client Sample ID: 1-POC Duplicate

Lab ID#: 0703154-01AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.6	99	30	320

Client Sample ID: 2-POC

Lab ID#: 0703154-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.6	170	30	550

Client Sample ID: 3-POC

Lab ID#: 0703154-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.2	80	29	260

2020-04-28: SSI-130

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Client Sample ID: 1-POC

Lab ID#: 0703154-01A

MODIFIED TO-15 GC/MS

File Name:	c031225	Date of Collection:	2/28/07
Dil. Factor:	1.91	Date of Analysis:	3/12/07 09:00 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.6	99	30	320

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130

2020-04-28: SSI-131

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: 1-POC Duplicate

Lab ID#: 0703154-01AA

MODIFIED TO-15 GC/MS

File Name:	c031226	Date of Collection:	2/28/07
Dil. Factor:	1.91	Date of Analysis:	3/12/07 09:29 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.6	99	30	320

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130

2020-04-28: SSI-132

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: 2-POC

Lab ID#: 0703154-02A

MODIFIED TO-15 GC/MS

File Name:	c031227	Date of Collection:	2/28/07
Dil. Factor:	1.91	Date of Analysis:	3/12/07 10:02 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.6	170	30	550

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130

2020-04-28: SSI-133

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: 3-POC

Lab ID#: 0703154-03A

MODIFIED TO-15 GC/MS

File Name:	c031228	Date of Collection:	2/28/07
Dil. Factor:	1.83	Date of Analysis:	3/12/07 10:35 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	9.2	80	29	260

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130

2020-04-28: SSI-134

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: Lab Blank

Lab ID#: 0703154-04A

MODIFIED TO-15 GC/MS

File Name:	c031211	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 3/12/07 02:40 PM	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Benzene	5.0	Not Detected	16	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130

2020-04-28: SSI-135

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: CCV

Lab ID#: 0703154-05A

MODIFIED TO-15 GC/MS

File Name:	c031204	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 3/12/07 11:02 AM	

Compound	%Recovery
Benzene	83

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130

2020-04-28: SSI-136

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: LCS

Lab ID#: 0703154-06A

MODIFIED TO-15 GC/MS

File Name:	c031205	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 3/12/07 11:29 AM	

Compound	%Recovery
Benzene	91

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130

2020-04-28: SSI-137

@ AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. hotline (800) 467-4922.

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

CHAIN-OF-CUSTODY RECORD

Page ____ of ____

Contact Person: Shawn Nelezen / Kevin Donahoe
Company: The Alvarado Group, LLC Email:
Address: 225 Verne Roberts Circle City: Antioch State: CA Zip: 94509
Phone: Fax:
Collected by: (Signature)

Project Info:
P.O. #:
Project #: 06173.0
Project Name: Schnitzer Steel

Turn Around Time:
☐ Normal
☐ Rush
specify

Lab Use Only
Pressurized by: VIA
Date: 3/19/07
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can#	Date	Time	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final
01A	1-POC	312	2/28/07	0901-1002	Benzene by EPA-TO-15	30	10.5	9.0	5.0 psi
02A	2-POC	2332	2/28/07	1035-1135	↓	30	10.5	9.0	
03A	3-POC	2447	2/28/07	1206-1306	↓	30	11	8.0	↓

Relinquished by: (signature) Date/Time: 3/5/07 1215
Received by: (signature) Date/Time: T. LaFlash - ATL 3/6/07 0830
Notes:
Relinquished by: (signature) Date/Time
Received by: (signature) Date/Time
Relinquished by: (signature) Date/Time
Received by: (signature) Date/Time

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Customer Seals Intact?	Work Order #
	Drop off	—	NA	good	Yes No (None)	0703154

Form 1293 rev.10

2020-04-28: SSI-138

APPENDIX D.5
TOTAL ORGANIC COMPOUNDS LABORATORY DATA

2020-04-28 SSI-139

AtmAA Inc.
23917 Craftsman Rd., Calabasas, CA 91302 • (818) 223-3277 • FAX (818) 223-8250
environmental consultants
laboratory services

March 27, 2007

LTR/062n/07

Shawn Nelezen
The Avogadro Group
2825 Verne Roberts Circle
Antioch, CA 94509

RECEIVED
MAR 29 2007

re: Schnitzer

Dear Shawn:

Please find enclosed the laboratory analysis report, quality assurance summary, and the yellow copy chain of custody form for two M25.1 TCA trays received March 9, 2007.

The M25.1 tanks were analyzed for carbon monoxide, methane, carbon dioxide, ethane, and TGNMO. The condensate traps were burned to CO2 and analyzed.

Sincerely,

AtmAA, Inc.

Michael L. Porter
Laboratory Director

Encl.
MLP/krm

2020-04-28: SSI-140

AtmAA Inc.
23917 Craftsman Rd., Calabasas, CA 91302 • (818) 223-3277 • FAX (818) 223-8250
environmental consultants
laboratory services

LABORATORY ANALYSIS REPORT

CO, CH_4, CO_2, TGNMO, and Ethane Analysis in Tanks and Traps by SCAQMD Method 25 (FID/TCA)

Report Date: March 27, 2007
Client: The Avogadro Group
Client Project No.: 06178.0
Source Location: Shnitzer Steel
Source ID: Shredder

Date Received: March 9, 2007
Date Analyzed: March 9, - 21, 2007

AtmAA Lab No.	Sample ID			Tank CO	Tank CH_4	Tank CO_2	Tank Ethane	Tank TGNMO	Trap CO2 in ICV	Tank & Trap Total TGNMO	P_1	P_2
	Tank	Trap	ICV	(Concentration, ppmv)								
00687-9	30	146	15	0.98	2.00	490	<1	46.5	325	81.7	649	820
00687-10	31	192	16	1.04	1.99	403	<1	93.9	131	109	625	820
00687-11	64	143	17	1.10	2.04	407	<1	25.4	388	73.2	571	820
00687-12	23	187	18	1.08	2.04	413	<1	10.5	379	59.8	542	820

trap burn system blank	1	5.48

TGNMO is total gaseous non-methane organics (excluding ethane) reported as ppmv carbon.
Ethane is reported as ppmv carbon.

P_1 - Initial Pressure, mm Hg
P_2 - Final Pressure, mm Hg

Michael L. Porter
Laboratory Director

2020-04-28: SSI-141

QUALITY ASSURANCE SUMMARY
(Repeat Analyses)

Client Project No.: 06178.0
Date Received: March 9, 2007
Date Analyzed: March 9, - 21, 2007

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppmv)			
CO	TK 30	0.96	1.01	0.98	2.7
	TK 64	1.13	1.06	1.10	3.2
CH_4	TK 30	2.01	2.00	2.00	0.26
	TK 64	2.05	2.03	2.04	0.53
CO_2	TK 30	489	491	490	0.14
	TK 64	407	408	407	0.05
Ethane	TK 30	<1	<1	---	---
	TK 64	<1	<1	---	---
TGNMO	TK 30	46.5	46.5	46.5	0.0
	TK 64	25.2	25.5	25.4	0.63
CO_2 in ICV (in trap, transfer tanks)	ICV 15	326	325	325	0.15
	ICV 17	389	388	388	0.12

A set of 4 TCA samples, laboratory numbers 00687-(9 - 12), was analyzed for CO, CH_4, CO_2, total gaseous non-methane organics (TGNMO), and ethane. Agreement between repeat analyses is a measure of precision and is shown in the column "% Difference from Mean". The average % Difference from Mean for 10 repeat measurements from the sample set of 4 TCA samples is 0.78%.

Gas standards (containing CO, CH_4, CO_2 and isobutane) used for TCA analyses, were prepared and certified by Praxair.

2020-04-28: SSI-142

CHAIN OF CUSTODY

Client/Project Name	Project Location/Sample Location	ANALYSES			
Schnitzer Steel	Shredder				
Project No. 06178.0 ☒ Lump-sum ☐ T&M ☒ California ☐ Medford ☐ Portland	BAAQMD: ☐ Yes ☐ No / P.O. No.				Full 202? ☐ Yes ☐ No
Sampler: (Signature) Dennis Fowler	Send Analytical Report To: Sharon Nelezen + Kevin Donahue				

Sample No./ Identification	Date	# of Containers	Lab Sample Number	Type of Sample	EPA 25			Remarks
1-TOC	2/28	2		Cryogenic trap	X			Tank 39/Trap 146
2-TOC	↓	↓		+ evacuated tank	X			Tank 31/Trap 192
3-TOC	↓	↓			X			Tank 64/Trap 143
3-TOC (duplicate)	↓	↓			X			Tank 23/Trap 187

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Dennis Fowler	3/2/07	1745	[signature]	3/5/07	1157
[signature]	3/5/07	1230	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

Sample Collected By:

The Avogadro Group, LLC
2825 Verne Roberts Circle
Antioch, CA 94509
(925) 680-4300 * (925) 680-4416 FAX

Analytical report due date: _____

White: Project Mgr. **Yellow:** Originator **Pink:** Laboratory

2020-04-28: SSI-143

APPENDIX E
EMISSION CALCULATIONS

2020-04-28 SSI-144

APPENDIX E.1
GENERAL EMISSION CALCULATIONS

2020-04-28: GSI-145

EMISSION CALCULATIONS

1. Volumetric Flow and Isokinetics

a. Standard sample gas volume, dscf

$$V_{m\,std} = (0.03342)(V_m)\left[P_{bar} + \left(\frac{\Delta H}{13.6}\right)\right]\left(\frac{T_{ref}}{T_m}\right)(Y)$$

b. Water vapor volume, scf

$$V_{w\,std} = (0.0472)(V_{lc})\left(\frac{T_{ref}}{528\ ^{\circ}R}\right)$$

c. Moisture content, nondimensional

$$B_{ws} = \left(\frac{V_{w\,std}}{(V_{m\,std} + V_{w\,std})}\right)$$

d. Stack gas molecular weight, lb/lb mole (dry)

$$MW_{dry} = [0.44\,(\%\ CO_2)] + [0.32\,(\%\ O_2)] + [0.28\,(\%\ N_2)]$$

e. Stack gas molecular weight, lb/lb mole (wet)

$$MW_{wet} = [MW_{dry}\,(1 - B_{ws})] + [18\,(B_{ws})]$$

f. Absolute stack pressure, in Hg

$$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

g. Stack velocity, ft/sec

$$V_s = (2.90)(C_p)\sqrt{(\Delta P)(T_s)}\ \sqrt{\left(\frac{29.92}{P_s}\right)\left(\frac{28.95}{MW_{wet}}\right)}$$

h. Actual stack flow rate, acfm

$$Q = (V_s)\,(A_s)\,(60\ min/hr)$$

i. Standard stack gas flow rate, wscfm

$$Q_{ws} = (Q)\left(\frac{T_{ref}}{T_s}\right)\left(\frac{P_s}{29.92}\right)$$

j. Standard stack gas flow rate, dscfm

$$Q_{ds} = (Q)\,(1 - B_{ws})\left(\frac{T_{ref}}{T_s}\right)\left(\frac{P_s}{29.92}\right)$$

k. Percent isokinetic

$$I = \left(\frac{(17.32)(T_s)(V_{m\,std})}{(1 - B_{ws})(\Theta)(V_s)(P_s)(D_n^{\,2})}\right)\left(\frac{528\ ^{\circ}R}{T_{ref}}\right)$$

2020-04-28: SSI-146

2. Gaseous Emissions

a. Concentration, ppm volume wet (i.e. to calculate wet ppm from dry ppm)

$$C_w = (C)(1 - B_{ws})$$

b. Concentration, ppm @ 3% O_2 dry

$$C_3 = (C)\left[\frac{(20.9 - 3.0)}{(20.9 - \%\ O_2)}\right]$$

c. Concentration, ppm @ 12% CO_2 dry

$$C_{12} = (C)\left(\frac{12.0}{\%\ CO_2}\right)$$

d. Concentration, ppm volume dry (i.e. to calculate dry ppm from wet ppm)

$$C = \left[\frac{C_w}{(1 - B_{ws})}\right]$$

e. Mass emission rate, lb/hr

$$M = (C)\,(10^{-6})\left(\frac{MW_s}{SV}\right)(Q_{ds})\,(60\ min/hr)$$

where,

SV = specific molar volume of an ideal gas:

$SV = 379.5\ ft^3/lb\ mole\ for\ T_{ref} = 520\ ^\circ R$ (60 °F)

$SV = 383.1\ ft^3/lb\ mole\ for\ T_{ref} = 525\ ^\circ R$ (65 °F)

$SV = 385.3\ ft^3/lb\ mole\ for\ T_{ref} = 528\ ^\circ R$ (68 °F)

$SV = 386.8\ ft^3/lb\ mole\ for\ T_{ref} = 530\ ^\circ R$ (70 °F)

$SV = (379.5)\left[\frac{(460 + (T_{ref}\ ^\circ F))}{520}\right]$ at different reference temperatures

$^\circ R = {}^\circ F + 460$ (to convert reference temperature in $^\circ F$ to $^\circ R$, add 460)

f. Emission rate, lb/MMBtu

$$E = (C)\,(10^{-6})\left(\frac{MW_s}{SV}\right)(F_d)\left(\frac{20.9}{20.9 - \%\ O_2}\right)$$

g. Mass emission rate, grams/bhp-hr

$$M_j = (M)\left(\frac{453.59\ g/lb}{J}\right)$$

2020-04-28: SSI-147

3. Particulate Emissions

a. Grain loading, gr/dscf

$$G = (0.01543)\left(\frac{G_m}{V_{m\,std}}\right)$$

b. Grain loading corrected to 12% CO_2, gr/dscf @ 12% CO_2

$$G_{12} = (G)\left(\frac{12.0}{\%\,CO_2}\right)$$

c. Mass emission rate, lb/hr

$$M = (G)(Q_{ds})\left(\frac{60\ min/hr}{7000\ gr/lb}\right)$$

d. Emission rate, lb/MMBtu

$$E = (G)\left(\frac{1\ lb}{7000\ gr}\right)(F_d)\left(\frac{20.9}{20.9 - \%\,O_2}\right)$$

4. <u>Fuel Factor "F"</u>

a. Choice #1 – use the values for Fd provided in Method 19, Table 19-1
Choice #2 – if you have fuel ultimate and proximate analysis, calculate Fd
(need fuel weight %CHONS, HHV)
Stoichiometric fuel factor at 68 °F, dscf/MMBtu at 0% O_2:

$$F_d = \frac{(10^6)\left[3.64\,(\%H) + 1.53\,(\%C) + 0.14\,(\%N) + 0.57\,(\%S) - 0.46\,(\%\,O)\right]}{HHV,\ Btu/lb}$$

b. Fuel factor at 60 °F (use if all your volumes and flows are at 60 °F)

$$F_{d60} = F_d\left(\frac{520^\circ R}{528^\circ R}\right)$$

2020-04-28: SSI-148

5. Miscellaneous Equations

a. Standard stack gas flow rate, calculated from fuel flow and F factor, dscfm

Note: Q_f and HHV need to be in units of either lb/hr and Btu/lb, or scf/hr and *Btu/scf. Do not mix units!*

(calculation based on stack $\%O_2$)

$$Q_{ds} = (Q_f)(HHV)(10^{-6})(F_d)\left(\frac{20.9}{(20.9 - O_2)}\right) / (60\ min/hr)$$

or (calculation based on stack $\%CO_2$ – see EPA Method 19 for values of F_c)

$$Q_{ds} = (Q_f)(HHV)(10^{-6})(F_c)\left(\frac{100}{CO_2}\right) / (60\ min/hr)$$

b. Destruction efficiency of emission control device, %

$$EFF = \left(\frac{C_{in} - C_{out}}{C_{in}}\right)(100) \quad \text{based on concentrations}$$

or

$$EFF = \left(\frac{M_{in} - M_{out}}{M_{in}}\right)(100) \quad \text{based on mass emission rates}$$

c. Cylinder gas audit, % accuracy

$$A_c = \left(\frac{(C_m - C_a)}{C_a}\right)(100)$$

2020-04-28: SSI-149

Nomenclature:

A_c	=	accuracy of CEMS during cylinder gas audit (CGA), % difference
A_s	=	stack area, ft^2 (πr^2), where $\pi = 3.1416$ and r = radius (½ diameter) in feet
B_{ws}	=	flue gas moisture content (multiply by 100 for % by volume)
C	=	concentration of gaseous species, ppm volume dry
C_a	=	concentration of audit gas, ppm (for CGA, equation 5c)
C_m	=	concentration measured by CEMS, ppm (for CGA, equation 5c)
C_p	=	calibration factor for pitot tube, dimensionless
C_w	=	concentration of gaseous species, ppm volume wet
C_3	=	corrected concentration of gaseous species, ppm @ 3% O_2 dry
C_{12}	=	corrected concentration of gaseous species, ppm @ 12% CO_2 dry
CO_2	=	carbon dioxide content of stack gas, % volume dry
D_n	=	nozzle diameter, inches (inches = millimeters / 2.54 / 10)
E	=	mass emission rate, lb/MMBtu
EFF	=	destruction or removal efficiency of emission control device, % efficiency
F_c	=	stoichiometric "F" factor of fuel based on CO_2, dscf/MMBtu @ 100% CO_2
F_d	=	stoichiometric "F" factor of fuel based on O_2, dscf/MMBtu @ 0% O_2
G	=	particulate matter grain loading, grains/dscf
G_{12}	=	corrected particulate matter grain loading, grains/dscf @ 12% CO_2
G_m	=	mass of collected particulate matter, mg
ΔH	=	meter orifice pressure differential, inches of water, gauge (iwg)
HHV	=	higher heating value of fuel, Btu/lb or Btu/scf
I	=	% isokinetic sampling rate, %
J	=	brake horsepower, bhp
M_j	=	mass emission rate of measured species (s), g/hp-hr
M	=	mass emission rate, lb/hr
MW_{dry}	=	molecular weight of stack gas, dry basis
MW_{wet}	=	molecular weight of stack gas, wet basis

2020-04-28: SSI-150

MW_s = molecular weight of gaseous species (s), lb/lb mole:

CO	:	28.01	(can use 28)
NO_x as NO_2	:	46.01	(can use 46)
SO_x as SO_2	:	64.06	(can use 64)
Hydrocarbons as C	:	12.01	(can use 12)
Hydrocarbons as CH_4	:	16.04	(can use 16)
Hydrocarbons as C_3H_8	:	44.10	(can use 44)
NH_3	:	17.03	(can use 17)

N_2 = nitrogen content of stack gas, % volume dry
(usually determined by difference, $N_2 = 100 - \% O_2 - \% CO_2$)

Θ = sampling time, minutes

O_2 = oxygen content of stack gas, % volume dry

ΔP = average pitot tube differential pressure, root mean square (RMS), iwg
(average the square roots of the delta p's, then square the result = $\left(\sqrt{\overline{\Delta P}}\right)^2$)

P_{bar} = barometric pressure, in. Hg

P_s = stack absolute pressure, in. Hg

P_{sg} = stack static pressure, inches of water, gauge (iwg)

Q = wet stack gas flow rate at actual conditions, acfm

Q_f = fuel flow rate, scfh or lb/hr (be careful of units)

Q_{ds} = dry stack gas flow rate at standard conditions, dscfm

Q_{ws} = wet stack gas flow rate at standard conditions, wscfm

$°R$ = absolute temperature in Rankin degrees (°F plus 460)

SV = specific molar volume of an ideal gas at standard conditions, ft^3/lb mole

T_m = meter temperature, °R

T_{ref} = reference temperature, °R

T_s = stack gas temperature, °R

V_s = stack gas velocity, ft/sec

V_{lc} = volume of liquid collected in impingers, ml

V_m = dry meter volume uncorrected, acf

$V_{m\,std}$ = dry meter volume corrected to standard conditions, dscf

$V_{w\,std}$ = volume of water vapor at standard conditions, scf

Y = meter calibration coefficient, dimensionless

2020-04-28: SSI-151

APPENDIX E.2
PARTICULATE MATTER SPREADSHEETS

2020-04-28: SSI-152

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test number	1-PM
Unit / Location	edder Exhaust Outlet	*	Date	2/28/07
Test method	EPA 5/202	*	Start / Stop time	0900-1003

Meter box number	CB-14	*	Barometric pressure, in Hg	29.85
Meter calibration, Yd	0.9860	*	Meter box volume, acf	38.830
Stack area, square feet	12.306	*	Impinger liquid volume, ml	21.0
Reference temperature, °F	70	*	Meter temperature, °F	61.7
Sample time, minutes	60	*	Meter pressure, (Delta H) iwg.	1.350
Pitot coefficient	0.8191	*	Velocity head, (Delta P) iwg	0.2643
Nozzle diameter, in	0.271	*	Static pressure, iwg	-0.14
Process feed rate, tons/hr	[redacted]	*	Stack temperature, °F	79.1
Fuel "HHV", Btu/scf	N/A	*	Stack O_2, % volume dry	20.691
Fuel "F" factor, dscf/MMBtu	N/A	*	Stack CO_2, % volume dry	0.18

F½ particulate matter catch (filter), mg	1.03
F½ particulate matter catch (acetone), mg	1.97
B½ particulate matter catch (water), mg	1.80
B½ particulate matter catch ($MeCL_2$), mg	0.50
Total particulate matter catch, mg	5.30

1a	Standard sample volume, dscf	38.931
1b	Water vapor volume, scf	0.9950
1c	Moisture fraction, nondimensional	0.0249
1d	Stack gas molecular weight, dry	28.856
1e	Stack gas molecular weight, wet	28.585
1f	Absolute stack pressure, in Hg	29.840
1g	Stack gas velocity, ft/sec	28.573
1h	Stack flow rate, acfm	21,097
1i	Stack flow rate, wscfm	20,685
1j	Stack flow rate, dscfm	20,170
1k	Isokinetic ratio, %	98.9

3a	F½ grain loading, gr/dscf	0.0012
3b	F½ grain loading @ 12% CO_2	0.0811
3c	F½ mass emissions, lb/hr	0.2056
	F½ mass emissions, lb/ton of feed	[redacted]
3a	B½ grain loading, gr/dscf	0.0009
3b	B½ grain loading @ 12% CO_2	0.0622
3c	B½ mass emissions, lb/hr	0.1576
	B½ mass emissions, lb/ton of feed	[redacted]
3a	Total grain loading, gr/dscf	0.0021
3b	Total grain loading @ 12% CO_2	0.1432
3c	Total mass emissions, lb/hr	0.3632
	Total mass emissions, lb/ton of feed	[redacted]

2020-04-28: SSI-153

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test number	2-PM
Unit / Location	Shredder Exhaust Outlet	*	Date	2/28/07
Test method	EPA 5/202	*	Start / Stop time	1033-1136

Meter box number	CB-14	*	Barometric pressure, in Hg	29.85
Meter calibration, Yd	0.9860	*	Meter box volume, acf	40.281
Stack area, square feet	12.306	*	Impinger liquid volume, ml	16.9
Reference temperature, °F	70	*	Meter temperature, °F	62.3
Sample time, minutes	60	*	Meter pressure, (Delta H) iwg.	1.400
Pitot coefficient	0.8191	*	Velocity head, (Delta P) iwg	0.2775
Nozzle diameter, in	0.271	*	Static pressure, iwg	-0.13
Process feed rate, tons/hr	[redacted]	*	Stack temperature, °F	79.8
Fuel "HHV", Btu/scf	N/A	*	Stack O_2, % volume dry	20.786
Fuel "F" factor, dscf/MMBtu	N/A	*	Stack CO_2, % volume dry	0.15

F½ particulate matter catch (filter), mg	0.50
F½ particulate matter catch (acetone), mg	2.40
B½ particulate matter catch (water), mg	0.83
B½ particulate matter catch ($MeCL_2$), mg	0.50
Total particulate matter catch, mg	4.23

1a	Standard sample volume, dscf	40.344
1b	Water vapor volume, scf	0.8007
1c	Moisture fraction, nondimensional	0.0195
1d	Stack gas molecular weight, dry	28.856
1e	Stack gas molecular weight, wet	28.645
1f	Absolute stack pressure, in Hg	29.840
1g	Stack gas velocity, ft/sec	29.266
1h	Stack flow rate, acfm	21,609
1i	Stack flow rate, wscfm	21,160
1j	Stack flow rate, dscfm	20,748
1k	Isokinetic ratio, %	99.6

3a	F½ grain loading, gr/dscf	0.0011
3b	F½ grain loading @ 12% CO_2	0.0870
3c	F½ mass emissions, lb/hr	0.1973
	F½ mass emissions, lb/ton of feed	[redacted]
3a	B½ grain loading, gr/dscf	0.0005
3b	B½ grain loading @ 12% CO_2	0.0399
3c	B½ mass emissions, lb/hr	0.0905
	B½ mass emissions, lb/ton of feed	[redacted]
3a	Total grain loading, gr/dscf	0.0016
3b	Total grain loading @ 12% CO_2	0.1269
3c	Total mass emissions, lb/hr	0.2877
	Total mass emissions, lb/ton of feed	[redacted]

PM, benzene, TOC spreadsheets

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test number	3-PM
Unit / Location	ler Exhaust Outlet	*	Date	2/28/07
Test method	EPA 5/202	*	Start / Stop time	1206-1308

Meter box number	CB-14	*	Barometric pressure, in Hg	29.88
Meter calibration, Yd	0.9860	*	Meter box volume, acf	42.047
Stack area, square feet	12.306	*	Impinger liquid volume, ml	16.1
Reference temperature, °F	70	*	Meter temperature, °F	65.0
Sample time, minutes	60	*	Meter pressure, (Delta H) iwg.	1.510
Pitot coefficient	0.8191	*	Velocity head, (Delta P) iwg	0.2968
Nozzle diameter, in	0.271	*	Static pressure, iwg	-0.14
Process feed rate, tons/hr	[redacted]	*	Stack temperature, °F	80.4
Fuel "HHV", Btu/scf	N/A	*	Stack O_2, % volume dry	20.791
Fuel "F" factor, dscf/MMBtu	N/A	*	Stack CO_2, % volume dry	0.15

F½ particulate matter catch (filter), mg	0.50
F½ particulate matter catch (acetone), mg	0.90
B½ particulate matter catch (water), mg	0.73
B½ particulate matter catch ($MeCL_2$), mg	0.50
Total particulate matter catch, mg	2.63

1a	Standard sample volume, dscf	41.949
1b	Water vapor volume, scf	0.7628
1c	Moisture fraction, nondimensional	0.0179
1d	Stack gas molecular weight, dry	28.855
1e	Stack gas molecular weight, wet	28.661
1f	Absolute stack pressure, in Hg	29.870
1g	Stack gas velocity, ft/sec	30.260
1h	Stack flow rate, acfm	22,343
1i	Stack flow rate, wscfm	21,876
1j	Stack flow rate, dscfm	21,485
1k	Isokinetic ratio, %	100.0

3a	F½ grain loading, gr/dscf	0.0005
3b	F½ grain loading @ 12% CO_2	0.0426
3c	F½ mass emissions, lb/hr	0.0948
	F½ mass emissions, lb/ton of feed	[redacted]
3a	B½ grain loading, gr/dscf	0.0005
3b	B½ grain loading @ 12% CO_2	0.0374
3c	B½ mass emissions, lb/hr	0.0833
	B½ mass emissions, lb/ton of feed	[redacted]
3a	Total grain loading, gr/dscf	0.0010
3b	Total grain loading @ 12% CO_2	0.0801
3c	Total mass emissions, lb/hr	0.1782
	Total mass emissions, lb/ton of feed	[redacted]

PM, benzene, TOC spreadsheets

2020-04-28: SSI-155

Particulate Matter Result Average
Schnitzer Steel
Shredder Exhaust Outlet

Test No:	1-PM	2-PM	3-PM	AVERAGE
Date:	2/28/07	2/28/07	2/28/07	--
Time:	0900-1003	1033-1136	1206-1308	--
O_2, % volume dry:	20.691	20.786	20.791	20.756
CO_2, % volume dry:	0.176	0.153	0.145	0.158
Moisture Content, % by volume:	2.492	1.946	1.786	2.075
Stack Temperature, °F:	79.1	79.8	80.4	79.8
Flow Rate, acfm:	21,097	21,609	22,343	21,683
Flow Rate, dscfm:	20,170	20,748	21,485	20,801
Process Feed Rate:	[redacted]	[redacted]	[redacted]	[redacted]
F½ grain loading, gr/dscf.....	0.0012	0.0011	0.0005	0.0009
F½ grain loading @ 12% CO2.....	0.0811	0.0870	0.0426	0.0702
F½ mass emissions, lb/hr.....	0.206	0.197	0.095	0.166
F½ mass emissions, lb/ton of feed.....	[redacted]	[redacted]	[redacted]	[redacted]
F½ mass emissions, lb/day.....	4.93	4.73	2.28	3.98
B½ grain loading, gr/dscf.....	0.0009	0.0005	0.0005	0.0006
B½ grain loading @ 12% CO2.....	0.0622	0.0399	0.0374	0.0465
B½ mass emissions, lb/hr.....	0.16	0.09	0.08	0.110
B½ mass emissions, lb/ton of feed.....	[redacted]	[redacted]	[redacted]	[redacted]
B½ mass emissions, lb/day.....	3.78	2.17	2.00	2.65
Total grain loading, gr/dscf.....	0.0021	0.0016	0.0010	0.0016
Total mass emissions, lb/hr.....	0.363	0.288	0.178	0.276
Total mass emissions, lb/ton of feed....	[redacted]	[redacted]	[redacted]	[redacted]

(1) Species was detected in every sample and sample fraction.

(2) The results were blank-corrected.

APPENDIX E.3
HEXAVALENT CHROMIUM SPREADSHEETS

2020-04-28 SSI-157

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test Number	1-Cr
Unit / Location	Shredder Exhaust Stack	*	Date	3/1/07
Test Method	CARB 425	*	Start / Stop Time	0853-1045

Meter Box Number	CB-14	*	Barometric Press (in Hg)	29.90
Meter Calibration (Yd)	0.9860	*	Meter Volume (acf)	63.533
Stack Area (square feet)	12.306	*	Liquid Volume (ml)	19.6
Reference Temperature (°F)	70	*	Meter Temperature (°F)	55.4
Sample Time (Minutes)	102	*	Meter Pressure (iwg)	1.250
Pitot Coefficient	0.8191	*	Velocity Head (iwg)	0.2465
Nozzle Diameter (in)	0.274	*	Static Pressure (iwg)	-0.15
Process feed rate, ton/hr	[redacted]	*	Stack Temperature (°F)	78.1
Fuel "HHV" (Btu/scf)	N/A	*	Stack O_2 (%)	20.51
Fuel "F" Factor (dscf/MMBtu)	N/A	*	Stack CO_2 (%)	0.09

a	Standard Sample Volume (dscf)	64.57
b	Water Vapor Volume (scf)	0.929
c	Moisture Fraction (nondimensional)	0.0142
d_1	Stack Gas Molecular Weight (dry)	28.834
d_2	Stack Gas Molecular Weight (wet)	28.681
e	Absolute Stack Pressure (in Hg)	29.889
f	Stack Gas Velocity (ft/sec)	27.500
g	Stack Flow Rate (acfm)	20,305
h_1	Stack Flow Rate (dscfm)	19,695
h_2	Stack Flow Rate (wscfm)	19,978
i	Isokinetic Ratio (%)	96.6

2020-04-28: SSI-158

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test Number	2-Cr
Unit / Location	Shredder Exhaust Stack	*	Date	3/2/07
Test Method	CARB 425	*	Start / Stop Time	0753-1012

Meter Box Number	CB-14	*	Barometric Press (in Hg)	29.88
Meter Calibration (Yd)	0.9860	*	Meter Volume (acf)	73.815
Stack Area (square feet)	12.306	*	Liquid Volume (ml)	26.7
Reference Temperature (°F)	70	*	Meter Temperature (°F)	59.1
Sample Time (Minutes)	120	*	Meter Pressure (iwg)	1.170
Pitot Coefficient	0.8191	*	Velocity Head (iwg)	0.2280
Nozzle Diameter (in)	0.274	*	Static Pressure (iwg)	-0.14
Process feed rate, ton/hr	[redacted]	*	Stack Temperature (°F)	78.0
Fuel "HHV" (Btu/scf)	N/A	*	Stack O_2 (%)	20.46
Fuel "F" Factor (dscf/MMBtu)	N/A	*	Stack CO_2 (%)	0.11

a	Standard Sample Volume (dscf)	74.42
b	Water Vapor Volume (scf)	1.265
c	Moisture Fraction (nondimensional)	0.0167
d_1	Stack Gas Molecular Weight (dry)	28.836
d_2	Stack Gas Molecular Weight (wet)	28.655
e	Absolute Stack Pressure (Hg)	29.870
f	Stack Gas Velocity (ft/sec)	26.466
g	Stack Flow Rate (acfm)	19,541
h_1	Stack Flow Rate (dscfm)	18,897
h_2	Stack Flow Rate (wscfm)	19,218
i	Isokinetic Ratio (%)	98.6

2020-04-28: SSI-159

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test Number	3-Cr
Unit / Location	Shredder Exhaust Stack	*	Date	3/2/07
Test Method	CARB 425	*	Start / Stop Time	1115-1209

Meter Box Number	CB-14	*	Barometric Press (in Hg)	29.83
Meter Calibration (Yd)	0.9860	*	Meter Volume (acf)	36.515
Stack Area (square feet)	12.306	*	Liquid Volume (ml)	14.5
Reference Temperature (°F)	70	*	Meter Temperature (°F)	67.5
Sample Time (Minutes)	54	*	Meter Pressure (iwg)	1.490
Pitot Coefficient	0.8145	*	Velocity Head (iwg)	0.2949
Nozzle Diameter (in)	0.274	*	Static Pressure (iwg)	-0.71
Process feed rate, ton/hr	[redacted]	*	Stack Temperature (°F)	78.6
Fuel "HHV" (Btu/scf)	N/A	*	Stack O_2 (%)	20.46
Fuel "F" Factor (dscf/MMBtu)	N/A	*	Stack CO_2 (%)	0.11

a	Standard Sample Volume (dscf)	36.20
b	Water Vapor Volume (scf)	0.687
c	Moisture Fraction (nondimensional)	0.0186
d_1	Stack Gas Molecular Weight (dry)	28.836
d_2	Stack Gas Molecular Weight (wet)	28.634
e	Absolute Stack Pressure (Hg)	29.778
f	Stack Gas Velocity (ft/sec)	30.004
g	Stack Flow Rate (acfm)	22,153
h_1	Stack Flow Rate (dscfm)	21,292
h_2	Stack Flow Rate (wscfm)	21,696
i	Isokinetic Ratio (%)	94.6

2020-04-28: SSI-160

TOTAL AND HEXAVALENT CHROMIUM EMISSIONS SUMMARY

Schnitzer Steel

Shredder Exhaust Stack

REFERENCE TEMP (F):	70	**TEST METHOD:**	
DETECTION LIMIT:	0.50 ug for Total Cr 0.05 ug for Cr (VI)	**ANALYTICAL METHOD:**	
		LABORATORY:	

Test No.	Fractions ug/ sample	Fractions Blank, ug	Results ug/ train	O_2, %	CO_2, %	H_2O, %	Vmstd, dscf	Qsd, dscfm	ug/m^3	lb/hr
TOTAL CHROMIUM										
1-Cr-probe	17.000	0.940	#####	20.51	0.09	1.42	64.568	19,695	8.783	6.47E-04
1-Cr-impingers	0.000	0.000	0.000	20.51	0.09	1.42	64.568	19,695	0.000	0.00E+00
	17.000	**0.940**	**16.060**						**8.783**	**6.47E-04**
2-Cr-probe	4.000	0.940	3.060	20.46	0.11	1.67	74.419	18,897	1.452	1.03E-04
2-Cr-impingers	0.000	0.000	0.000	20.46	0.11	1.67	74.419	18,897	0.000	0.00E+00
	4.000	**0.940**	**3.060**						**1.452**	**1.03E-04**
3-Cr-probe	0.980	0.940	0.040	20.46	0.11	1.86	36.195	21,292	0.039	3.11E-06
3-Cr-impingers	0.000	0.000	0.000	20.46	0.11	1.86	36.195	21,292	0.000	0.00E+00
	0.980	**0.940**	**0.040**						**0.039**	**3.11E-06**
FB-Cr-probe	0.940	0.00	0.940	20.48	0.10	1.65	58.394	19,961	0.568	
FB-Cr-impingers	ND< 0.000	1.100	0.000	20.48	0.10	1.65	58.394	19,961	0.000	
Method Blank	ND< 0.500								**0.568**	
			AVERAGE BLANK CORRECTED (Total):						**3.425**	**2.51E-04**
HEXAVALENT CHROMIUM										
1-Cr-probe	ND< 0.060	0.080	0.060	20.51	0.09	1.42	64.568	19,695	0.033	2.42E-06
1-Cr-impingers	0.100	0.050	0.100	20.51	0.09	1.42	64.568	19,695	0.055	4.03E-06
	0.160	**0.130**	**0.160**						**0.087**	**6.45E-06**
2-Cr-probe	0.060	0.080	0.060	20.46	0.11	1.67	74.419	18,897	0.028	2.01E-06
2-Cr-impingers	ND< 0.060	0.050	0.060	20.46	0.11	1.67	74.419	18,897	0.028	2.01E-06
	0.120	**0.130**	**0.120**						**0.057**	**4.02E-06**
3-Cr-probe	0.060	0.080	0.060	20.46	0.11	1.86	36.195	21,292	0.059	4.66E-06
3-Cr-impingers	ND< 0.060	0.050	0.060	20.46	0.11	1.86	36.195	21,292	0.059	4.66E-06
	0.120	**0.130**	**0.120**						**0.117**	**9.33E-06**
FB-Cr-probe	0.080	--	0.080	20.48	0.10	1.65	58.394	19,961	0.048	
FB-Cr-impingers	ND< 0.050	--	0.050	20.48	0.10	1.65	58.394	19,961	0.030	
Method Blank	ND< 0.060								**0.079**	
			AVERAGE BLANK CORRECTED (Total):						**0.087**	**6.60E-06**

Note: Results (ug/train) are blank corrected as per M 425 as follows:
Probe fraction - As the blank result is comparable to the sample results, all probe fraction results are reported at analytical
Impinger fraction - The blank samples contained excess reagent, positively biasing the ug/train. Volumes were adjusted to

CALCULATIONS:
ug/m^3 = ug/train * 35.31/Vmstd
lb/hr = ug/train * lb/454*10^6 ug * Qsd/Vmstd * 60 min/hr

TOTAL AND HEXAVALENT CHROMIUM EMISSIONS SUMMARY

Schnitzer Steel

Shredder Exhaust Stack

Test No.:	1-Cr	2-Cr	3-Cr					FB-Cr
Date:	3/1/07	3/2/07	3/2/07					3/1/07
Time:	0853-1045	0753-1012	1115-1209					
Sample Volume, dscf	64.57	74.42	36.20		Average			58.39
O_2, % volume dry	20.51	20.46	20.46					20.48
CO_2, % volume dry	0.09	0.11	0.11					0.10
Moisture Content, %	1.42	1.67	1.86					1.65
Temperature, °F	78.1	78.0	78.6					78.2
Flow Rate, acfm	20,305	19,541	22,153					20,666
Flow Rate, dscfm	19,695	18,897	21,292					19,961
Process Feed Rate:	[redacted]	[redacted]	[redacted]					[redacted]
Species	**ug/m³**	**ug/m³**	**ug/m³**	**ug/m³**	**ug/m³ @ 7% O_2**	**lb/hr**	**lb/ton**	**ug/m³**
Total Chromium, Cr	8.783	1.452	0.039	3.425	119.845	2.51E-04	[redacted]	0.568
Hexavalent Chromium, Cr^{6+}	< 0.087	< 0.057	< 0.117	0.087	2.877	6.60E-06	[redacted]	< 0.079
Cr^{6+}/Cr, %	1%	4%	300%	3%	2%	3%	3%	--

Note: Results (ug/train) are blank corrected as per M 425 as follows:
Probe fraction - As the blank result is comparable to the sample results, all probe fraction results are reported at analytical detectio
Impinger fraction - The blank samples contained excess reagent, positively biasing the ug/train. Volumes were adjusted to 100 mL
< - species was detected in at least one sample or sample fraction, but not in all samples or sample fractions.

APPENDIX E.4
POLYCHLORINATED BIPHENYL SPREADSHEETS

2020-04-28 SSI-163

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test Number	1-PCB
Unit / Location	Exhaust Outlet	*	Date	3/1/2007
Test Method	CARB 428	*	Start / Stop Time	0849-1045

Meter Box Number	CB-13	*	Barometric Press (in Hg)	29.90
Meter Calibration (Yd)	1.0060	*	Meter Volume (acf)	63.895
Stack Area (square feet)	12.306	*	Liquid Volume (ml)	16.3
Reference Temperature (°F)	70	*	Meter Temperature (°F)	55.8
Sample Time (Minutes)	103	*	Meter Pressure (iwg)	1.250
Pitot Coefficient	0.8145	*	Velocity Head (iwg)	0.2607
Nozzle Diameter (in)	0.267	*	Static Pressure (iwg)	-0.15
Process feed rate, ton/hr	[redacted]	*	Stack Temperature (°F)	77.3
Fuel "HHV" (Btu/scf)	N/A	*	Stack O_2 (%)	20.51
Fuel "F" Factor (dscf/MMBtu)	N/A	*	Stack CO_2 (%)	0.087

a	Standard Sample Volume (dscf)	66.20
b	Water Vapor Volume (scf)	0.772
c	Moisture Fraction (nondimensional)	0.0115
d_1	Stack Gas Molecular Weight (dry)	28.834
d_2	Stack Gas Molecular Weight (wet)	28.709
e	Absolute Stack Pressure (in Hg)	29.889
f	Stack Gas Velocity (ft/sec)	28.087
g	Stack Flow Rate (acfm)	20,738
h_1	Stack Flow Rate (dscfm)	20,200
h_2	Stack Flow Rate (wscfm)	20,435
i	Isokinetic Ratio (%)	100.7

2020-04-28: SSI-164

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test Number	2-PCB
Unit / Location	Exhaust Outlet	*	Date	3/2/2007
Test Method	CARB 428	*	Start / Stop Time	0752-1011

Meter Box Number	CB-13	*	Barometric Press (in Hg)	29.88
Meter Calibration (Yd)	1.0060	*	Meter Volume (acf)	73.335
Stack Area (square feet)	12.306	*	Liquid Volume (ml)	15.6
Reference Temperature (°F)	70	*	Meter Temperature (°F)	63.7
Sample Time (Minutes)	120	*	Meter Pressure (iwg)	1.250
Pitot Coefficient	0.8145	*	Velocity Head (iwg)	0.2609
Nozzle Diameter (in)	0.267	*	Static Pressure (iwg)	-0.14
Process feed rate, ton/hr	[redacted]	*	Stack Temperature (°F)	78.5
Fuel "HHV" (Btu/scf)	N/A	*	Stack O_2 (%)	20.46
Fuel "F" Factor (dscf/MMBtu)	N/A	*	Stack CO_2 (%)	0.111

a	Standard Sample Volume (dscf)	74.79
b	Water Vapor Volume (scf)	0.739
c	Moisture Fraction (nondimensional)	0.0098
d_1	Stack Gas Molecular Weight (dry)	28.836
d_2	Stack Gas Molecular Weight (wet)	28.730
e	Absolute Stack Pressure (Hg)	29.870
f	Stack Gas Velocity (ft/sec)	28.128
g	Stack Flow Rate (acfm)	20,769
h_1	Stack Flow Rate (dscfm)	20,207
h_2	Stack Flow Rate (wscfm)	20,406
i	Isokinetic Ratio (%)	97.6

2020-04-28: SSI-165

SOURCE TEST DATA SUMMARY

Client	Schnitzer Steel	*	Test Number	3-PCB
Unit / Location	Exhaust Outlet	*	Date	3/2/2007
Test Method	CARB 428	*	Start / Stop Time	1114-1209

Meter Box Number	CB-13	*	Barometric Press (in Hg)	29.83
Meter Calibration (Yd)	1.0060	*	Meter Volume (acf)	36.668
Stack Area (square feet)	12.306	*	Liquid Volume (ml)	8.0
Reference Temperature (°F)	70	*	Meter Temperature (°F)	63.7
Sample Time (Minutes)	55	*	Meter Pressure (iwg)	1.250
Pitot Coefficient	0.8038	*	Velocity Head (iwg)	0.2609
Nozzle Diameter (in)	0.267	*	Static Pressure (iwg)	-0.14
Process feed rate, ton/hr	[redacted]	*	Stack Temperature (°F)	78.5
Fuel "HHV" (Btu/scf)	N/A	*	Stack O_2 (%)	20.46
Fuel "F" Factor (dscf/MMBtu)	N/A	*	Stack CO_2 (%)	0.111

a	Standard Sample Volume (dscf)	37.33
b	Water Vapor Volume (scf)	0.379
c	Moisture Fraction (nondimensional)	0.0101
d_1	Stack Gas Molecular Weight (dry)	28.836
d_2	Stack Gas Molecular Weight (wet)	28.727
e	Absolute Stack Pressure (Hg)	29.820
f	Stack Gas Velocity (ft/sec)	27.783
g	Stack Flow Rate (acfm)	20,514
h_1	Stack Flow Rate (dscfm)	19,920
h_2	Stack Flow Rate (wscfm)	20,122
i	Isokinetic Ratio (%)	107.9

2020-04-28: SSI-166

POLYCHLORINATED BIPHENYL EMISSIONS SUMMARY
Schnitzer Steel
Shredder Exhaust Outlet

Species	Method Blank ng	Field Blank FB-PCB ng	1-PCB ng	2-PCB ng	3-PCB ng	Field Blank ng/m^3
Chlorobiphenyls	ND< 0.050	0.072	963	329	160	0.043
Dichlorobiphenyls	ND< 0.166	0.477	5,430	3,520	1,340	0.283
Trichlorobiphenyls	ND< 0.050	2.270	3,140	4,110	1,560	1.348
Tetrachlorobiphenyls	0.056	1.110	492	1510	408	0.659
Pentachlorobiphenyls	ND< 0.050	0.112	29.7	191.0	48.3	0.067
Hexachlorobiphenyls	ND< 0.050	ND< 0.050	6.550	44.600	9.750	ND< 0.030
Heptachlorobiphenyls	ND< 0.050	ND< 0.050	1.250	6.550	1.510	ND< 0.030
Octachlorobiphenyls	ND< 0.050	ND< 0.050	0.518	1.350	0.267	ND< 0.030
Nonachlorobiphenyls	ND< 0.050	ND< 0.050	0.114	0.299	ND< 0.050	ND< 0.030
Decachlorobiphenyl	ND< 0.050	ND< 0.050	ND< 0.050	0.059	ND< 0.050	ND< 0.030
Total PCBs	< 0.622	< 4.291	< #####	9,713	< 3,528	< 2.549

Note: The average volume standard was used for the field blank.

POLYCHLORINATED BIPHENYL RESULTS SUMMARY
Schnitzer Steel
Shredder Exhaust Outlet

SPECIES	ng/train	ng/dscm	ng/dscm @ 7% O_2	ng/dscm @ 12% CO_2	lb/hr	lb/ton	g/s
total Chlorobiphenyls	484	273	9,331	34,667	2.06E-05		2.60E-06
total Dichlorobiphenyls	3,430	1,942	65,308	######	1.46E-04		1.84E-05
total Trichlorobiphenyls	2,937	1,697	55,982	######	1.28E-04		1.61E-05
total Tetrachlorobiphenyls	803	454	14,734	51,663	3.42E-05		4.31E-06
total Pentachlorobiphenyls	89.67	50.57	1,625	5,624	3.81E-06		4.80E-07
total Hexachlorobiphenyls	20.30	11.26	361.7	1,252	8.48E-07		1.07E-07
total Heptachlorobiphenyls	3.103	1.729	55.723	######	1.30E-07		1.64E-08
total Octachlorobiphenyls	0.712	0.389	12.688	44.773	2.93E-08		3.69E-09
total Nonachlorobiphenyls	0.154	0.083	2.714	9.587	6.27E-09		7.90E-10
Decachlorobiphenyl	0.053	0.034	1.109	3.927	2.54E-09		3.21E-10
TOTAL PCBs	< 7,768	< 4,430	< ######	< ######	< 3.34E-04		< 4.21E-05

ND< - species was not detected in the sample or sample fraction.

POLYCHLORINATED BIPHENYL EMISSIONS SUMMARY
Schnitzer Steel
Shredder Exhaust Outlet

Client:	Schnitzer Steel	**T Ref (F):**	70
Unit:	Shredder Exhaust Outlet	**Flow Rate (dscfm):**	20,200
Location:	Stack	**Standard Vol. (dscf):**	66.202
Test Date:	3/1/2007	**O_2, % volume dry:**	20.51
Test Number:	1-PCB	**CO_2, % volume dry:**	0.087

SPECIES	ng/train	ng/dscm	ng/dscm @ 7% O_2	ng/dscm @ 12% CO_2	lb/hr	lb/ton
total Chlorobiphenyls	963.0	513.6	18,260	70,846	3.88E-05	[redacted]
total Dichlorobiphenyls	5,430	2,896	######	######	2.19E-04	
total Trichlorobiphenyls	3,140	1,675	59,538	######	1.27E-04	
total Tetrachlorobiphenyls	492.0	262.4	9,329	36,196	1.98E-05	
total Pentachlorobiphenyls	29.70	15.84	563.1	2,185	1.20E-06	
total Hexachlorobiphenyls	6.550	3.494	124.2	481.9	2.64E-07	
total Heptachlorobiphenyls	1.250	0.667	23.70	91.96	5.04E-08	
total Octachlorobiphenyls	0.518	0.276	9.822	38.11	2.09E-08	
total Nonachlorobiphenyls	0.114	0.061	2.162	8.387	4.60E-09	
total Decachlorobiphenyl	ND< 0.050	ND< 0.027	ND< 0.948	ND< 3.678	ND< 2.02E-09	
TOTAL PCBs	< 10,063	< 5,367	< ######	< ######	< 4.06E-04	

ND< - species not detected in sample or sample fraction.

2020-04-28: SSI-169

POLYCHLORINATED BIPHENYL EMISSIONS SUMMARY
Schnitzer Steel
Shredder Exhaust Outlet

Client:	Schnitzer Steel	**T Ref (F):**	70
Unit:	Shredder Exhaust Outlet	**Flow Rate (dscfm):**	20,207
Location:	Stack	**Standard Vol. (dscf):**	74.787
Test Date:	3/2/2007	**O_2, % volume dry:**	20.46
Test Number:	2-PCB	**CO_2, % volume dry:**	0.111

SPECIES	ng/train	ng/dscm	ng/dscm @ 7% O_2	ng/dscm @ 12% CO_2	lb/hr	lb/ton
total Chlorobiphenyls	329.0	155.3	4,930	16,793	1.17E-05	[redacted]
total Dichlorobiphenyls	3,520	1,662	52,742	######	1.26E-04	
total Trichlorobiphenyls	4,110	1,941	61,582	######	1.47E-04	
total Tetrachlorobiphenyls	1,510	712.9	22,625	77,074	5.39E-05	
total Pentachlorobiphenyls	191.0	90.18	2,862	9,749	6.82E-06	
total Hexachlorobiphenyls	44.60	21.06	668.3	2,276	1.59E-06	
total Heptachlorobiphenyls	6.550	3.093	98.14	334.3	2.34E-07	
total Octachlorobiphenyls	1.350	0.637	20.23	68.91	4.82E-08	
total Nonachlorobiphenyls	0.299	0.141	4.480	15.26	1.07E-08	
total Decachlorobiphenyl	0.059	0.028	0.878	2.991	2.09E-09	
TOTAL PCBs	9,713	4,586	######	######	3.47E-04	

ND< - species not detected in sample or sample fraction.

2020-04-28: SSI-170

POLYCHLORINATED BIPHENYL EMISSIONS SUMMARY
Schnitzer Steel
Shredder Exhaust Outlet

Client:	Schnitzer Steel	**T Ref (F):**	70
Unit:	Shredder Exhaust Outlet	**Flow Rate (dscfm):**	19,920
Location:	Stack	**Standard Vol. (dscf):**	37.331
Test Date:	3/2/2007	**O_2, % volume dry:**	20.46
Test Number:	3-PCB	**CO_2, % volume dry:**	0.111

SPECIES	ng/train	ng/dscm	ng/dscm @ 7% O_2	ng/dscm @ 12% CO_2	lb/hr	lb/ton
total Chlorobiphenyls	160.0	151.3	4,803	16,361	1.13E-05	[redacted]
total Dichlorobiphenyls	1,340	1,267	40,223	######	9.45E-05	
total Trichlorobiphenyls	1,560	1,476	46,827	######	1.10E-04	
total Tetrachlorobiphenyls	408.0	385.9	12,247	41,720	2.88E-05	
total Pentachlorobiphenyls	48.30	45.69	1,450	4,939	3.41E-06	
total Hexachlorobiphenyls	9.750	9.222	292.7	997.0	6.88E-07	
total Heptachlorobiphenyls	1.510	1.428	45.33	154.4	1.06E-07	
total Octachlorobiphenyls	0.267	0.253	8.015	27.30	1.88E-08	
total Nonachlorobiphenyls	ND< 0.050	ND< 0.047	ND< 1.501	ND< 5.113	ND< 3.53E-09	
total Decachlorobiphenyl	ND< 0.050	ND< 0.047	ND< 1.501	ND< 5.113	ND< 3.53E-09	
TOTAL PCBs	< 3,528	< 3,337	< ######	< ######	< 2.49E-04	

ND< - species not detected in sample or sample fraction.

POLYCHLORINATED BIPHENYL TEST RESULTS
Schnitzer Steel
Shredder Exhaust Outlet

Test No:	1-PCB	2-PCB	3-PCB		FB-PCB
Date:	3/1/2007	3/2/2007	3/2/2007		3/1/2007
Time:	0849-1045	0752-1011	1114-1209		--
Flow Rate, dscfm:	20,200	20,207	19,920		20,109
Sample Volume, dscf:	66.20	74.79	37.33	AVERAGES	59.44
Temperature, °F	77.3	78.5	78.5		78.1
O_2, % volume dry:	20.51	20.46	20.46		20.48
CO_2, % volume dry:	0.087	0.111	0.111		0.103
H_2O, % by volume:	1.15	0.98	1.01		1.05

Species	ng/m³	ng/m³	ng/m³	ng/m³	lb/hr	lb/ton	g/s	ng/m³
Chlorobiphenyls	513.6	155.3	151.3	273.4	2.06E-05	[redacted]	2.60E-06	0.043
Dichlorobiphenyls	2,896	1,662	1,267	1,942	1.46E-04	[redacted]	1.84E-05	0.283
Trichlorobiphenyls	1,675	1,941	1,476	1,697	1.28E-04	[redacted]	1.61E-05	1.348
Tetrachlorobiphenyls	262.4	712.9	385.9	453.8	3.42E-05	[redacted]	4.31E-06	0.659
Pentachlorobiphenyls	15.84	90.18	45.69	50.57	3.81E-06	[redacted]	4.80E-07	0.067
Hexachlorobiphenyls	3.494	21.06	9.222	11.26	8.48E-07	[redacted]	1.07E-07	ND< 0.030
Heptachlorobiphenyls	0.667	3.093	1.428	1.729	1.30E-07	[redacted]	1.64E-08	ND< 0.030
Octachlorobiphenyls	0.276	0.637	0.253	0.389	2.93E-08	[redacted]	3.69E-09	ND< 0.030
Nonachlorobiphenyls	0.061	0.141	ND< 0.047	< 0.083	< 6.27E-09	[redacted]	< 7.90E-10	ND< 0.030
Decachlorobiphenyl	ND< 0.027	0.028	ND< 0.047	< 0.034	< 2.54E-09	[redacted]	< 3.21E-10	ND< 0.030
Total PCBs	< 5,367	4,586	< 3,337	< 4,430	< 3.34E-04	[redacted]	< 4.21E-05	< 2.549

ND< - species was not detected in the sample.

< - species was detected in at least one sample or sample fraction, but not in all samples or sample fractions.

(1) No blank corrections of any kind were made to sample values.

(2) The field blank values presented were calculated using the average sample volume from these tests.

(3) Non-detected values are reported at the detection limit.

APPENDIX E.5
BENZENE/TOTAL ORGANIC COMPOUNDS SPREADSHEETS

2020-04-28 SSI-173

SOURCE TEST DATA SUMMARY

Client	ichnitzer Steel	*	Test number	Run 1
Unit / Location	Exhaust Outlet	*	Date	2/28/07
Test method	PA 25, TO-15	*	Start / Stop time	0900-1003

Meter box number	CB-14	*	Barometric pressure, in Hg	29.85
Meter calibration, Yd	0.9860	*	Meter box volume, acf	38.830
Stack area, square feet	12.306	*	Impinger liquid volume, ml	21.0
Reference temperature, °F	70	*	Meter temperature, °F	61.7
Sample time, minutes	60	*	Meter pressure, (Delta H) iwg.	1.350
Pitot coefficient	0.8191	*	Velocity head, (Delta P) iwg	0.2643
Process feed rate, tons/hr	[redacted]	*	Static pressure, iwg	-0.14
Fuel "F" factor, dscf/MMBtu	N/A	*	Stack temperature, °F	79.1

O_2, % volume dry	20.691
CO_2, % volume dry	0.18
TOC emissions, ppm volume wet as C	82.00
Benzene emissions, ppb volume dry	9.60

2a	O_2, % volume wet	20.175
2a	CO_2, % volume wet	0.17

1a	Standard sample volume, dscf	38.931
1b	Water vapor volume, scf	0.9950
1c	Moisture fraction, nondimensional	0.0249
1d	Stack gas molecular weight, dry	28.856
1e	Stack gas molecular weight, wet	28.585
1f	Absolute stack pressure, in Hg	29.840
1g	Stack gas velocity, ft/sec	28.573
1h	Stack flow rate, acfm	21,097
1i	Stack Flow Rate (wscfm)	20,685
1j	Stack Flow Rate (dscfm)	20,170

Total Organic Compounds Emissions

Concentrations

2d	TOC concentrations, ppm volume dry as C	84.10

Mass Emissions as Carbon

2e	TOC mass emissions, lb/hr as C	3.160
2e	TOC mass emissions, lb/day as C (based on 24 hours)	75.8
2e	TOC mass emissions, tons/year as C (based on 8,760 hours)	13.84
2f	TOC mass emissions, lb/ton of feed as C	[redacted]

Mass Emissions as Methane

2e	TOC mass emissions, lb/hr as CH4	4.220
2e	TOC mass emissions, lb/day as CH4 (based on 24 hours)	101.3
2e	TOC mass emissions, tons/year as CH4 (based on 8,760 hours)	18.48
2f	TOC mass emissions, lb/ton of feed as CH4	[redacted]

Benzene Emissions

2e	Benzene mass emissions, lb/hr	0.00235
2e	Benzene mass emissions, lb/day (based on 24 hours)	0.05630
2e	Benzene mass emissions, tons/year (based on 8,760 hours)	0.01027
2f	Benzene mass emissions, lb/ton of feed	[redacted]

2020-04-28: SSI-174

SOURCE TEST DATA SUMMARY

Client	ichnitzer Steel	*	Test number	Run 2
Unit / Location	Exhaust Outlet	*	Date	2/28/07
Test method	PA 25, TO-15	*	Start / Stop time	1033-1136

Meter box number	CB-14	*	Barometric pressure, in Hg	29.85
Meter calibration, Yd	0.986	*	Meter box volume, acf	40.281
Stack area, square feet	12.306	*	Impinger liquid volume, ml	16.9
Reference temperature, °F	70	*	Meter temperature, °F	62.3
Sample time, minutes	60	*	Meter pressure, (Delta H) iwg.	1.400
Pitot coefficient	0.8191	*	Velocity head, (Delta P) iwg	0.2775
Process feed rate, tons/hr	[redacted]	*	Static pressure, iwg	-0.13
Fuel "F" factor, dscf/MMBtu	8,710	*	Stack temperature, °F	79.8

O_2, % volume dry	20.786
CO_2, % volume dry	0.15
TOC emissions, ppm volume wet as C	109.00
Benzene emissions, ppb volume dry	9.60

2a	O_2, % volume wet	20.381
2a	CO_2, % volume wet	0.15

1a	Standard sample volume, dscf	40.344
1b	Water vapor volume, scf	0.8007
1c	Moisture fraction, nondimensional	0.0195
1d	Stack gas molecular weight, dry	28.856
1e	Stack gas molecular weight, wet	28.645
1f	Absolute stack pressure, in Hg	29.840
1g	Stack gas velocity, ft/sec	29.266
1h	Stack flow rate, acfm	21,609
1i	Stack Flow Rate (wscfm)	21,160
1j	Stack Flow Rate (dscfm)	20,748

Total Organic Compounds Emissions

Concentrations

2d	TOC concentrations, ppm volume dry as C	111.16

Mass Emissions as Carbon

2e	TOC mass emissions, lb/hr as C	4.297
2e	TOC mass emissions, lb/day as C (based on 24 hours)	103.1
2e	TOC mass emissions, tons/year as C (based on 8,760 hours)	18.82
2f	TOC mass emissions, lb/ton of feed as C	[redacted]

Mass Emissions as Methane

2e	TOC mass emissions, lb/hr as CH4	5.739
2e	TOC mass emissions, lb/day as CH4 (based on 24 hours)	137.7
2e	TOC mass emissions, tons/year as CH4 (based on 8,760 hours)	25.14
2f	TOC mass emissions, lb/ton of feed as CH4	[redacted]

Benzene Emissions

2e	Benzene mass emissions, lb/hr	0.00241
2e	Benzene mass emissions, lb/day (based on 24 hours)	0.05791
2e	Benzene mass emissions, tons/year (based on 8,760 hours)	0.01057
2f	Benzene mass emissions, lb/ton of feed	[redacted]

2020-04-28: SSI-175

SOURCE TEST DATA SUMMARY

Client	ichnitzer Steel	*	Test number	Run 3
Unit / Location	3xhaust Outlet	*	Date	2/28/07
Test method	PA 25, TO-15	*	Start / Stop time	1206-1308

Meter box number	CB-14	*	Barometric pressure, in Hg	29.88
Meter calibration, Yd	0.986	*	Meter box volume, acf	42.047
Stack area, square feet	12.306	*	Impinger liquid volume, ml	16.1
Reference temperature, °F	70	*	Meter temperature, °F	65.0
Sample time, minutes	60	*	Meter pressure, (Delta H) iwg.	1.510
Pitot coefficient	0.8191	*	Velocity head, (Delta P) iwg	0.2968
Process feed rate, tons/hr	[redacted]	*	Static pressure, iwg	-0.14
Fuel "F" factor, dscf/MMBtu	8,710	*	Stack temperature, °F	80.4

O_2, % volume dry	20.791
CO_2, % volume dry	0.15
TOC emissions, ppm volume wet as C	66.50
Benzene emissions, ppb volume dry	9.20

2a	O_2, % volume wet	20.420
2a	CO_2, % volume wet	0.14

1a	Standard sample volume, dscf	41.949
1b	Water vapor volume, scf	0.7628
1c	Moisture fraction, nondimensional	0.0179
1d	Stack gas molecular weight, dry	28.855
1e	Stack gas molecular weight, wet	28.661
1f	Absolute stack pressure, in Hg	29.870
1g	Stack gas velocity, ft/sec	30.260
1h	Stack flow rate, acfm	22,343
1i	Stack Flow Rate (wscfm)	21,876
1j	Stack Flow Rate (dscfm)	21,485

Total Organic Compounds Emissions

Concentrations

2d	TOC concentrations, ppm volume dry as C	67.71

Mass Emissions as Carbon

2e	TOC mass emissions, lb/hr as C	2.710
2e	TOC mass emissions, lb/day as C (based on 24 hours)	65.0
2e	TOC mass emissions, tons/year as C (based on 8,760 hours)	11.87
2f	TOC mass emissions, lb/ton of feed as C	[redacted]

Mass Emissions as Methane

2e	TOC mass emissions, lb/hr as CH4	3.620
2e	TOC mass emissions, lb/day as CH4 (based on 24 hours)	86.9
2e	TOC mass emissions, tons/year as CH4 (based on 8,760 hours)	15.85
2f	TOC mass emissions, lb/ton of feed as CH4	[redacted]

Benzene Emissions

2e	Benzene mass emissions, lb/hr	0.00239
2e	Benzene mass emissions, lb/day (based on 24 hours)	0.05747
2e	Benzene mass emissions, tons/year (based on 8,760 hours)	0.01049
2f	Benzene mass emissions, lb/ton of feed	[redacted]

2020-04-28: SSI-176

Average Test Results, TOC and Benzene
Schnitzer Steel
Shredder Exhaust Outlet

Test number	Run 1	Run 2	Run 3	Average
Date	2/28/07	2/28/07	2/28/07	--
Start / Stop time	0900-1003	1033-1136	1206-1308	--
O2, % volume dry	20.691	20.786	20.791	**20.756**
CO2, % volume dry	0.18	0.15	0.15	**0.16**
Moisture content, % by volume	2.492	1.946	1.786	**2.075**
Stack temperature, °F	79.1	79.8	80.4	**79.8**
Stack flow rate, acfm	21,097	21,609	22,343	**21,683**
Stack Flow Rate (dscfm)	20,170	20,748	21,485	**20,801**
TOC concentrations, ppm volume dry as C	84.10	111.16	67.71	**87.66**
TOC mass emissions, lb/hr as CH4	4.22	5.74	3.62	**4.53**
TOC mass emissions, lb/ton of feed as CH4	[redacted]			
Benzene emissions, ppb volume dry	9.60	9.60	9.20	**9.47**
Benzene mass emissions, lb/hr	0.00235	0.00241	0.00239	**0.00238**
Benzene mass emissions, lb/ton of feed	[redacted]			

APPENDIX E.6
EXAMPLE "HAND-WRITTEN" CALCULATIONS

2020-04-28 SSI-178

EXAMPLE CALCULATIONS
STACK GAS VOLUMETRIC FLOW RATE

Project name: Schnitzer Steel **Project number:** 06178.0

Computed by: Patrick Switzer **Calculation date:** 3/30/07

Run number: 1

SAMPLE TRAIN DATA

Meter calibration factor, Yd	0.9860	Y
Stack area, square feet	12.306	A_s
Reference temperature, °R	530	T_{ref} = (°F plus 460)
Pitot Coefficient	0.8191	C_p
Barometric pressure, in Hg	29.85	P_{bar}
Meter box volume, acf	38.83	V_m
Impinger liquid volume, ml	21.0	V_{lc}
Meter temperature, °R	521.7	T_m = (°F plus 460)
Meter pressure, (Delta H) iwg	1.35	ΔH
Velocity head, (Delta P) iwg	0.2643	ΔP
Static pressure, iwg	-0.14	P_{sg}
Stack temperature, °R	539.1	T_s = (°F plus 460)
Stack O_2, % volume dry	20.691	O_2
Stack CO_2, % volume dry	0.18	CO_2
Stack N_2, % volume dry	79.13	N_2 = (100- % O_2 - % CO_2)

***Note:** The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.*

2020-04-28: SSI-179

1. VOLUMETRIC FLOW RATE

a. Standard sample gas volume, dscf

$$V_{m\,std} = (0.03342)(V_m)\left[P_{bar} + \left(\frac{\Delta H}{13.6}\right)\right]\left(\frac{T_{ref}}{T_m}\right)(Y)$$

$$V_{m\,std} = (0.03342)(38.83)\left[29.85 + \left(\frac{1.35}{13.6}\right)\right]\left(\frac{530}{521.7}\right)(0.9860)$$

$V_{m\,std}$ = 38.93 dscf

b. Water vapor volume, scf

$$V_{w\,std} = (0.0472)(V_{lc})\left(\frac{T_{ref}}{528\ ^{\circ}R}\right)$$

$$V_{w\,std} = (0.0472)(21.0)\left(\frac{530}{528}\right)$$

$V_{w\,std}$ = 0.995 scf

c. Moisture content, non-dimensional

$$B_{ws} = \left(\frac{V_{w\,std}}{(V_{m\,std} + V_{w\,std})}\right)$$

$$B_{ws} = \left(\frac{0.995}{(38.93 + 0.995)}\right)$$

B_{ws} = 0.0249 moisture content (multiply by 100 for % by volume)

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d. Stack gas molecular weight, lb/lb mole (dry)

$$MW_{dry} = [0.44\,(\%\ CO_2)] + [0.32\,(\%\ O_2)] + [0.28\,(\%\ N_2)]$$

$$MW_{dry} = [0.44\,(0.18)] + [0.32\,(20.691)] + [0.28\,(79.13)]$$

MW_{dry} = 28.85 lb/lb mole

e. Stack gas molecular weight, lb/lb mole (wet)

$$MW_{wet} = [MW_{dry}\,(1 - B_{ws})] + [18\,(B_{ws})]$$

$$MW_{wet} = [28.85\,(1 - 0.0249)] + [18\,(0.0249)]$$

MW_{wet} = 28.58 lb/lb mole

f. Absolute stack pressure, in Hg

$$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

$$P_s = 29.85 + \left(\frac{-0.14}{13.6}\right)$$

P_s = 29.84 in. Hg

g. Stack velocity, ft/sec

$$V_s = (2.90)(C_p)\sqrt{(\Delta P)(T_s)}\ \sqrt{\left(\frac{29.92}{P_s}\right)\left(\frac{28.95}{MW_{wet}}\right)}$$

$$V_s = (2.90)(0.8191)\sqrt{(0.2643)(539.1)}\ \sqrt{\left(\frac{29.92}{29.84}\right)\left(\frac{28.95}{28.58}\right)}$$

V_s = 28.57 ft/sec

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h. Actual stack flow rate, acfm

$$Q = (V_s)\,(A_s)\,(60\ min/hr)$$

$$Q = (28.57)\,(12.306)\,(60)$$

$$Q = \underline{21{,}095}\ \text{acfm}$$

i. Standard stack gas flow rate, wscfm

$$Q_{ws} = (Q)\left(\frac{T_{ref}}{T_s}\right)\left(\frac{P_s}{29.92}\right)$$

$$Q_{ws} = (21{,}095)\left(\frac{530}{539.1}\right)\left(\frac{29.84}{29.92}\right)$$

$$Q_{ws} = \underline{20{,}683}\ \text{wscfm}$$

j. Standard stack gas flow rate, dscfm

$$Q_{ds} = (Q)\,(1 - B_{ws})\left(\frac{T_{ref}}{T_s}\right)\left(\frac{P_s}{29.92}\right)$$

$$Q_{ds} = (21{,}095)\,(1 - 0.0249)\left(\frac{530}{539.1}\right)\left(\frac{29.84}{29.92}\right)$$

$$Q_{ds} = \underline{20{,}168}\ \text{dscfm}$$

2020-04-28: SSI-182

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name: Schnitzer Steel **Project number:** 06178.0

Computed by: Patricia Switzer **Calculation date:** 3/30/07

Run number: 1 **Gaseous species:** CH_4

EMISSIONS DATA

Reference temperature, °R	530	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	84.10	C
Flue gas moisture content, non-dimensional	0.0249	B_{ws}
Dry stack gas flow rate at standard conditions, dscfm	20,168	Q_{ds}
Stack O_2, % volume dry	20.691	O_2
Stack CO_2, % volume dry	0.18	CO_2
"F" factor of fuel based on O_2, dscf/MMBtu @ 0% O_2	N/A	F_d
Brake horsepower, bhp	N/A	J
Molecular weight of gaseous species, lb/lb mole	16.04	MW_s where,

MW_s = 28.01 for CO; 46.01 for NO_X as NO_2; 64.06 for SO_X as SO_2; 17.03 for NH_3; 12.01 for carbon, C; 16.04 for methane (CH_4)

Specific molar volume of an ideal gas at standard conditions, ft^3/lb mole: 386.8 SV where,

SV = 379.5 ft^3/lb mole for T_{ref} at 520 °R (60 °F)

SV = 385.3 ft^3/lb mole for T_{ref} at 528 °R (68 °F)

SV = 386.8 ft^3/lb mole for T_{ref} at 530 °R (70 °F)

$$SV = (379.5)\left[\frac{(T_{ref}\ ^{\circ}R)}{520}\right]$$ at different reference temperatures

Note: The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

2020-04-28; SSI-183

2. GASEOUS EMISSIONS

a. Concentration, ppm volume wet (i.e. to calculate wet ppm from dry ppm)

$$C_w = (C)(1 - B_{ws})$$

$$C_w = (84.1)(1 - 0.0249)$$

C_w = 82.0 ppmvw

b. Concentration, ppm @ 3% O_2 dry

$$C_3 = (C)\left[\frac{(20.9 - 3.0)}{(20.9 - \%\ O_2)}\right]$$

N/A

$$C_3 = (\qquad)\left[\frac{(20.9 - 3.0)}{(20.9 - \qquad)}\right]$$

C_3 = _____ ppm @ 3% O_2

c. Concentration, ppm @ 12% CO_2 dry

$$C_{12} = (C)\left(\frac{12.0}{\%\ CO_2}\right)$$

N/A

$$C_{12} = (\qquad)\left(\frac{12.0}{\qquad}\right)$$

C_{12} = _____ ppm @ 12% CO_2

2020-04-28; SSI-184

d. Concentration, ppm volume dry (i.e. to calculate dry ppm from wet ppm)

$$C = \left[\frac{C_w}{(1 - B_{ws})}\right]$$

$$C = \left[\frac{82.0}{(1 - 0.0249)}\right]$$

C = 84.1 ppmvd

e. Mass emissions, lb/hr

$$M = (C)\,(10^{-6})\left(\frac{MW_s}{SV}\right)(Q_{ds})(60\ min/hr)$$

$$M = (84.1)\,(10^{-6})\left(\frac{16.04}{386.8}\right)(20{,}168)(60)$$

M = 4.22 lb/hr

f. Emission rate, lb/MMBtu

N/A

$$E = (C)\,(10^{-6})\left(\frac{MW_s}{SV}\right)(F_d)\left(\frac{20.9}{20.9 - \%\,O_2}\right)$$

$$E = (\qquad)\,(10^{-6})\left(\frac{\qquad}{\qquad}\right)(\qquad)\left(\frac{20.9}{20.9 - \qquad}\right)$$

E = _____ lb/MMBtu

2020-04-28: SSI-185

g. Mass emissions, grams/bhp-hr

N/A

$$M_j = (M\ )\left(\frac{453.59\ g/lb}{J}\right)$$

$$M_j = (\qquad\qquad)\left(\frac{453.59}{\qquad}\right)$$

M_j = _____ grams/bhp-hr

2020-04-28 SSI-186

EXAMPLE CALCULATIONS
PARTICULATE MATTER EMISSIONS

Project name: Schnitzer Steel **Project number:** 06178.0

Computed by: Patrick Switzer **Calculation date:** 3/30/07

Run number: 1

EMISSIONS DATA

Mass of collected particulate matter, mg	5.30	G_m
Dry stack gas flow rate at standard conditions, dscfm	20,168	Q_{ds}
Dry meter volume at standard conditions, dscf	38.93	$V_{m\,std}$
Stack O_2, % volume dry	20.691	O_2
Stack CO_2, % volume dry	0.18	CO_2
"F" factor of fuel based on O_2, dscf/MMBtu @ 0% O_2	N/A	F_d

3. PARTICULATE MATTER EMISSIONS

a. Grain loading, gr/dscf

$$G = (0.01543)\left(\frac{G_m}{V_{m\,std}}\right)$$

$$G = (0.01543)\left(\frac{5.3}{38.93}\right)$$

G = [redacted] gr/dscf

***Note:** The results calculated on this page and the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.*

2020-04-28: SSI-187

b. Grain loading corrected to 12% CO_2, gr/dscf @ 12% CO_2

$$G_{12} = (G)\left(\frac{12.0}{\%\,CO_2}\right)$$

$$G_{12} = (0.002)\left(\frac{12.0}{0.18}\right)$$

G_{12} = 0.13 gr/dscf @ 12% CO_2

c. Mass emission rate, lb/hr

$$M = (G)(Q_{ds})\left(\frac{60\ min/hr}{7000\ gr/lb}\right)$$

$$M = (0.002)(20168)\left(\frac{60}{7000}\right)$$

M = 0.35 lb/hr

d. Emission rate, lb/MMBtu

$$E = (G)\left(\frac{1\ lb}{7000\ gr}\right)(F_d)\left(\frac{20.9}{20.9 - \%\,O_2}\right)$$

N/A

$$E = (0.002)\left(\frac{1\ lb}{7000\ gr}\right)(\qquad)\left(\frac{20.9}{20.9 -}\right)$$

E = _____ lb/MMBtu

2020-04-28: SSI-188

The Avogadro Group

Client: Schnitzer Steel
Project Number: 06178.0
Run Number: 1-Cr
Date: 3/1/07
Computed By: Patrick Switzer
Date: 3/30/07
Subject: Total Chromium Mass Emission Rate

$C = 8.783\ \mu g/m^3$

$$M = \left(8.783\ \mu g/m^3\right)\left(\frac{10^{-6}\ g}{\mu g}\right)\left(\frac{1\ m^3}{35.31466572\ ft^3}\right)\left(\frac{1\ lb}{453.59237\ g}\right)\left(\frac{20{,}168\ ft^3}{1\ min}\right)\left(\frac{60\ min}{1\ hr}\right)$$

$M = 6.63 \times 10^{-4}\ lb/hr$

2020-04-28: SSI-189

APPENDIX F
COPY OF PERMIT

2020-04-28: GSI-190

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

SPARE THE AIR 50 1955-2005 FOR A HEALTHIER FUTURE

Plant No. 208: Schnitzer Steel Products Company
Source Nos. 6 & 7: Shredder and Infeed Conveyor, respectively
Application No. 14194
Condition No. 23114

COND# 23114 ----------

S-6 & S-7 Shredder and Infeed conveyor

1. The owner/operator shall not exceed the scrap throughput limit of 431,471 tons in any consecutive 12-month period at this facility.
(basis: baseline; 2005 production level; CEQA exemption)
2. The owner/operator shall enclose and vent the shredder to the abatement system at all times it is operating to minimize fugitive emissions.
(basis: TBACT)
3. The owner/operator shall abate particulate emissions from the shredder by water injection at a sufficient rate to ensure that non-metallic material exiting the unit be moist to the touch at all times, and abatement system consisting of cyclones, scrubber, filter, and demister at all times when the shredder is in operation. The PM grain loading at the exhaust outlet of the abatement system shall not exceed 0.01 gr/dscf.
(basis: TBACT)
4. The owner/operator shall operate the Recycling Center in such a manner that particulate emissions into the atmosphere from any operation/equipment for a period or periods aggregating more than three minutes in any hour shall not cause a visible emission which is as dark or darker than No. 0.5 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree or result in fallout on adjacent property in such quantities as to cause public nuisance per District Regulation 1-301.
(basis: Regulations 6-301; 1-301)
5. The owner/operator shall use water spray to minimize fugitive dust emissions from material/scrap handling and storage to comply with condition 4. The owner/operator shall pave the site truck transport roads and sweep/spray with water/other actions deemed appropriate by the District, if necessary, to minimize fugitive dust emissions from trucking activities to comply with condition 4.
(basis: Regulations 6-301; 1-301)
6. In order to demonstrate compliance with

2020-04-28: SSI-191

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

condition number 1, the owner/operator shall keep records of monthly and yearly throughput in a District approved log. The log shall be maintained for a period of at least 24 months from the date of data entry and shall be made available to the District staff upon request for inspection.
(basis: recordkeeping)

7. Within 45 days of startup, the owner/operator shall perform a District approved source test to determine emission factors of total organics, PM, hexavalent chromium, PCB, and benzene for the shredder. The emission factors shall be expressed in pounds/ton of feed. The source test shall be performed at or near maximum feed rate of the shredder. The feed shall be a typical mix of the vehicles, appliances, etc. Operating parameters such as water injection rate, scrubber water recirculation rate, and quality of water used for injection/circulation shall be noted for each source test run. At least 7 days in advance of the test, the owner/operator shall notify the District's Source test Section Manager of the test date and time, and shall obtain prior approval of the test method(s) to be used. The owner/operator shall submit a written report to the District within 30 days of completion of the source test.
(basis: Startup condition)

End of Condition

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