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Test Report for Particulate, Nitrogen Oxides, Carbon Monoxide and Total Non-Methane Hydrocarbon Testing on the No. 4 Calciner (AQD No. 80, CA-4) Stack

Conducted for Solvay Minerals, Inc.
at their Facility Located Near Green River, Wyoming

Report No. 1457A
April 11, 2001

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Project Overview

General

Airtech Environmental Services Inc. was contracted by Solvay Minerals, Inc. to perform an air emission compliance test program at their facility located near Green River, Wyoming. The objective of the test program was to demonstrate that particulate and nitrogen oxides (NOx) emissions from the No. 4 Calciner (AQD No. 80, CA-4) are within permit limits. Additionally, carbon monoxide (CO) and total non-methane hydrocarbon (TNMHC) measurements were performed to show the emissions are within the estimate provided in the permit. The associated Permit No. is CT-1347, issued February 6, 1998. Three test runs were performed at the Calciner Stack test location for each of the parameters listed below.

Parameters

The following parameters were determined at the CA-4 Stack:

- volumetric flow rate
- flue gas temperature
- gas moisture content
- carbon dioxide concentration
- oxygen concentration
- total suspended particulate concentration
- condensible particulate matter concentration
- nitrogen oxides concentration
- carbon monoxide concentration
- methane concentration
- total hydrocarbon concentration

Methodology

An isokinetic sampling train was used to determine the total suspended particulate (TSP) and the condensible particulate (CPM) of the flue gas, using a combined EPA Method 5 and 202 sampling train. Three, 60 minute test runs were performed at the Calciner No. 4 Stack on March 2, 2001.

Continuous emission monitors were used to determine the concentrations of nitrogen oxides, carbon monoxide and total hydrocarbons. EPA Methods 7E, 10 and 25A were referenced. Since methane is not a regulated VOC, an on-site gas chromatograph was used to determine the methane concentration using EPA Method 18. To convert the constituent concentrations to mass flow rates, the volumetric gas flow rate were determined at the source. The Methane emission rate was then subtracted from the total

hydrocarbon emission rate measured by the Flame Ionization Analyzer to give a total non-methane hydrocarbon (TNMHC) emission rate. Three, 60 minute test runs were performed at the Calciner No. 4 Stack on March 1, 2001.

Testing was performed by Airtech Environmental Services Inc. Coordinating the field portion of the test program were:

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A source identification table can be found in the Description of Installation.

Compound (CAS) Numbers

Compound Name	*Molecular Weight*	*CAS No.*
Nitrogen Oxides	46.01	10102-44-0
Carbon Monoxide	28.01	630-08-0
Total Hydrocarbons (as propane)	44.10	74-98-6
Methane	16.04	74-82-8

Summary of Results

Source **Constituent**	**Sampling Method**	**Measured Results**	**Permit Limit**
CA-4 Stack			
Particulate Matter (lb/hr)	EPA 1-5/202	7.93	12.25
Nitrogen Oxides (lb/hr)	EPA 1-4 & 7E	12.0	20.0
Carbon Monoxide (lb/hr)	EPA 1-4 & 10	168	NA
TNMHC (lb/hr)	EPA 1-4, 18 & 25A	17.3	NA

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AIRTECH Environmental Services

Results

Table 1 – Calciner No. 4, Gaseous Emissions

Test Parameters	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	3/1/01	3/1/01	3/1/01	
Start Time	11:38	13:08	14:26	
Stop Time	12:38	14:08	15:26	
Process Conditions*				
Production Rate (tons/hr)	255	255	255	**255**
Fuel Flow (MSCFH)	249.0	247.1	245.5	**247.2**
Fuel Btu Value	1030	1030	1030	**1030**
Opacity (%)	1.6	1.5	1.3	**1.5**
Gas Conditions				
Temperature (°F)	303	302	299	**301**
Volumetric Flow Rate (acfm)	274,100	273,400	262,000	**269,800**
Volumetric Flow Rate (scfm)	149,300	149,200	143,500	**147,300**
Volumetric Flow Rate (dscfm)	100,810	100,510	96,910	**99,410**
Carbon Dioxide (% dry)	12.5	12.4	12.5	**12.4**
Oxygen (% dry)	10.0	9.9	10.1	**10.0**
Moisture (%)	32.5	32.7	32.5	**32.6**
Nitrogen Oxide Results				
Concentration (ppmdv)	15.1	18.3	17.1	**16.8**
Emission (lb/hr)	10.9	13.2	11.8	**12.0**
Carbon Monoxide Results				
Concentration (ppmdv)	375	326	467	**389**
Emission (lb/hr)	165	143	197	**168**
Total HC Results (as propane)				
Concentration (ppmwv)	40.3	34.9	51.6	**42.3**
Emission (lb/hr)	41.4	35.7	50.8	**42.6**
Methane Results				
Concentration (ppmdv)	98.8	91.8	117	**102**
Emission (lb/hr)	24.9	23.0	28.2	**25.4**
TNMHC Results (as propane)				
Emission (lb/hr)	16.5	12.7	22.6	**17.3**

* Process conditions provided by Solvay Minerals, Inc.

9.3 9.3 9.1

Table 2 – Calciner No. 4, Particulate Emissions

Test Parameters	**Run 1**	**Run 2**	**Run 3**	**Average**
Date (2001)	3/2	3/2	3/2	
Start Time	8:05	10:45	12:44	
Stop Time	9:18	11:51	13:50	
Process Conditions*				
Production Rate (tons/hr)	255	255	255	**255**
Fuel Flow (MSCFH)	251.8	258.9	255.1	**255.3**
Fuel Btu Value	1,065	1,065	1,065	**1,065**
Opacity (%)	7.7	2.3	1.3	**3.8**
Gas Conditions				
Temperature (°F)	286	296	304	**296**
Volumetric Flow Rate (acfm)	254,800	274,600	274,900	**268,100**
Volumetric Flow Rate (scfm)	142,000	151,000	149,600	**147,500**
Volumetric Flow Rate (dscfm)	96,830	102,410	101,130	**100,120**
Carbon Dioxide (% dry)	11.8	12.1	12.2	**12.0**
Oxygen (% dry)	10.7	10.9	10.8	**10.8**
Moisture (%)	31.8	32.2	32.4	**32.1**
Front Half Particulate				
Concentration (grains/dscf)	0.00189	0.00259	0.00143	**0.00197**
Emission Rate (lb/hr)	1.57	2.28	1.24	**1.70**
Back Half Organic Particulate				
Concentration (grains/dscf)	0.0272	0.0263	0.0649	**0.0395**
Emission Rate (lb/hr)	22.5	23.1	56.3	**34.0**
Back Half Inorganic Particulate				
Concentration (grains/dscf)	0.00466	0.00559	0.0114	**0.00723**
Emission Rate (lb/hr)	3.86	4.90	9.92	**6.23**
Front and Back Half Inorganic Particulate				
Concentration (grains/dscf)	0.00655	0.00818	0.0129	**0.00920**
Emission Rate (lb/hr)	5.43	7.18	11.2	**7.93**

* Process conditions provided by Solvay Minerals, Inc.

Test Procedures

Method Listing

The following test methods were referenced for the test program. These methods can be found in 40 CFR part 60, Appendix A as well as 40 CFR Part 51, Appendix M.

Method 1	Sample and Velocity Traverse for Stationary Sources
Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Method 3	Gas Analysis for the Determination of Molecular Weight
Method 4	Determination of Moisture Content in Stack Gases
Method 5	Determination of Particulate Emissions from Stationary Sources
Method 7E	Determination of Nitrogen Oxides Emissions from Stationary Sources (instrumental analyzer procedure)
Method 10	Determination of Carbon Monoxide Emissions from Stationary Sources
Method 18	Measurement of Gaseous Organic Compound Emissions by Gas Chromatography
Method 25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
Method 202	Determination of Condensible Particulate Emissions from Stationary Sources

Method Descriptions

Method 1

EPA Method 1 was used to determine the suitability of the test location and to determine the sample points used for particulate and volumetric airflow determinations. The CA-4 Stack test location was a round vertical stack located more than eight diameters downstream and more than two diameters upstream from the nearest flow disturbances. A diagram of the test location showing the sampling points can be found in Figure 1 in the Appendix.

Method 2

EPA Method 2 was used to determine the gas velocity through the test location. A Type S Pitot tube and an incline plane oil manometer were used at the test location for the determination of gas velocity. The manometer was leveled and "zeroed" prior to each test run. The sample train was leak checked before and after each run by pressurizing the positive side, or "high" side, of the Pitot tube and creating a deflection on the manometer of at least three inches H_2O. The leak check was considered valid if the manometer remained stable for 15 seconds. This procedure was repeated on the negative side by generating a vacuum of at least three inches H_2O. The velocity head pressure and gas

temperature were then determined at each point specified in Method 1. The static pressure of the stack was measured using a water filled U-tube manometer. In addition, the barometric pressure was measured and recorded.

Method 3

The carbon dioxide and oxygen content was determined using EPA Method 3. A gas sample was collected into a Tedlar bag from the back of the EPA Method 4 or 5/202 train for the duration of each test run. Analysis was performed using an Orsat gas analyzer. The gas analyzer was leak checked prior to sampling by raising the liquid levels in each pipette to a reference mark on the capillary tubes and then closing the pipette valves. The burette solution was raised to bring the meniscus onto the graduated portion of the burette and the manifold valve was closed. After four minutes, the pipette meniscus did not fall below the reference mark and the burette meniscus did not fall by more than 0.2 percent, so the leak check was considered valid. The carbon dioxide content and oxygen content were used, along with the moisture content determined in Method 4, to calculate the gas stream molecular weight. The molecular weight was then used for the volumetric flow rate calculation. For these calculations, the remainder of the gas stream was assumed to consist of nitrogen.

Method 4

The moisture content at the test location was determined using EPA Method 4. A known volume of sample gas was withdrawn from the source and the moisture was condensed and measured. The dry standard volume of the sample gas was then compared to the volume of moisture collected to determine the moisture content of the sample gas.

To condense the water vapor the gas sample passed through a series of four impingers. The first three impingers each contained 100 ml of deionized ultra filtered (DIUF) water. The fourth impinger contained a known weight of silica gel to absorb any remaining water vapor. The sample train was leak checked prior to the test run by capping the probe tip and pulling a vacuum greater than the highest vacuum expected during the test run. A leak check was considered valid since the leak rate was less than 0.02 cubic feet per minute. The volume of dry gas exiting the gas condenser system was measured with a dry gas meter. After leaving the dry gas meter, the sample stream passed through an orifice, that was used to meter the flow rate through the sample train. The pressure drop across the orifice was measured with an incline plane oil manometer. The gas meter reading, gas meter inlet and outlet temperatures, gas meter static pressure and pump vacuum were recorded during each test run.

After the test run the sample train was leak checked at the highest vacuum encountered during the test run. The amount of water collected in the condenser system was measured gravimetrically. The net weight gain of water was converted to a volume of wet gas and then compared to the amount of dry gas sampled to determine the moisture content. The moisture content was used, along with the oxygen and carbon dioxide content determined by EPA Method 3, for the calculation of the molecular weight.

Methods 5 and 202

EPA Method 5 was used in conjunction with EPA Method 202 to measure total particulate matter at the test location. EPA Method 5 measured particulate collected in the nozzle, probe, connecting glassware and filter. EPA Method 202 measured the condensible particulate matter collected in the impinger assembly. The weight of particulate collected with the sample train combined with the volume of dry gas withdrawn from the stack was then used to calculate the particulate concentration.

To prevent contamination, all components of the sample train were constructed of glass with no metal connections. Prior to testing, the components were washed using detergent and then rinsed with deionized water, acetone and finally methylene chloride. After drying, all components were sealed with aluminum foil.

The sample probe that was used consisted of a glass liner and glass nozzle. Sample gas passed through the nozzle and probe assembly and then through a glass fiber filter which was maintained at a temperature greater than the flue gas. After exiting the filter, the sample gas passed through the condenser system described in Method 4. The dry gas exiting the moisture condenser system then passed through a sample pump and a dry gas meter to measure the gas volume. After leaving the dry gas meter, the sample stream passed through an orifice which was used to meter the flow rate through the sample train. The pressure drop across the orifice was measured with an incline plane oil manometer. A schematic of the Method5/202 sampling train can be found in Figure 2 in the Appendix.

Whatman 934-AH glass fiber filters were used as the substrate for the particulate sampling. The filter was loaded into a glass filter holder with a Teflon support screen that was cleaned and prepared in the same manner as the other components of the sample train. Prior to the test run, the filter was desiccated for at least 24 hours and then weighed to the nearest 0.0001gram (g) until a constant weight was achieved. The weight of the filter was then considered constant when two consecutive weights taken at least six hours apart were within 0.0005g of each other.

The probe liner was thoroughly pre-cleaned with DIUF water and the probe wash was saved as a quality assurance check. The condenser system was prepared following procedures outlined in Method 202. The sample train was leak checked prior to the test run by capping the probe tip and pulling a vacuum of at least 15 inches Hg. The tests were considered valid since the leak rate was below 0.02 cfm. When not in operation or inside the stack, the nozzle was sealed with Teflon tape.

The probe tip was then placed at each of the sample points determined in Method 1. The velocity at the sample point was determined, using Method 2, by reading the velocity pressure from the manometer. Sample was withdrawn from the source at a rate such that the velocity at the opening of the nozzle matched the velocity of the stack gas at the sample point (isokinetically). During the test run, the train was moved to each of the Method 1 sample points. The gas velocity pressure (ΔP), gas meter reading, gas meter

inlet and outlet temperatures, gas meter orifice pressure (ΔH) and pump vacuum were recorded for each sample point.

After the test run, the train was leak checked at the highest vacuum encountered during the test run. The condensate weight gain of the impinger contents was determined as outlined in Method 4. The impingers and all connecting glassware were rinsed three times with DIUF water. The condensate and rinse was saved in a pre-cleaned amber glass jar equipped with a Teflon lined lid. A final rinse of the above components was performed three times using methylene chloride and saved in a separate a pre-cleaned amber glass jar equipped with Teflon lined lid. The probe liner and nozzle were washed with DIUF and the rinse was saved in a 250-ml amber glass jar equipped with a Teflon lined lid. The filter was removed from the filter holder and placed in a labeled petri dish.

Due to flue gas desulfurization properties of soda ash, the sixty-minute purge of the impingers, specified in the method, was not required.

Analysis of the samples for particulate matter was performed as follows. The probe rinses were transferred to tared beakers, evaporated to dryness under ambient temperature and pressure conditions, desiccated for 24 hours and weighed to a constant weight. The filters were desiccated for 24 hours and weighed to a constant weight. The weight gain of the probe rinses and filters yielded the total front half weight of particulate collected.

The impinger water was extracted by adding the contents of the methylene chloride rinse to the impinger water, and separating the layers in a separatory funnel. Two additional 75-milliliter portions of methylene chloride were added to the funnel to complete the extraction. The organic extract fraction was then placed into a tared beaker and evaporated at room temperature to dryness. The beakers were then desiccated for 24 hours and weighed to a constant weight. The aqueous inorganic fraction were placed into a tared beaker, taken to dryness at a slightly elevated temperature, and allowed to air dry at room temperature. The residue was desiccated for 24 hours and weighed to a constant weight. The weight differentials for the organic and inorganic fractions were combined to determine the total condensible particulate matter. All fractions of the particulate analysis were adjusted for the appropriate blank values.

To eliminate interference in establishing a constant weight, the analytical balance was equipped with an ion generating polonium strip designed to eliminate static electricity that may have collected on the samples. The analysis of the front half, particulate samples was performed on-site by Airtech Environmental Services Inc. The analysis of the condensible, back half, particulate samples collected by Method 202 was performed by Airtech Environmental Services Inc. located in Evergreen, Colorado.

Methods 7E, 10 and 25A

The nitrogen oxides, carbon monoxide and total hydrocarbon concentrations at the test location were determined using EPA Methods 7E, 10 and 25A. A sample of the gas stream was continuously withdrawn from the test location and analyzed using a

Continuous Emissions Monitoring (CEM) system. A diagram of the CEM sample system apparatus is shown in Figure 3 in the Appendix.

The sample gas was withdrawn from the test location at a constant rate through a stainless steel probe, a glass fiber filter and a Teflon sample line. The probe, filter and sample line were operated at a temperature of 250 °F to prevent the condensation of moisture. The sample gas was then split into two separate portions. The first portion was directed to a gas cooler and the second portion was directed to the total hydrocarbon analyzer.

The first portion of the sample gas passed through an M & C Type EC gas cooler system. The gas cooler consists of two separate stages designed to unobtrusively lower the dewpoint of the sample gas to 35 °F, thus removing the moisture. The dry gas was then vented to the nitrogen oxides and carbon monoxide analyzers. Results from these analyzers were determined on a "dry" basis.

The analyzers that were used for this project are listed in the table below.

Parameter	Manufacturer	Model Number	Operating Principle	Units Reported	Range used
Nitrogen Oxides	California Analytical	300	Chemi-luminescence	(ppmdv)	(0-100)
Carbon Monoxide	Thermo Environmental	48C	Infrared, Gas Filter Correlation	(ppmdv)	(0-2000)

Prior to sampling, a calibration error test was performed for each analyzer. The zero and high-range calibration gases for each constituent were introduced directly into each analyzer. Each analyzer was then adjusted to the appropriate values. The mid-range gas was then introduced to each analyzer and the measured values were recorded. The measured values for each calibration gas were then compared to the calibration gas values and the differences were less than the method requirement of two percent of the span value.

A sample system bias check was then performed by introducing the zero and mid-range calibration gases into the sampling system prior to the filter. The gas was drawn through the entire sampling system. The measured responses were then compared to the calibration error test values to determine the bias in response due to the sampling system. The sampling system bias was less than the method requirement of five percent of the span value.

After each test run the instrument drift for each analyzer was determined by introducing the zero and mid-range calibration gases into the sampling system prior to the filter. The gas was drawn through the entire sampling system. The measured responses were then compared to the values from the previous test run to determine the analyzer drift. For all

test runs, the analyzer drift was less than the method requirement of three percent of the span value.

The second portion of the gas stream remained heated and was vented to a California Analytical Model H300HFID gas analyzer. This analyzer uses a flame ionization detector for the determination of total hydrocarbons. Results from this analyzer are determined on a "wet" basis. A 40 percent H_2/60 percent He mixture was used to fuel the instrument. The flame ionization analyzer (FIA) was calibrated with zero nitrogen and three known concentrations of propane in a balance of nitrogen. Each calibration gas was certified according to EPA Protocol 1 procedures.

Prior to sampling, a calibration error test was performed for the FIA. The zero and high-range calibration gases were introduced into the sampling system prior to the filter. The gas was drawn through the entire sampling system and the FIA was adjusted to the appropriate values. The mid and low-range gases were then introduced to the FIA and the measured values were recorded. The measured values for each calibration gas were then compared to the calibration gas values and the differences were less than the method requirement of five percent of the actual value.

After each test run the instrument drift for the FIA was determined by introducing the zero and low-range calibration gases into the sampling system prior to the filter. The gas was drawn through the entire sampling system. The measured responses were then compared to the values from the previous test run to determine the analyzer drift. For all test runs, the analyzer drift was less than the method requirement of three percent of the span value.

EPA Method 18

EPA Method 18 was used to determine the concentration of methane in the gas stream. In Method 18, a sample of the gas stream is withdrawn from the source, and its major components separated, using a gas chromatograph (GC). The individual components are then quantified using a flame ionization detector (FID).

A Tedlar bag gas collected from the back of the Method 4 sample train was used for the Method 18 analysis. A portion of the gas sample was injected into the GC using a gas tight syringe. The components of the gas sample were then separated using a GS Alumina megabore column. Nitrogen was used as a carrier to pass the sample through the column. After exiting the column, the separated sample components, along with the carrier gas, passed through the FID. The output of the FID was monitored using computer integration software. The retention time and area of the methane peak were determined by the software. The identity of the methane peak was then determined by comparing the retention time of the sample peak with the retention time determined by analyzing a known standard.

The GC was calibrated using gas standards that contain a known concentration of methane. The standards were prepared by introducing a known quantity of zero air into a

Tedlar bag using a calibrated flowmeter. A known quantity of methane was injected into the Tedlar bag using a gas tight syringe. A minimum of three standards of different concentrations were prepared and analyzed.

Results of methane was calculated by comparing the areas of the standards to the area of the gas sample using linear regression analysis or an average response factor.

Description of Installation

Solvay Minerals, Inc., located near Green River, Wyoming, is a mine and refinery with corporate offices in Houston, Texas.

The primary raw material for the Green River facility is sodium sesquicarbonate commonly referred to as trona. The trona is mined at the plant site from an ore bed located 1,500 feet below the surface. The trona is hoisted to the surface before refining into soda ash and other sodium-based products.

The caustic/sulfite system is fed unfiltered saturated sodium carbonate solution from the soda ash process. Insolubles are separated by settling and filtration. At this point, the caustic carbonate liquor is reacted with lime forming caustic soda. The remaining sodium carbonate liquor is reacted with sulfur dioxide forming sodium sulfite or sodium metabisulfite. At the completion of the refining process, the caustic soda, sodium sulfite and sodium metabisulfite are stored pending shipment.

The trona that is fed to the soda ash calciners is heated, resulting in thermal calcination of the sodium sesquicarbonate forming a crude soda ash. The crude soda ash is dissolved in water and the insolubles are separated from the solution by settling and filtration. The insolubles are disposed of in the mine void. The high-purity saturated solution of sodium carbonate is then fed to crystallizers where a large amount of water is removed and a slurry of sodium carbonate monohydrate crystals is formed. This slurry is then further dewatered and washed by a series of cyclones and centrifuges. The resulting monohydrate crystals are fed through dryers forming a high quality soda ash, which then is ready for storage and shipment.

The facility is equipped with baghouses, scrubbers and electrostatic precipitators (ESP) to control emissions.

Source identification is shown in the table below.

Solvay Minerals, Inc. CA 4 *(AQD No. 80)* **Calciner Profile**

Unit Identification Number	*AQD No. 80, CA-4*
Process	Calciner
Fuel	Natural Gas
Heat Content	1043 Btu/ft^3
Stack Height	180 feet
Stack Diameter	125.5 inches
Diameters to Upstream Disturbance	Approximately 8.1
Diameters to Downstream Disturbance	Approximately 5.5
Primary Control Equipment	ESP

A general schematic of the process is shown in Figure 4 in the Appendix.

Figures

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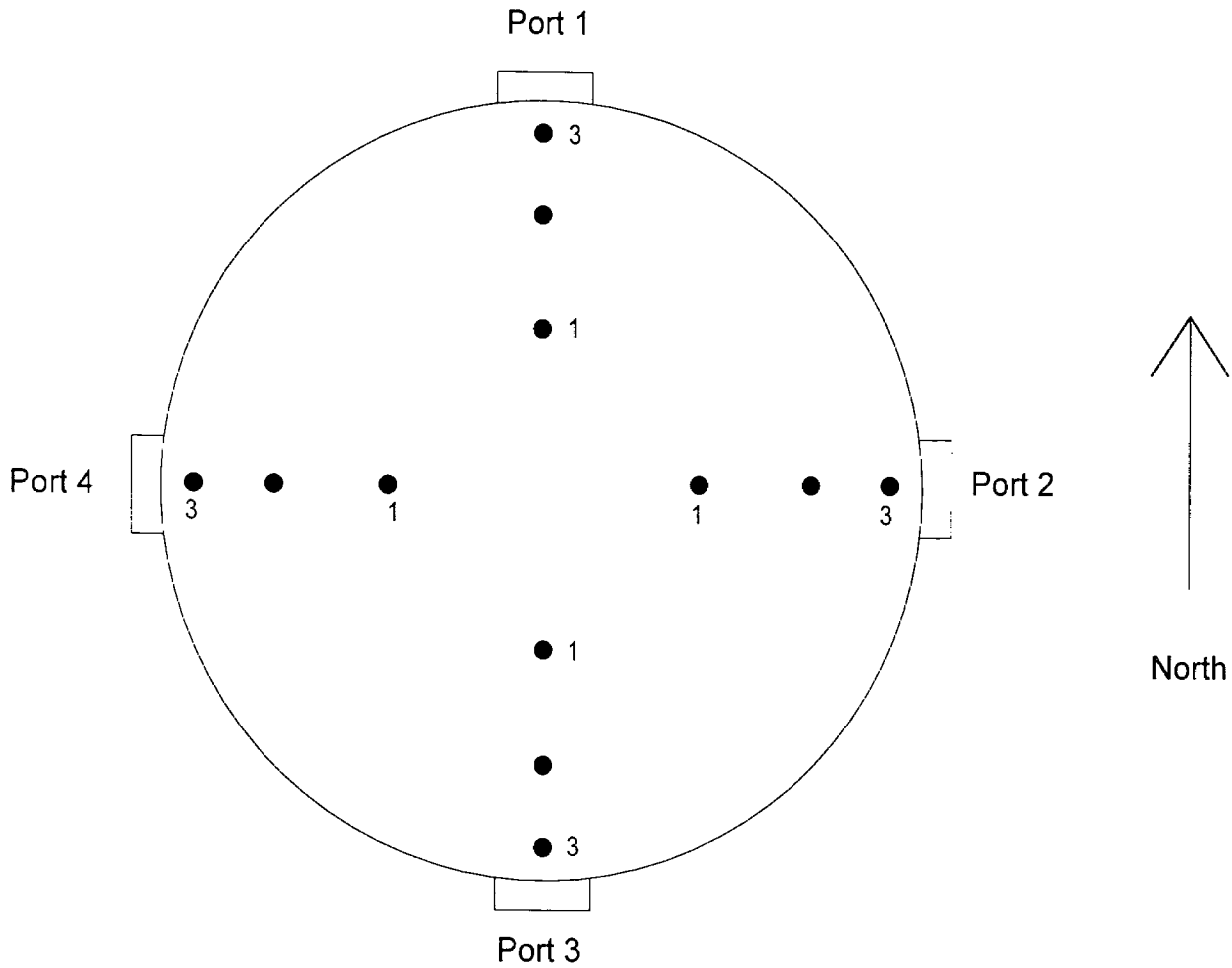

Diameter (in.)	125.5
Port Length (in.)	4.0

Point	Distance from Wall (in.)
1	37.1
2	18.3
3	5.5

Cross Section of the CA-4 Stack
Solvay Minerals, Inc.

Figure 1

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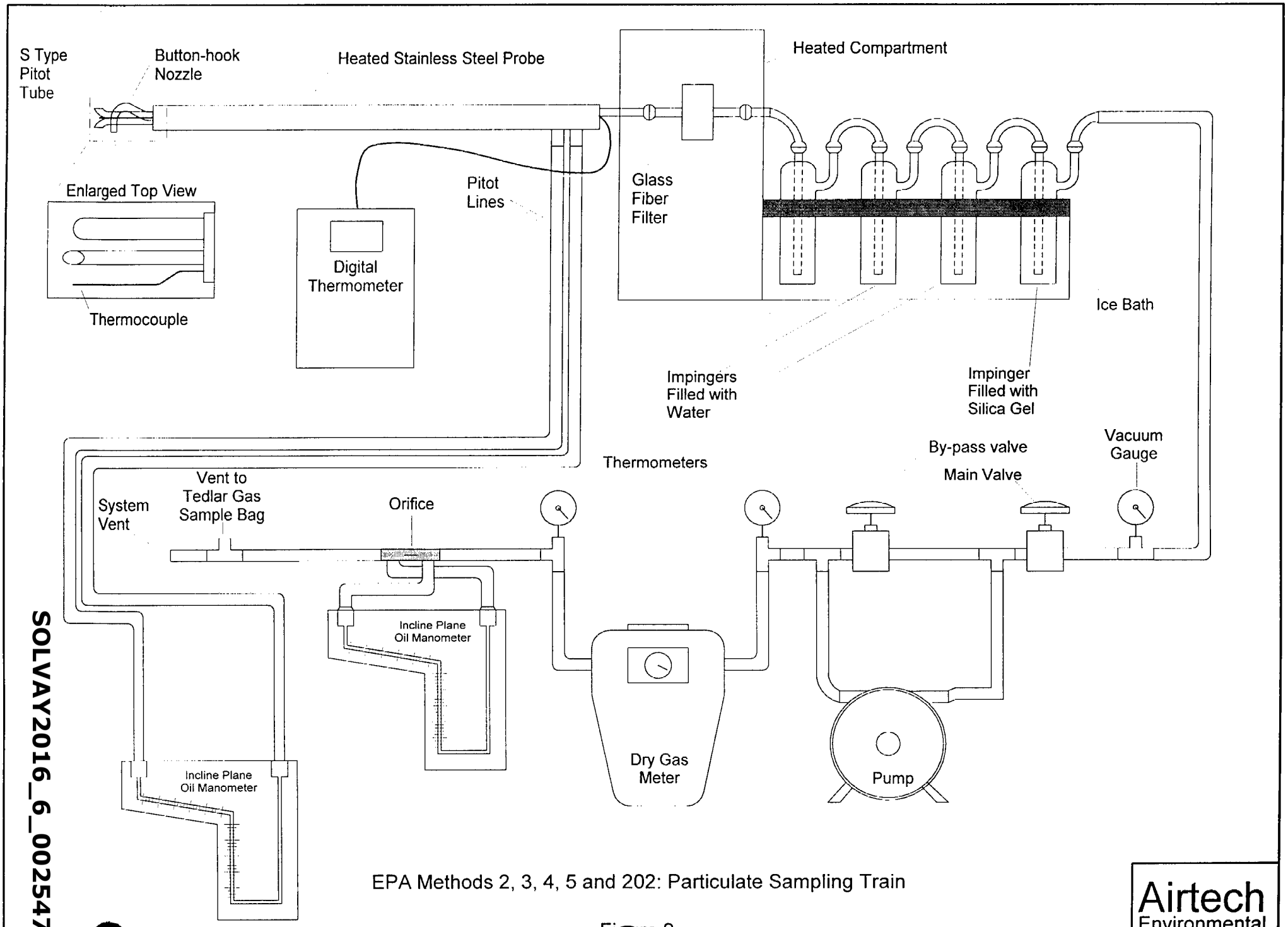

EPA Methods 2, 3, 4, 5 and 202: Particulate Sampling Train

Figure 2

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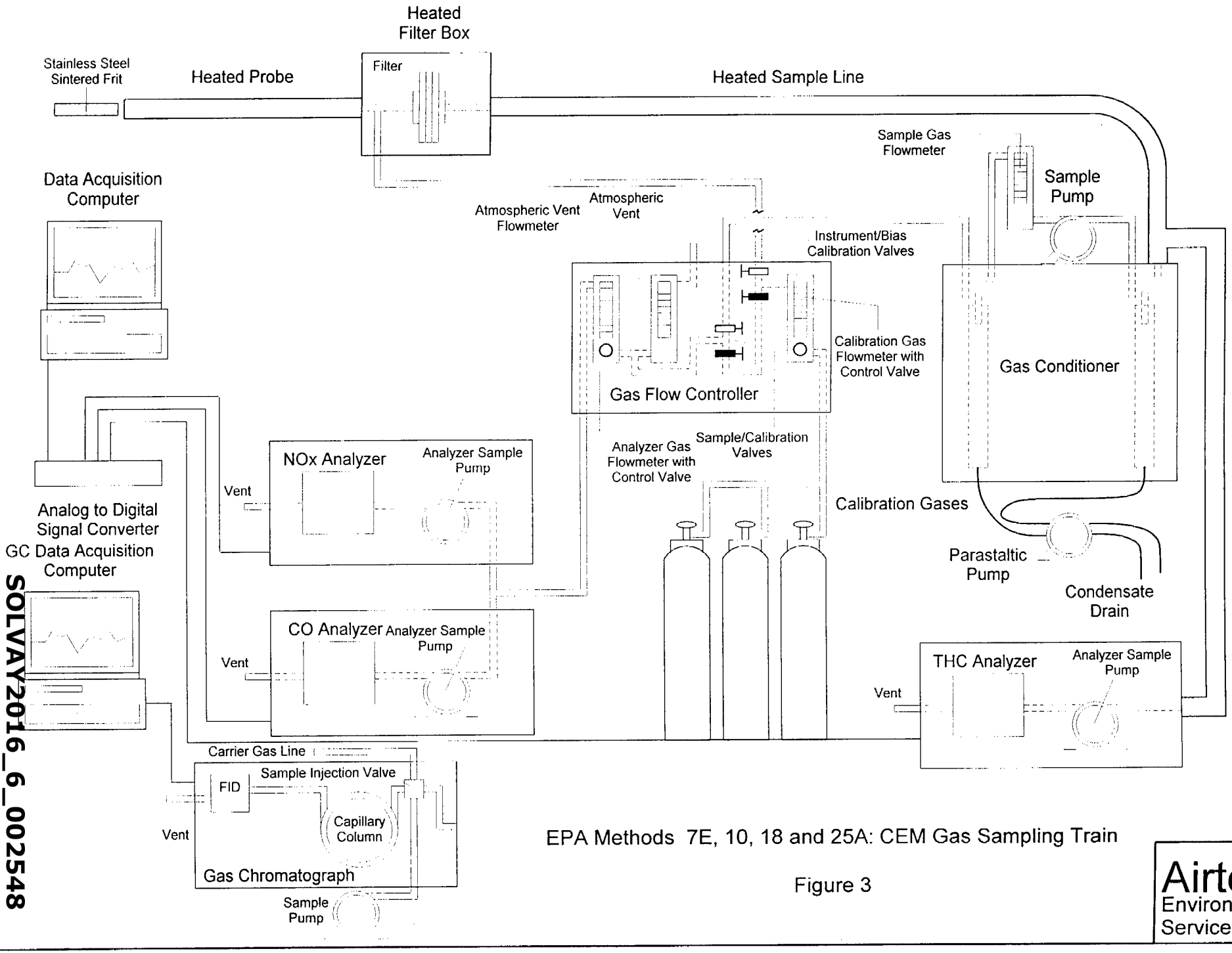
SOLVAY2016_6_002547



EPA Methods 7E, 10, 18 and 25A: CEM Gas Sampling Train

Figure 3

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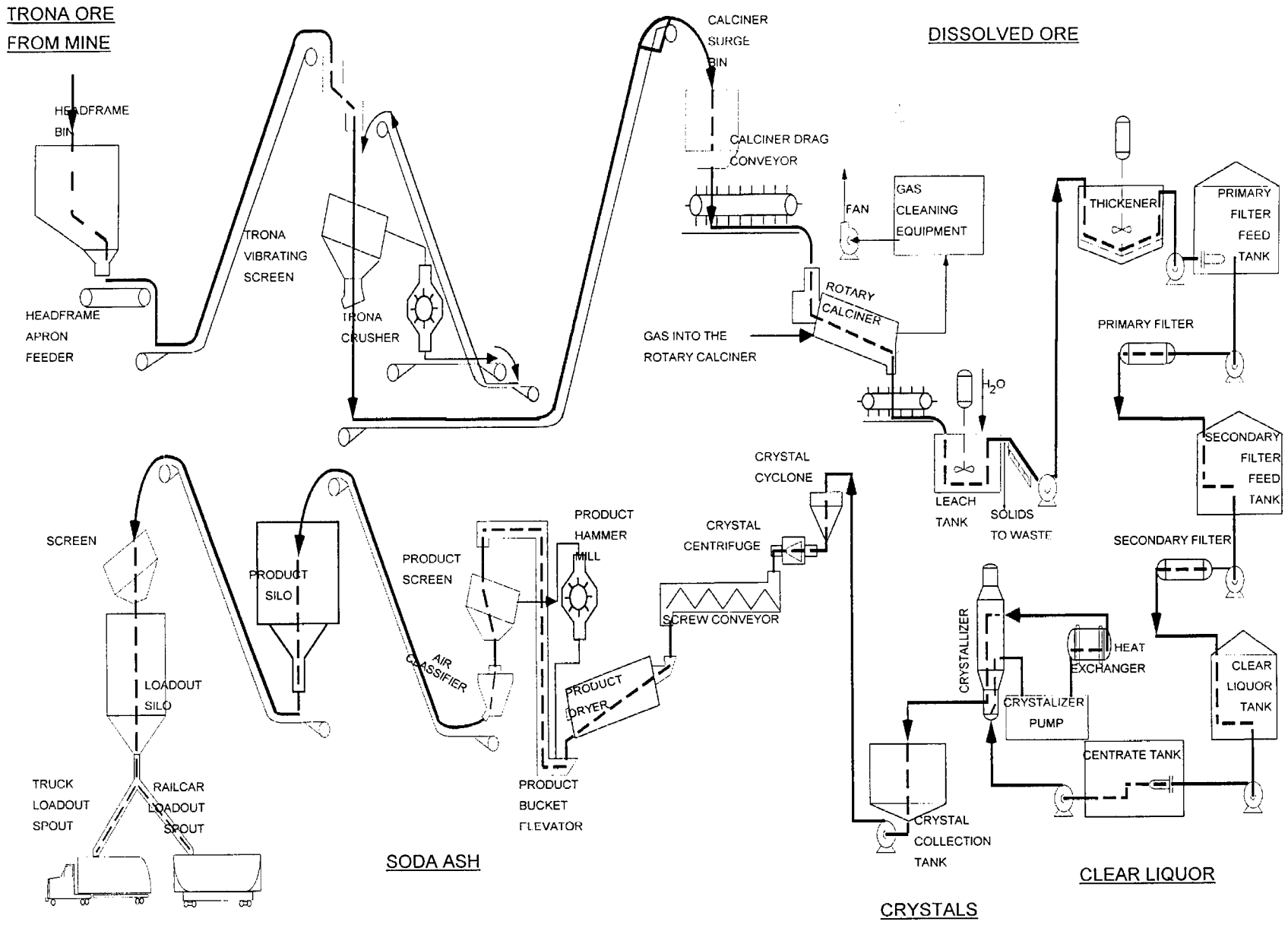

Process Schematic

Figure 4

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SOLVAY2016_6_002549

Sample Calculations

SOLVAY2016_6_002550

Sample Calculations for Particulate Run 1, Calciner No. 4 Stack

Area of Sample Location

$$A_s = \pi \times \left(\frac{d}{2x12}\right)^2$$

$$A_s = \pi \times \left(\frac{125.5}{2x12}\right)^2$$

$$A_s = 85.90\, ft^2$$

where:

A_s	= area of sample location (ft^2)
d	= stack diameter (in)
2	= conversion factor (diameter to radius)
12	= conversion factor (in/ft)

Stack Pressure Absolute

$$P_a = P_b + \frac{P_s}{13.6}$$

$$P_a = 23.60 + \frac{-0.4}{13.6}$$

$$P_a = 23.57\ in.Hg$$

where:

P_a	= stack pressure absolute (in. Hg)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure (in. H_2O)
13.6	= conversion factor (in. H_2O/in. Hg)

Volume of Dry Gas Collected Corrected to Standard Temperature and Pressure

$$V_{m(std)} = \frac{17.64(V_m)(Y_d)\left(P_b + \frac{\Delta H}{13.6}\right)}{(T_m + 460)}$$

$$V_{m(std)} = \frac{17.64(39.70)(1.0226)\left(23.60 + \frac{1.34}{13.6}\right)}{(42.9 + 460)}$$

$$V_{m(std)} = 33.75 ft^3$$

where:

$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
V_m	= volume of gas sampled at meter conditions (ft^3)
Y_d	= gas meter correction factor (dimensionless)
P_b	= barometric pressure (in. Hg)
ΔH	= average sample pressure (in. H_2O)
T_m	= average gas meter temperature (^oF)
13.6	= conversion factor (in. H_2O/in. Hg)
17.64	= ratio of standard temperature over standard pressure (^oR/in. Hg)
460	= conversion (^oF to ^oR)

Volume of Water Vapor Collected Corrected to Standard Temperature and Pressure

$$V_{w(std)} = 0.04715 \times V_{wc} + 0.04715 \times V_{wsg}$$

$$V_{w(std)} = 0.04715 \times 295.3 + 0.04715 \times 38.7$$

$$V_{w(std)} = 15.7 ft^3$$

where:

$V_{w(std)}$	= volume of water vapor at standard conditions (scf)
V_{wc}	= weight of liquid collected (g)
V_{wsg}	= weight gain of silica gel (g)
0.04715	= volume occupied by one gram of water at standard temperature and pressure (ft^3/g)

Percent Moisture

$$B_{ws} = 100 \times \left[\frac{V_{w(std)}}{\left(V_{m(std)} + V_{w(std)}\right)} \right]$$

$$B_{ws} = 100 \times \left[\frac{15.7}{(33.75 + 15.7)} \right]$$

$$B_{ws} = 31.8\%$$

where:

B_{ws}	= moisture content of the gas stream (%)
$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
$V_{w(std)}$	= volume of water vapor at standard conditions (scf)
100	= conversion factor

Molecular Weight of Dry Gas Stream[1]

$$M_d = \left(44 \times \frac{\%CO_2}{100}\right) + \left(32 \times \frac{\%O_2}{100}\right) + \left(28 \times \frac{(\%CO + \%N_2)}{100}\right)$$

$$M_d = \left(44 \times \frac{11.8}{100}\right) + \left(32 \times \frac{10.7}{100}\right) + \left(28 \times \frac{77.5}{100}\right)$$

$$M_d = 30.31 \, lbs / lb - mole$$

where:

M_d	= molecular weight of the dry gas stream (lb/lb-mole)
$\%CO_2$	= carbon dioxide content of the dry gas stream (%)
44	= molecular weight of carbon dioxide (lb/lb-mole)
$\%O_2$	= oxygen content of the dry gas stream (%)
32	= molecular weight of oxygen (lb/lb-mole)
%CO	= carbon monoxide content of the dry gas stream (%)
$\%N_2$	= nitrogen content of the dry gas stream (%)
28	= molecular weight of nitrogen (lb/lb-mole)
100	= conversion factor

[1] The remainder of the gas stream after subtracting carbon dioxide and oxygen is assumed to be nitrogen.

Molecular Weight of Wet Gas Stream

$$M_s = \left(M_d \times \left(1 - \frac{B_{ws}}{100}\right)\right) + \left(18 \times \frac{B_{ws}}{100}\right)$$

$$M_s = \left(30.31 \times \left(1 - \frac{31.8}{100}\right)\right) + \left(18 \times \frac{31.8}{100}\right)$$

$$M_s = 26.39\, lbs / lb - mole$$

where:

M_s	= molecular weight of the wet gas stream (lb/lb-mole)
M_d	= molecular weight of the dry gas stream (lb/lb-mole)
B_{wo}	= moisture content of the gas stream (%)
18	= molecular weight of water (lb/lb-mole)
100	= conversion factor

Velocity of Gas Stream

$$V_s = 85.49(C_p)\left(\sqrt{\overline{\Delta P}}\right)\sqrt{\frac{(T_s + 460)}{(M_s)\left(P_b + \frac{P_s}{13.6}\right)}}$$

$$V_s = 85.49(0.84)(0.628)\sqrt{\frac{(286 + 460)}{(26.39)\left(23.60 + \frac{-0.4}{13.6}\right)}}$$

$$V_s = 49.4\, ft / \sec$$

where:

V_s	= average velocity of the gas stream (ft/sec)
C_p	= pitot tube coefficient (dimensionless)
$\sqrt{\Delta P}$	= average square root of velocity pressures (in. $H_2O)^{1/2}$
T_s	= average stack temperature (^oF)
M_s	= molecular weight of the wet gas stream (lb/lb-mole)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure of gas stream (in. H_2O)
85.49	= pitot tube constant (ft/sec)([(lb/lb-mole)(in. Hg)]/[(^oR)(in. H_2O)]) $^{1/2}$
460	= conversion (^oF to ^oR)
13.6	= conversion factor (in. H_2O/in. Hg)

Volumetric Flow of Gas Stream - Actual Conditions

$$Q_a = 60(V_s)(A_s)$$

$$Q_a = 60(49.4)(85.90)$$

$$Q_a = 254{,}752\ acfm$$

where:

Q_a	= volumetric flow rate of the gas stream at actual conditions (acfm)
V_s	= average velocity of the gas stream (ft/sec)
A_s	= area of duct or stack (ft^2)
60	= conversion factor (sec/min)

Volumetric Flow of Gas Stream - Standard Conditions

$$Q_{std} = \frac{17.64(Q_a)\left(P_b + \frac{P_s}{13.6}\right)}{(T_s + 460)}$$

$$Q_{std} = \frac{17.64(254{,}752)\left(23.60 + \frac{-0.4}{13.6}\right)}{(286 + 460)}$$

$$Q_{std} = 141{,}955\ scfm$$

where:

Q_{std}	= volumetric flow rate of the gas stream at standard conditions (scfm)
Q_a	= volumetric flow rate of the gas stream at actual conditions (acfm)
T_s	= average stack temperature (^oF)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure of gas stream (in. H_2O)
13.6	= conversion factor (in. H_2O/in. Hg)
17.64	= ratio of standard temperature over standard pressure (^oR/in. Hg)
460	= conversion (^oF to ^oR)

Volumetric Flow of Gas Stream - Standard Conditions - Dry Basis

$$Q_{dstd} = Q_{std}\left(1 - \frac{B_{ws}}{100}\right)$$

$$Q_{dstd} = 141{,}955\left(1 - \frac{31.8}{100}\right)$$

$$Q_{dstd} = 96{,}829\, dscfm$$

where:

Q_{dstd}	= volumetric flow rate of the gas stream at standard conditions, on a dry basis (dscfm)
Qstd	= volumetric flow rate of the gas stream at standard conditions (scfm)
B_{wo}	= moisture content of the gas stream (%)
100	= conversion factor

Area of Nozzle

$$A_n = \pi \times \left(\frac{d_n}{2 \times 12}\right)^2$$

$$A_n = \pi \times \left(\frac{0.308}{2 \times 12}\right)^2$$

$$A_n = 0.000517\, ft^2$$

where:

A_n	= area of nozzle (ft^2)
d_n	= diameter of nozzle (in)
12	= conversion factor (in/ft)
2	= conversion factor (diameter to radius)

Percent Isokinetic

$$I = \frac{0.0945(T_s + 460)(V_{m(std)})}{\left(P_b + \frac{P_s}{13.6}\right)(v_s)(A_n)(\Theta)\left(1 - \frac{B_{ws}}{100}\right)}$$

$$I = \frac{0.0945(286 + 460)(33.75)}{\left(23.60 + \frac{-0.4}{13.6}\right)(49.4)(0.000517)(60)\left(1 - \frac{31.8}{100}\right)}$$

$$I = 96.5\%$$

where:

I	= percent isokinetic (%)
T_s	= average stack temperature (^oF)
$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure of gas stream (in. H_2O)
V_s	= average velocity of the gas stream (ft/sec)
A_n	= cross sectional area of nozzle (ft^2)
Θ	= sample time (min)
B_{ws}	= moisture content of the gas stream (%)
0.0945	= conversion (^oF to ^oR)
13.6	= conversion factor (in. H_2O/in. Hg)
100	= conversion factor

Total Inorganic Particulate Catch

$$M_n = m_f + (m_{wf} - W_w) + (m_{wbi} - W_w)$$

$$M_n = 0.0002 + (0.0046 - 0.0007) + (0.0137 - 0.0035)$$

$$M_n = 0.0143g$$

where:

M_n	= total mass catch (g)
m_f	= mass on filter (g)
m_{wf}	= mass in front half DI H_2O in wash (g)
W_w	= mass in DI H_2O blank, corrected to volume (g)
m_{wbi}	= mass in back half inorganic fraction (g)

Total Inorganic Particulate Concentration, grains/dscf

$$C = \frac{(M_n)(15.43)}{V_{m,std}}$$

$$C = \frac{(0.0143)(15.43)}{33.75}$$

$$C = 0.00655 grains / dscf$$

where:

C	= particulate concentration (grains/dscf)
M_n	= total inorganic particulate catch (g)
$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
15.43	= conversion factor (grains/g)

Total Inorganic Particulate Emission Rate

$$E_{lb/hr} = \frac{(M_n)(Q_{dstd})(60)}{(V_{m,std})(453.6)}$$

$$E_{lb/hr} = \frac{(0.0143)(96{,}829)(60)}{(33.75)(453.6)}$$

$$E_{lb/hr} = 5.43 lb / hr$$

where:

$E_{lb/hr}$	= particulate emission rate (lb/hr)
M_n	= total particulate catch (g)
$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
Q_{dstd}	= volumetric flow rate of the gas stream at standard conditions, on a dry basis (dscfm)
60	= conversion factor (min/hr)
453.6	= conversion factor (g/lb)

Nitrogen Oxides Concentration, Corrected for Analyzer Drift[2]

$$C_d = \left(C - \left(\frac{c_{0i} + c_{0f}}{2}\right)\right)\left(\frac{c_a}{\left(\frac{c_{si} + c_{sf}}{2}\right) - \left(\frac{c_{0i} + c_{0f}}{2}\right)}\right)$$

$$C_d = \left(15.3 - \left(\frac{1.4 + -0.7}{2}\right)\right)\left(\frac{50.03}{\left(\frac{50.1 + 49.8}{2}\right) - \left(\frac{1.4 + -0.7}{2}\right)}\right)$$

$$C_d = 15.1\, ppmdv$$

where:

C_d	= nitrogen oxides concentration, corrected for analyzer drift (ppmdv)
C	= nitrogen oxides concentration (ppmdv)
C_{0i}	= initial zero calibration value (ppm)
C_{0f}	= final zero calibration value (ppm)
C_{si}	= initial span calibration value (ppm)
C_{sf}	= final span calibration value (ppm)
C_a	= actual span gas value (ppm)

Nitrogen Oxides Emission Rate (lb/hr)[3]

$$E_{NOx} = \frac{(C_d)(MW)(Q_{dstd})(60)}{385.3 \times 10^6}$$

$$E_{NOx} = \frac{(15.1)(46.01)(100{,}813)(60)}{385.3 \times 10^6}$$

$$E_{NOx} = 10.9\, lb/hr$$

where:

E_{NOx}	= nitrogen oxides emission rate (lb/hr)
C_d	= nitrogen oxides concentration (ppmdv)
MW	= molecular weight of nitrogen oxides (lb/lb-mole)
60	= conversion factor (min/hr)
385.3	= volume occupied by one pound of gas at standard conditions (dscf/lb-mole)
10^6	= conversion factor (fraction to ppm)

[2] Calculations for carbon monoxide and THCs are performed in the same manner.

[3] Calculations for carbon monoxide and methane are performed in the same manner using the appropriate molecular weight.

Total Hydrocarbon Emission Rate (lb/hr, as propane)

$$E_{THC} = \frac{(C_c)(MW)(Q_{std})(60)}{385.3 \times 10^6}$$

$$E_{THC} = \frac{(40.3)(44.10)(149{,}332)(60)}{385.3 \times 10^6}$$

$$E_{THC} = 41.4\, lb/hr$$

where:

E_{THC}	= THC emission rate (lb/hr, as propane)
C_c	= THC concentration (ppmwv, as propane)
MW	= molecular weight of propane (lb/lb-mole)
Q_{std}	= volumetric flow rate of the gas stream at standard conditions (scfm)
60	= conversion factor (min/hr)
385.3	= volume occupied by one pound of gas at standard conditions (dscf/lb-mole)
10^6	= conversion factor (fraction to ppm)

Total Non-Methane Hydrocarbon Emission Rate (lb/hr, as propane)

$$E_{TNMHC} = E_{THC} - E_M$$

$$E_{TNMHC} = 41.4 - 24.9$$

$$E_{TNMHC} = 16.5\, lb/hr$$

where:

E_{TNMHC}	= total non-methane hydrocarbon emission rate (lb/hr, as propane)
E_{THC}	= total hydrocarbon emission rate (lb/hr, as propane)
E_M	= methane emission rate (lb/hr)

Parameters

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Parameters	Run 1	Run 2	Run 3
Date	3/1/01	3/1/01	3/1/01
Start Time	11:37	13:10	14:32
Stop Time	12:17	13:50	15:12
Area of Sample Location, A_s (ft^2)	85.90	85.90	85.90
Velocity Pressure, $\Delta P^{1/2}$ avg (in. $H_2O^{1/2}$)	0.668	0.667	0.641
Barometric Pressure, P_b (Inches Hg)	23.60	23.60	23.60
Static Pressure, P_s (Inches H_2O)	-0.4	-0.4	-0.5
Pitot Coefficient, C_p	0.84	0.84	0.84
Sample Location Temperature, T_s (°F)	303	302	299
Volume Metered, V_m (ft^3)	31.99	32.77	32.94
Meter Temperature, T_m (°F)	53.0	62.1	63.6
Average Sample Pressure, ΔH_{avg} (in. H_2O)	2.00	2.00	2.00
Gas Meter Correction Factor, Y_d	1.0226	1.0226	1.0226
Carbon Dioxide (% dry)	12.5	12.4	12.5
Oxygen (% dry)	10.0	9.9	10.1
Weight of Water Collected, V_{wc} (g)	230.7	256.9	234.1
Silica Gel Net Weight, V_{wsg} (g)	42.3	19.7	41.1
Run Time, θ (minutes)	40	40	40

RESULTS			
Stack Pressure Absolute (inches Hg)	23.57	23.57	23.56
Volume Metered Standard, $V_{m(std)}$ (ft^3)	26.71	26.89	26.95
Volume of Water Vapor, $V_{w(std)}$ (ft^3)	12.9	13.0	13.0
Percent Moisture, B_{ws} (%)	32.5	32.7	32.5
Moisture Saturation Point, B_{wsat} (%)	100	100	100
Dry Molecular Weight, M_d (lbs/lb mole)	30.39	30.38	30.40
Wet Molecular Weight, M_s (lbs/lb mole)	26.36	26.34	26.37
Gas Velocity, V_s (ft/sec)	53.2	53.0	50.8
Average Flowrate, Q_a (acfm)	274,126	273,398	261,999
Standard Flowrate, Q_{std} (scfm)	149,332	149,212	143,511
Dry Standard Flowrate, Q_{dstd} (dscfm)	100,813	100,514	96,910
Nitrogen Oxides Concentration (ppmdv)	15.1	18.3	17.1
Nitrogen Oxides Emission (lb/hr)	10.9	13.2	11.8
Carbon Monoxide Concenntration (ppmdv)	375	326	467
Carbon Monoxide Emission (lb/hr)	165	143	197
Total Hydrocarbons Concentration (ppmwv)	40.3	34.9	51.6
Total Hydrocarbons Emission (lb/hr)	41.4	35.7	50.8
Methane Concentration (ppmdv)	98.8	91.8	116.5
Methane Emission (lb/hr)	24.9	23.0	28.2
TNMHC Emission (lb/hr)	16.5	12.7	22.6

NITROGEN OXIDES

Analyzer Values	Actual	Initial	Bias	Run 1	Run 2	Run 3
Date		3/1/01	3/1/01	3/1/01	3/1/01	3/1/01
Start Time		6:35	6:53	11:38	13:08	14:26
Stop Time		6:51	7:09	12:38	14:08	15:26
Concentration, C (ppm)				15.3	17.9	17.1
Zero Cal Gas, C_0 (ppm)	0.0	0.4	1.4	-0.7	-0.6	0.5
Low Cal Gas (ppm)	50.03	51.2	50.1	49.8	50.7	49.7
High Cal Gas (ppm)	92.3	93.0				
Span Value (ppm)	100.0					
Bias/Drift Check Gas, C_s (ppm)	50.03					
RESULTS						
Zero Error (%)	2 % of Span	0.4				
Low Error (%)		1.2				
High Error (%)		0.7				
Zero Bias (%)	5 % of Span		1.0	-1.1	-1.0	0.1
Upscale Bias (%)			-1.0	-1.4	-0.5	-1.5
Zero Drift (%)	3 % of Span			-2.1	0.1	1.1
Upscale Drift (%)				-0.4	0.9	-1.0
Concentration Corrected for Drift, C_d (ppm)				**15.1**	**18.3**	**17.1**

CARBON MONOXIDE

Analyzer Values	Actual	Initial	Bias	Run 1	Run 2	Run 3
Date		3/1/01	3/1/01	3/1/01	3/1/01	3/1/01
Start Time		6:35	6:53	11:38	13:08	14:26
Stop Time		6:51	7:09	12:38	14:08	15:26
Concentration, C (ppm)				366.4	331.3	466.8
Zero Cal Gas, C_0 (ppm)	0.0	-3.3	-3.3	-3.3	-3.3	-3.3
Low Cal Gas (ppm)	590.0	573.3	559.2	598.8	604.9	576.8
High Cal Gas (ppm)	1320.0	1329.5				
Span Value (ppm)	2000.0					
Bias/Drift Check Gas, C_s (ppm)	590.0					
	573.3					

RESULTS						
Zero Error (%)	2 % of Span	-0.2				
Low Error (%)		-0.8				
High Error (%)		0.5				
Zero Bias (%)	5 % of Span		0.0	0.0	0.0	0.0
Upscale Bias (%)			-0.7	1.3	1.6	0.2
Zero Drift (%)	3 % of Span			0.0	0.0	0.0
Upscale Drift (%)				2.0	0.3	-1.4
Concentration Corrected for Drift, C_d (ppm)				**374.6**	**326.3**	**466.8**

TOTAL HYDROCARBONS, THC

Analyzer Values	Actual	Initial	Bias	Run 1	Run 2	Run 3
Date		3/1/01	3/1/01	3/1/01	3/1/01	3/1/01
Start Time		6:35	6:53	11:38	13:08	14:26
Stop Time		6:51	7:09	12:38	14:08	15:26
Concentration, C (ppm)				41.1	35.9	50.3
Zero Cal Gas, C_0 (ppm)	0.0	-1.4	NA	2.2	1.7	5.7
Low Cal Gas (ppm)	300.29	298.4	NA	308.7	279.7	270.5
Mid Cal Gas (ppm)	494.41	494.9				
High Cal Gas (ppm)	845.82	849.3				
Span Value (ppm)	1000.0					
Bias/Drift Check Gas, C_s (ppm)	300.29					

RESULTS						
Zero Error (%)	5 % of Actual	-0.1				
Low Error (%)		-0.6				
Mid Error (%)		0.1				
High Error (%)		0.4				
Zero Drift (%)	3 % of Span			0.4	0.0	0.4
Upscale Drift (%)				1.0	-2.9	-0.9
Concentration Corrected for Drift, C_d (ppm)				**40.3**	**34.9**	**51.6**

Sample Parameters	Run1	Run2	Run3
Methane			
Peak Area # 1	10,400	8,953	13,341
Peak Area # 2	10,013	8,978	13,279
Average	10,207	8,966	13,310
%RSD	2.68	0.197	0.329
RESULTS			
Methane (ppm)	**98.8**	**91.8**	**116.5**

Methane Matrix Spike (Bag 3/Run 3, 50/50)

Inject 1	25,713
Inject 2	25,512
Average	25,613
% Recovery	126.1

Parameters	Run 1	Run 2	Run 3
Date	3/2/01	3/2/01	3/2/01
Start Time	8:05	10:45	12:44
Stop Time	9:18	11:51	13:50
Area of Sample Location, A_s (ft^2)	85.90	85.90	85.90
Velocity Pressure, $\Delta P^{1/2}$ avg (in. $H_2O^{1/2}$)	0.628	0.673	0.670
Barometric Pressure, P_b (Inches Hg)	23.60	23.60	23.60
Static Pressure, P_s (Inches H_2O)	-0.4	-0.4	-0.4
Pitot Coefficient, C_p	0.84	0.84	0.84
Sample Location Temperature, T_s (^oF)	286	296	304
Volume Metered, V_m (ft^3)	39.70	44.12	44.39
Meter Temperature, T_m (^oF)	42.9	54.2	64.2
Average Sample Pressure, ΔH_{avg} (in. H_2O)	1.34	1.64	1.61
Gas Meter Correction Factor, Y_d	1.0226	1.0226	1.0226
Carbon Dioxide (% dry)	11.8	12.1	12.2
Oxygen (% dry)	10.7	10.9	10.8
Weight of Water Collected, V_{wc} (g)	295.3	345.0	338.9
Silica Gel Net Weight, V_{wsg} (g)	38.7	25.0	29.7
Area of Nozzle, A_n (ft^2)	0.000517	0.000517	0.000517
Run Time, θ (minutes)	60	60	60

RESULTS			
Stack Pressure Absolute (inches Hg)	23.57	23.57	23.57
Volume Metered Standard, $V_{m(std)}$ (ft^3)	33.75	36.71	36.23
Volume of Water Vapor, $V_{w(std)}$ (ft^3)	15.7	17.4	17.4
Percent Moisture, B_{ws} (%)	31.8	32.2	32.4
Dry Molecular Weight, M_d (lbs/lb mole)	30.31	30.38	30.38
Wet Molecular Weight, M_s (lbs/lb mole)	26.39	26.39	26.37
Gas Velocity, V_s (ft/sec)	49.4	53.3	53.3
Average Flowrate, Q_a (acfm)	254,752	274,596	274,933
Standard Flowrate, Q_{std} (scfm)	141,955	151,006	149,576
Dry Standard Flowrate, Q_{dstd} (dscfm)	96,829	102,406	101,128
Isokinetics (%)	96.5	99.3	99.2

Field Data Printouts

SOLVAY2016_6_002568

Project Number	1457A
Client	Solvay
Plant	Green River
Location	CA-4
Date	3/1/01
Meter ID	M1
Y_d	1.0226
Pitot C_p	0.84

Duct Dimensions (in)	125.5
P_b (Inches Hg)	23.60
P_s (Inches H_2O)	-0.4
Start Time	11:37
Stop Time	12:17

Weight of Water Collected, V_{wc} (g)	230.7
Silica Gel Net Weight, V_{wsg} (g)	42.3

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.6	22.6	10.0
Trial 2	12.4	22.4	10.0
Trial 3	12.4	22.4	10.0
Average	12.5	NA	10.0

Run 1 EPA M 1-4

Traverse Point	Min/Pt 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 522.56	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)
1-1	5	0.51	2.00	526.60	305	48	48	0.714	56.9	3.407
1-2	10	0.47	2.00	530.70	304	49	49	0.686	54.6	3.450
1-3	15	0.40	2.00	534.70	303	53	50	0.632	50.3	3.350
2-1	20	0.47	2.00	538.71	303	55	51	0.686	54.6	3.348
2-2	25	0.43	2.00	542.66	303	57	52	0.656	52.2	3.289
2-3	30	0.37	2.00	546.00	301	58	53	0.608	48.3	2.775
3-1	35	0.46	2.00	550.56	304	58	54	0.678	54.0	3.786
3-2	40	0.46	2.00	554.55	304	58	55	0.678	54.0	3.309
3-3		0.33			303			0.574	45.7	
4-1		0.51			304			0.714	56.9	
4-2		0.51			303			0.714	56.8	
4-3		0.46			302			0.678	53.9	

Totals and Averages

40	2.00	31.99	303	53.0	0.668	53.2	26.71

Project Number	1457A
Client	Solvay
Plant	Green River
Location	CA-4
Date	3/1/01
Meter ID	M1
Y_d	1.0226
Pitot C_p	0.84

Duct Dimensions (in)	125.5
P_b (Inches Hg)	23.60
P_g (Inches H_2O)	-0.4
Start Time	13:10
Stop Time	13:50

Weight of Water Collected, V_{wc} (g)	256.9
Silica Gel Net Weight, V_{wsg} (g)	19.7

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.4	22.4	10.0
Trial 2	12.4	22.2	9.8
Trial 3	12.4	22.4	10.0
Average	12.4	NA	9.9

Run 2 EPA M 1-4

Traverse Point	Min/Pt 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 554.93	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)
4-1	5	0.52	2.00	559.02	301	60	58	0.721	57.3	3.376
4-2	10	0.52	2.00	563.06	300	61	59	0.721	57.3	3.328
4-3	15	0.46	2.00	567.10	300	63	60	0.678	53.9	3.318
3-1	20	0.43	2.00	571.15	301	64	60	0.656	52.1	3.324
3-2	25	0.42	2.00	575.26	302	65	60	0.648	51.6	3.370
3-3	30	0.36	2.00	579.41	303	66	61	0.600	47.8	3.396
2-1	35	0.45	2.00	583.57	303	67	62	0.671	53.4	3.398
2-2	40	0.43	2.00	587.70	303	66	62	0.656	52.2	3.376
2-3		0.41			302			0.640	50.9	
1-1		0.47			303			0.686	54.6	
2-1		0.49			302			0.700	55.7	
2-3		0.39			302			0.624	49.7	

Totals and Averages

40	2.00	32.77	302	62.1	0.667	53.0	26.89

Project Number	1457A
Client	Solvay
Plant	Green River
Location	CA-4
Date	3/1/01
Meter ID	M1
Y_d	1.0226
Pitot C_p	0.84

Duct Dimensions (in)	125.5
P_b (Inches Hg)	23.60
P_s (Inches H_2O)	-0.5
Start Time	14:32
Stop Time	15:12

Weight of Water Collected, V_{wc} (g)	234.1
Silica Gel Net Weight, V_{wsg} (g)	41.1

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.5	22.5	10.0
Trial 2	12.4	22.5	10.1
Trial 3	12.5	22.7	10.2
Average	12.5	NA	10.1

Run 3 EPA M 1-4

Traverse Point	Min/Pt 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 588.05	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)
1-1	5	0.47	2.00	592.15	297	62	60	0.686	54.3	3.371
1-2	10	0.45	2.00	596.23	298	63	61	0.671	53.2	3.348
1-3	15	0.37	2.00	600.30	300	63	61	0.608	48.3	3.340
2-1	20	0.44	2.00	604.39	300	65	61	0.663	52.7	3.350
2-2	25	0.41	2.00	608.49	301	68	63	0.640	50.9	3.342
2-3	30	0.36	2.00	612.68	300	68	63	0.600	47.7	3.416
3-1	35	0.37	2.00	616.84	301	67	63	0.608	48.3	3.394
3-2	40	0.37	2.00	620.99	302	66	63	0.608	48.4	3.389
3-3		0.29			298			0.539	42.7	
4-1		0.50			299			0.707	56.1	
4-2		0.49			295			0.700	55.4	
4-3		0.43			295			0.656	51.9	

Totals and Averages

40	2.00	32.94	299	63.6	0.641	50.8	26.95

Project Number	1457A
Client	Solvay Minerals
Plant	Green River
Location	CA-4
Date	3/2/01
Meter ID	M1
Y_d	1.0226
Pitot C_p	0.84

Nozzle Diameter (in)	0.308
Filter ID	083905
F 1/2 Beaker ID	AW 101
B 1/2 Inorganic Beaker ID	AW 13
B 1/2 Organic Beaker ID	AW 44
Train ID	AE 3
Duct Dimensions (in)	125.5
P_b (Inches Hg)	23.60
P_g (Inches H_2O)	-0.4
Start Time	8:05
Stop Time	9:18

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	733.2	639.9	93.3
Impinger 2	716.3	598.2	118.1
Impinger 3	693.9	610.0	83.9
Impinger 4			
Impinger 5			
Impinger 6			
Add Rinse			
Silica Gel	924.9	886.2	38.7
Weight of Water Collected, V_{wc} (g)			295.3
Silica Gel Net Weight, V_{wsg} (g)			38.7

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	11.8	22.4	10.6
Trial 2	11.8	22.5	10.7
Trial 3	11.7	22.5	10.8
Average	11.8	NA	10.7

Run 1 EPA M 5/202

Traverse Point	Min/Pt 5.0 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 622.24	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5.0	0.43	1.50	625.69	286	40	38	0.656	51.6	2.957	97.2
1-2	10.0	0.41	1.40	629.04	284	42	38	0.640	50.3	2.865	96.3
1-3	15.0	0.37	1.30	632.25	283	43	39	0.608	47.7	2.739	96.9
2-1	20.0	0.44	1.50	635.59	287	43	40	0.663	52.2	2.849	92.7
2-2	25.0	0.39	1.30	638.82	286	43	40	0.624	49.1	2.753	95.1
2-3	30.0	0.33	1.10	641.89	285	45	40	0.574	45.1	2.610	97.9
3-1	35.0	0.39	1.30	645.17	287	45	41	0.624	49.1	2.787	96.3
3-2	40.0	0.39	1.30	648.33	288	46	42	0.624	49.2	2.680	92.7
3-3	45.0	0.36	1.20	651.48	285	47	43	0.600	47.2	2.665	95.7
4-1	50.0	0.36	1.20	654.93	289	48	44	0.600	47.3	2.913	104.9
4-2	55.0	0.47	1.60	658.48	288	47	44	0.686	54.0	3.005	94.6
4-3	60.0	0.41	1.40	661.94	286	47	44	0.640	50.4	2.927	98.6
Totals and Averages											
	60.0		1.34	39.70	286		42.9	0.628	49.4	33.75	96.5

Project Number	1457A
Client	Solvay Minerals
Plant	Green River
Location	CA-4
Date	3/2/01
Meter ID	M1
Y_d	1.0226
Pitot C_p	0.84

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	778.7	631.0	147.7
Impinger 2	763.2	633.2	130.0
Impinger 3	784.8	717.5	67.3
Impinger 4			
Impinger 5			
Impinger 6			
Add Rinse			
Silica Gel	752.7	727.7	25.0
Weight of Water Collected, V_{wc} (g)			345.0
Silica Gel Net Weight, V_{wsg} (g)			25.0

Nozzle Diameter (in)	0.308
Filter ID	083096
F 1/2 Beaker ID	AW 29
B 1/2 Inorganic Beaker ID	AW 42
B 1/2 Organic Beaker ID	AW 9
Train ID	AE 20
Duct Dimensions (in)	125.5
P_b (Inches Hg)	23.60
P_s (Inches H_2O)	-0.4
Start Time	10:45
Stop Time	11:51

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.2	23.2	11.0
Trial 2	12.0	22.8	10.8
Trial 3	12.2	23.0	10.8
Average	12.1	NA	10.9

Run 2 EPA M 5/202

Traverse Point	Min/Pt 5.0 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 663.47	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
4-1	5.0	0.51	1.80	667.28	296	49	46	0.714	56.5	3.214	98.2
4-2	10.0	0.52	1.80	671.06	296	50	47	0.721	57.1	3.182	96.3
4-3	15.0	0.45	1.60	674.70	294	52	48	0.671	53.0	3.054	99.2
3-1	20.0	0.47	1.70	678.43	296	54	50	0.686	54.3	3.118	99.3
3-2	25.0	0.51	1.80	682.21	297	56	50	0.714	56.6	3.154	96.5
3-3	30.0	0.41	1.50	685.77	295	58	52	0.640	50.7	2.957	100.7
2-1	35.0	0.46	1.70	689.44	298	59	54	0.678	53.8	3.041	98.0
2-2	40.0	0.41	1.50	693.02	297	60	54	0.640	50.7	2.962	101.0
2-3	45.0	0.35	1.30	696.39	296	60	55	0.592	46.8	2.784	102.7
1-1	50.0	0.49	1.80	700.22	296	59	55	0.700	55.4	3.171	98.9
1-2	55.0	0.46	1.70	704.02	297	60	56	0.678	53.7	3.140	101.1
1-3	60.0	0.41	1.50	707.59	295	61	56	0.640	50.7	2.945	100.3

Totals and Averages

60.0		1.64	44.12	296	54.2	0.673	53.3	36.71	99.3

Project Number	1457A
Client	Solvay Minerals
Plant	Green River
Location	CA-4
Date	3/2/01
Meter ID	M1
Y_d	1.0226
Pitot C_p	0.84

Nozzle Diameter (in)	0.308
Filter ID	083097
F 1/2 Beaker ID	AW 37
B 1/2 Inorganic Beaker ID	AW 4
B 1/2 Organic Beaker ID	AW 26
Train ID	AE 3
Duct Dimensions (in)	125.5
P_b (Inches Hg)	23.60
P_s (Inches H_2O)	-0.4
Start Time	12:44
Stop Time	13:50

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	776.9	641.1	135.8
Impinger 2	732.4	602.1	130.3
Impinger 3	681.8	609.0	72.8
Impinger 4			0.0
Impinger 5			0.0
Impinger 6			0.0
Silica Gel			0.0
Silica Gel	888.0	858.3	29.7
Weight of Water Collected, V_{wc} (g)			338.9
Silica Gel Net Weight, V_{wsg} (g)			29.7

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.2	23.0	10.8
Trial 2	12.2	23.0	10.8
Trial 3	12.1	23.0	10.9
Average	12.2	NA	10.8

Run 3 EPA M 5/202

Traverse Point	Min/Pt 5.0 Elapsed Time	Velocity Pressure ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume Initial (ft^3) 708.00	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root ΔP	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5.0	0.51	1.80	711.88	303	60	58	0.714	56.8	3.200	98.5
1-2	10.0	0.46	1.70	715.62	302	62	58	0.678	53.9	3.078	99.7
1-3	15.0	0.38	1.40	719.10	301	64	59	0.616	49.0	2.853	101.6
2-1	20.0	0.47	1.70	722.82	304	63	60	0.686	54.6	3.053	98.0
2-2	25.0	0.41	1.50	726.43	305	65	60	0.640	51.0	2.955	101.6
2-3	30.0	0.37	1.30	729.87	303	66	61	0.608	48.4	2.809	101.5
3-1	35.0	0.50	1.80	733.72	305	67	62	0.707	56.3	3.142	97.8
3-2	40.0	0.43	1.50	737.33	306	67	63	0.656	52.3	2.941	98.8
3-3	45.0	0.42	1.50	740.96	304	69	64	0.648	51.6	2.949	100.1
4-1	50.0	0.51	1.80	744.86	307	71	66	0.714	57.0	3.159	97.5
4-2	55.0	0.51	1.80	748.74	306	71	66	0.714	56.9	3.143	97.0
4-3	60.0	0.43	1.50	752.39	305	71	67	0.656	52.2	2.951	99.1

Totals and Averages

60.0	1.61	44.39	304	64.2	0.670	53.3	23.57	99.2

Field Data

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Data Sheet

TESTING TYPE: [illegible]

RUN NO. 1

METHOD NO. 1-4

Page	1	of	1

Client	SOLVAY				
Plant	WESTVACO [illegible]				
Location	CA [illegible] 3-1-01				
Date	[illegible]/01	Project No.	1457		
Meter Operator	[illegible]				
Probe Operator	[illegible]				
Meter ID	M1	Yd	1.0[illegible]	Pitot Cp	.84
ΔH@	1.9[illegible]	Kf	N/A	Leak check	[illegible]
Pre Leak Check	.001	[cfm] [lpm] @	15	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	21	(inHg)	

[N] [Up]

First point all the way [in] [out]

Gas flow [in] [out] of page

Cross Section of Duct

Barometric (inHg)	23.60	Water [ml] (g)	230.7
Ambient Temp (°F)	30	Silica gel (g)	42.3
Static (inH$_2$O)	-.4	Total Vlc	273.0
Probe ID	6'S	Liner Type	S.S.
Nozzle ID	N/A	Nozzle Dia (in)	N/A
Filter ID	N/A		
Train ID	[illegible]	Train Type	[illegible]
Duct Dim. (in)	[illegible]	Port Lngth (in)	[illegible]
Start Time	11:27	Stop Time	12:17

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (inH$_2$O)	Orifice Setting ΔH (inH$_2$O)	Gas Sample Volume Initial [f^3] [l] 522.56	Stack Temp (°F)	Probe Temp (°F) N/A	Filter Temp (°F) N/A	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (inHg)	Auxiliary Temp (°F)		Notes	ΔP	°F
SINGLE	5	SEE	2.0	526.60	SEE			40	48	48	13	N/A		1-1	.51	305
[illegible]	10	NOTES		530.70	NOTES			41	49	49	14			2	.47	304
	15			534.70				43	53	50	15			3	.40	303
	20			538.71				44	55	51	15			2-1	.47	303
	25			542.66				46	57	52	15			2	.43	303
	30			546.60				47	58	53	15			3	.37	301
	35			550.56				49	58	54	15			3-1	.46	304
	40			554.55				50	58	55	15			2	.46	304
														3	.33	303
														4-1	.51	304
														2	.51	303
														3	.46	302
Total	40			31.99												
Average			2.0						53						.6683	303

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

SOLVAY2016_6_002576

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Data Sheet

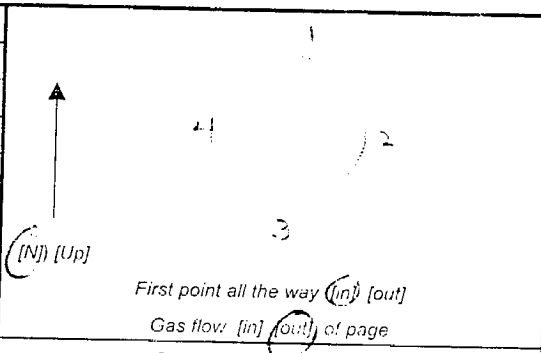
TESTING TYPE: MOISTURE

RUN NO. 2

METHOD NO. 1-4

Page	1	of	1

Client	SOLVAY				
Plant	WESTVACO RD., WY.				
Location	CA4				
Date	3/1/01	Project No.	14157		
Meter Operator	KONM. LUKAART				
Probe Operator	TW				
Meter ID	M1	Yd	1.0226	Pitot Cp	.84
ΔH@	1.9285	Kf	N/A	Leak check	✓
Pre Leak Check	.001 [cfm] [lpm] @	16	(inHg)		
Post Leak Check	.001 [cfm] [lpm] @	15	(inHg)		



Cross Section of Duct

Barometric (inHg)	23.60	Water [ml] [g]	256.9
Ambient Temp (°F)	30	Silica gel (g)	19.7
Static (inH$_2$O)	-.4	Total Vlc	276.6
Probe ID	6'S	Liner Type	S.S.
Nozzle ID	N/A	Nozzle Dia (in)	N/A
Filter ID	N/A		
Train ID	K.O.	Train Type	K.O.
Duct Dim. (in)	12 5 5	Port Lngth (in)	3.5
Start Time	13:10	Stop Time	12:50

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (inH$_2$O)	Orifice Setting ΔH (inH$_2$O)	Gas Sample Volume Initial [f^3] [l] 554.93	Stack Temp (°F)	Probe Temp (°F) N/A	Filter Temp (°F) N/A	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (inHg)	Auxiliary Temp (°F) N/A		Notes ΔP	°F
SINGLE PT.	5	SEE	2.0	559.02	SEE			40	60	58	10			4-1 .52	301
	10	NOTES		563.06	NOTES			41	61	59	11			2 .52	300
	15			567.10				43	63	60	11			3 .46	300
	20			571.15				45	64	60	11			3-1 .43	301
	25			575.26				47	65	60	13			2 .42	302
	30			579.41				49	66	61	13			3 .36	303
	35			583.57				51	67	62	13			2-1 .45	303
	40			587.70				52	66	62	14			2 .43	303
														3 .41	302
														1-1 .47	303
														2 .49	302
														3 .39	302
Total	40			32.77											
Average			2.0						62					.6668	302

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

SOLVAY2016_6_00257

AIRTECH ENVIRONMENTAL SERVICES INC.

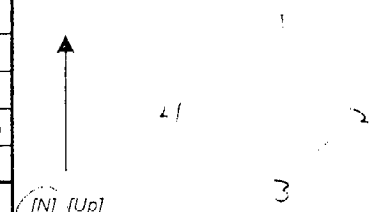
General Testing Data Sheet

TESTING TYPE: MOISTURE

RUN NO. 3 METHOD NO. 1-4

Page 1 of 1

Client	SOLVAY				
Plant	WESTVACO RD WV				
Location	CA4				
Date	3/1/01	Project No.	1457		
Meter Operator	RON M. LUIKAART				
Probe Operator	TW				
Meter ID	M1	Yd	1.0226	Pitot Cp	.84
ΔH@	1.9285	Kf	N/A	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @	16	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	18	(inHg)	



First point all the way [in], [out]

Gas flow [in] [out] of page

Cross Section of Duct

Barometric (inHg)	23.60	Water [ml] [g]	234.1
Ambient Temp (°F)	30	Silica gel (g)	41.1
Static (inH₂O)	RML-.5-.5	Total Vlc	275.2
Probe ID	6'S	Liner Type	S.S.
Nozzle ID	N/A	Nozzle Dia (in)	N/A.
Filter ID	N/A		
Train ID	K.O.	Train Type	K.O.
Duct Dim. (in)	125.5	Port Lngth (in)	3.5
Start Time	14:32	Stop Time	15:12

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (inH₂O)	Orifice Setting ΔH (inH₂O)	Gas Sample Volume Initial [f] [l] 588.05	Stack Temp (°F)	Probe Temp (°F) N/A	Filter Temp (°F) N/A	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (inHg)	Auxiliary Temp (°F)		Notes ΔP	°F
SINGLE	5	SEE	2.0	592.15	SEE			41	62	60	10	N/A		1-1 .47	297
PT.	10	NOTES		596.23	NOTES			43	63	61	10			2 .45	298
	15			600.20				44	63	61	11			3 .37	300
	20			604.39				46	65	61	13			2-1 .44	300
	25			608.49				47	68	63	13			2 .41	301
	30			612.68				49	68	63	14			3 .36	300
	35			616.84				50	67	63	13			3-1 .37	301
	40			620.99				50	66	63	13			2 .37	302
														3 .29	298
														4-1 .50	299
														2 .49	295
														3 .43	295
Total	40			32.94										.6405	299
Average			2.0						64						

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

SOLVAY2016_6_002578

AIRTECH ENVIRONMENTAL SERVICES INC.

Oxygen and Carbon Dioxide Data Sheet

PROJECT NO. 1457

Page	1	of	1

Client	Solvay Minerals		
Plant	Green River		
Location	Stack		
Date	3-1-01	Unit	CA-4
Analyzer Type	Orsat		

Run No.	Trial No.	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$	F_O	Analyst	Date	Time
1	1	12.6	22.6	10.0		[illegible]	3-1-01	1325
1-4	2	12.4	22.4	10.0				
Gases	3	12.4	22.4	10.0				
	Average	12.5		10.0				
2	1	12.4	22.4	10.0		[illegible]	3-1-01	1450
	2	12.4	22.2	9.8				
Gases	3	12.4	22.4	10.0				
	Average	12.4		9.9				
3	1	12.5	22.5	10.0		[illegible]	3-1-01	1730
	2	12.4	22.5	10.1				
Gases	3	12.5	22.7	10.2				
	Average	12.5		10.1				
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
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	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							

AIRTECH ENVIRONMENTAL SERVICES INC.

Impinger Weights Data Sheet

PROJECT NO. 1457A

Page	1	of	1

Client	Solvay Minerals		
Plant	Green River, WY		
Location	CA-4		
Date	3-1-01	Unit	CA4
Operator	RMC		

Run No.	1					
Method No.	4	Train ID	AE-3			
	Contents	Final (g)	Tare with Contents (g)	Tare without Contents (g)	Total (g)	Notes
Impinger No. 1	DI N_2O	706.4	646.0		60.4	
Impinger No. 2	DI N_2O	684.9	619.0		65.9	
Impinger No. 3	DI N_2O	706.2	601.8		104.4	230.7
Impinger No. 4	Si GEL	947.0	904.7		42.3	
Impinger No. 5						
Impinger No. 6						
Impinger No. 7						
Additional Rinse						
				Net Weight (g)	273.0	

Run No.	2					
Method No.	4	Bucket No.	AE 20			
	Contents	Final (g)	Tare with Contents (g)	Tare without Contents (g)	Total (g)	Notes
Impinger No. 1	DI N_2O	729.2	656.6		72.6	
Impinger No. 2	DI N_2O	699.4	620.1		79.3	
Impinger No. 3	DI N_2O	720.8	615.8		105.0	256.9
Impinger No. 4	Si GEL	951.7	932.0		19.7	?
Impinger No. 5						
Impinger No. 6						
Impinger No. 7						
Additional Rinse						
				Net Weight (g)	276.6	

Run No.	3					
Method No.	4	Bucket No.	AE-3			
	Contents	Final (g)	Tare with Contents (g)	Tare without Contents (g)	Total (g)	Notes
Impinger No. 1	DI N_2O	662.8	589.9		72.9	
Impinger No. 2	DI N_2O	697.9	618.8		79.1	
Impinger No. 3	DI N_2O	704.0	626.9		77.1	234.1
Impinger No. 4	Si GEL	923.8	882.7		41.1	
Impinger No. 5						
Impinger No. 6						
Impinger No. 7						
Additional Rinse						
				Net Weight (g)	275.2	

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Data Sheet

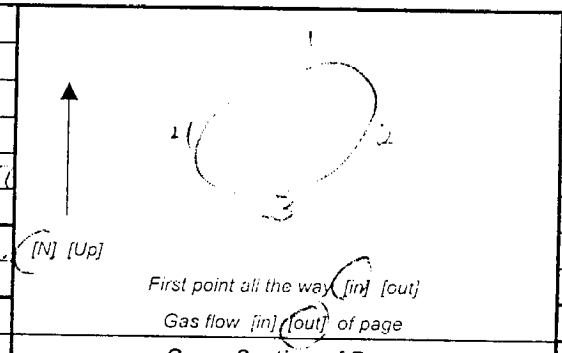
TESTING TYPE: [illegible]

RUN NO. 5

METHOD NO. [illegible]

Page	1	of	1

Client	SOLVAY				
Plant	WESTVACO RD, WY.				
Location	CA4				
Date	2/2/01	Project No.	1457		
Meter Operator	RON M. LUKAART				
Probe Operator	MJP				
Meter ID	M1	Yd	1.0006	Pitot Cp	.84
ΔH@	1.9281	Kf	3.4	Leak check	✓
Pre Leak Check	.0030	[cfm] [lpm] @	15	(inHg)	
Post Leak Check	.0030	[cfm] [lpm] @	17	(inHg)	



Cross Section of Duct

Barometric (inHg)	23.60	Water [ml] [g]	295.3
Ambient Temp (°F)	30	Silica gel (g)	38.7
Static (inH$_2$O)	-.4	Total Vlc	334.00
Probe ID	IP1	Liner Type	GLASS
Nozzle ID	.308	Nozzle Dia (in)	.308
Filter ID	083075		
Train ID	AE3	Train Type	IMP.
Duct Dim. (in)	[illegible]	Port Lngth (in)	3.5
Start Time	[illegible]	Stop Time	9:18

Traverse Point	Min/Point 1 Elapsed Time	Velocity Pressure ΔP (inH$_2$O)	Orifice Setting ΔH (inH$_2$O)	Gas Sample Volume Initial [f^3] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (inHg)	Auxiliary Temp (°F)		Notes
				622.24		250	250							
1-1	5	.42	1.5	625.69	286	[illegible]	260	36	40	38	11	N/A		
2	10	.41	1.4	629.04	284	258	260	35	42	38	11			
3	15	.37	1.3	632.[illegible]	283	[illegible]	[illegible]	35	43	39	11			
4	20	.44	1.5	635.59	284	261	261	38	43	40	14			
5	25	.39	1.3	638.82	286	257	257	40	43	40	14			
6	30	.33	1.1	641.89	285	257	254	42	45	40	13			
1-1	35	.39	1.3	645.17	287	254	260	45	45	41	14			
2	40	.39	1.3	648.33	288	254	253	46	46	42	14			
3	45	.36	1.2	651.48	285	256	256	48	47	43	13			
4-1	50	.36	1.2	654.93	289	253	260	49	48	44	13			
2	55	.47	1.6	658.48	288	254	259	51	47	44	7			
3	60	.41	1.4	661.94	286	255	258	52	47	44	10			
Total				39.70										
Average		.6285	1.342		286.2				42.9					

Circle correct bracketed [ ] units

Train Type: [illegible]tes impingers, knockouts, etc.

SOLVAY2016_6_002581

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Data Sheet

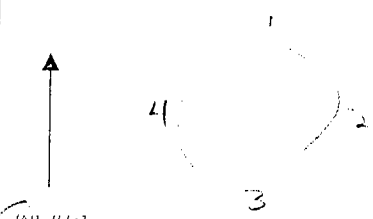
TESTING TYPE: PARTICULATE

RUN NO. 6

METHOD NO. M5202

Page 1 of 1

Client	SOLVAY				
Plant	WESTVACO RD, WV				
Location	CA4				
Date	3/2/01	Project No.	1457		
Meter Operator	RONM. LUKAART				
Probe Operator	MJP				
Meter ID	M1	Yd	1.0226	Pitot Cp	.84
ΔH@	1.9285	Kf	3.6	Leak check	✓
Pre Leak Check	.002 [cfm] [lpm] @	16	(inHg)		
Post Leak Check	.002 [cfm] [lpm] @	15	(inHg)		



First point all the way [in] [out]

Gas flow [in] [out] of page

Cross Section of Duct

Barometric (inHg)	~~26.20~~ 23.60 MJP	Water [ml] [g]	345.0
Ambient Temp (°F)	30	Silica gel (g)	25.0
Static (inH$_2$O)	-.4	Total Vlc	370.0
Probe ID	1P1	Liner Type	GLASS
Nozzle ID	.308	Nozzle Dia (in)	.308
Filter ID	083096		
Train ID	AE20	Train Type	IMP.
Duct Dim. (in)	125.5	Port Lngth (in)	3.5
Start Time	10:45	Stop Time	11:51

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (inH$_2$O)	Orifice Setting ΔH (inH$_2$O)	Gas Sample Volume Initial [f^3] [l] 663.47	Stack Temp (°F)	Probe Temp (°F) 250	Filter Temp (°F) 250	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (inHg)	Auxiliary Temp (°F)		Notes
4-1	5	.51	1.8	667.28	296	256	258	34	49	46	9	N/A		
2	10	.52	1.8	671.06	296	255	256	33	50	47	9			671.06
3	15	.45	1.6	674.70	294	256	253	34	52	48	9			
1	20	.47	1.7	678.43	296	257	255	35	54	50	9			
2	25	.51	1.8	682.21	297	258	256	37	56	50	10			
3	30	.41	1.5	685.77	295	257	256	39	58	52	9			
1	35	.46	1.7	689.44	298	255	257	41	59	54	9			
2	40	.41	1.5	693.02	297	256	259	43	60	54	9			
3	45	.35	1.3	696.39	296	255	258	44	60	55	8			
1	50	.49	1.8	700.22	296	254	257	47	59	55	9			
2	55	.46	1.7	704.02	297	253	259	50	60	56	10			
3	60	.41	1.5	707.57	295	256	258	51	61	56	9			
Total														
Average		.6729	1.642	44.12	296.1				54.2					

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

SOLVAY2016_6_002582

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Data Sheet

TESTING TYPE: PARTICULATE

RUN NO. 7

METHOD NO. M5 JC 2

Page 1 of 1

Client	SOLVAY				
Plant	WESTVACC RD, W.V.				
Location	CA4				
Date	3/2/01	Project No.	1457		
Meter Operator	RON M. LUIKAART				
Probe Operator	MJP				
Meter ID	M1	Yd	1.0226	Pitot Cp	.84
ΔH@	1.9285	Kf	3.6	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @	14	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	16	(inHg)	

[N] [Up]

First point all the way [in] [out]

Gas flow [in] [out] of page

Cross Section of Duct

Barometric (inHg)	23.60	Water [ml] [g]	338.9
Ambient Temp (°F)	30	Silica gel (g)	29.7
Static (inH$_2$O)	-.4	Total Vlc	368.6
Probe ID	1P1	Liner Type	GLASS
Nozzle ID	.308	Nozzle Dia (in)	.308
Filter ID	083097		
Train ID	AE3	Train Type	IMP.
Duct Dim. (in)	125.5	Port Lngth (in)	3.5
Start Time	12:44	Stop Time	13:50

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (inH$_2$O)	Orifice Setting ΔH (inH$_2$O)	Gas Sample Volume Initial [f] [l] 708.00	Stack Temp (°F)	Probe Temp (°F) 250	Filter Temp (°F) 250	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (inHg)	Auxiliary Temp (°F)		Notes
1-1	5	.51	1.8	711.68	303	253	257	36	60	58	7	N/A		
2	10	.46	1.7	715.62	302	256	259	37	62	58	7			
3	15	.38	1.4	719.10	301	254	257	39	64	59	7			
2	20	.47	1.7	722.82	304	257	256	43	63	60	8			
	25	.41	1.5	726.43	305	252	257	45	65	60	9			
	30	.37	1.3	729.87	303	251	255	45	66	61	8			
3	35	.50	1.8	733.72	305	253	256	46	67	62	9			
	40	.43	1.5	737.33	306	255	254	47	67	63	8			
	45	.42	1.5	740.96	304	253	257	48	69	64	8			
4	50	.51	1.8	744.86	307	252	257	49	71	66	9			
	55	.51	1.8	748.74	306	251	259	51	71	66	9			
	60	.43	1.5	752.39	305	252	256	53	71	67	8			
Total														
Average		.6698	1.608	44.39	304.3				64.2					

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

SOLVAY2016_6_002583

AIRTECH ENVIRONMENTAL SERVICES INC.
Oxygen and Carbon Dioxide Data Sheet

PROJECT NO. 1457

Page	1	of	1

Client	Solvay Minerals		
Plant	Green River		
Location	Stack		
Date	3-2-01	Unit	CA-4
Analyzer Type	Orsat		

Run No.	Trial No.	%CO_2	%CO_2+%O_2	%O_2	F_o	Analyst	Date	Time
5	1	11.8	22.4	10.6		WJP	3-2-01	1000
5/202	2	11.8	22.5	10.7				
	3	11.7	22.5	10.8				
	Average	11.8		10.7				
6	1	12.2	23.2	11.0		WJP	3-2-01	1430
5/202	2	12.0	22.8	10.8				
	3	12.2	23.0	~~10.8~~ 11.0				
	Average	12.1		10.9				
7	1	12.2	23.0	10.8		WJP	3-2-01	1445
5/202	2	12.2	23.0	10.8				
	3	12.1	23.0	10.9				
	Average	12.2		10.8				
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							

AIRTECH ENVIRONMENTAL SERVICES INC.
Impinger Weights Data Sheet

PROJECT NO. 1457

Page	1	of	1

Client	SOLVAY		
Plant	WESTVACO RD., W.V.		
Location	CA4		
Date	~~3/1/01~~ 3-2-01	Unit	CA4
Operator	RON M. LUIKAART		

Run No.	5	FILTER # 083095				
Method No.	M5 202	Train ID	AE3			
	Contents	Final (g)	Tare with Contents (g)	Tare without Contents (g)	Total (g)	Notes
Impinger No. 1	D.I. H_2O	733.2	639.9		93.3	
Impinger No. 2	"	716.3	598.2		118.1	
Impinger No. 3	"	693.9	610.0		83.9	295.3
Impinger No. 4	SIL. GEL	924.9	886.2		38.7	
Impinger No. 5						
Impinger No. 6						
Impinger No. 7						
Additional Rinse						
				Net Weight (g)	334.00	

Run No.	6	FILTER # 083096				
Method No.	M5 202	Bucket No.	AE20			
	Contents	Final (g)	Tare with Contents (g)	Tare without Contents (g)	Total (g)	Notes
Impinger No. 1	D.I. H_2O	778.7	631.0		147.7	
Impinger No. 2	"	763.2	633.2		130.0	
Impinger No. 3	"	784.8	717.5		67.3	345.0
Impinger No. 4	SIL GEL	752.7	727.7	25.0	~~25.0~~ RML	
Impinger No. 5						
Impinger No. 6						
Impinger No. 7						
Additional Rinse						
				Net Weight (g)	370.0	

Run No.	7	FILTER # 083097				
Method No.	M5202	Bucket No.	AE3			
	Contents	Final (g)	Tare with Contents (g)	Tare without Contents (g)	Total (g)	Notes
Impinger No. 1	D.I. H_2O	776.9	641.1		135.8	
Impinger No. 2	"	732.4	602.1		130.3	
Impinger No. 3	"	681.8	609.0		72.8	338.9
Impinger No. 4	SIL GEL	888.0	858.3		29.7	
Impinger No. 5						
Impinger No. 6						
Impinger No. 7						
Additional Rinse						
				Net Weight (g)	368.6	

Analyzer Data

SOLVAY2016_6_002586

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Calibration Error

Project No. 1457A

Date	3/1/01		
Time	NO_X (ppm)	CO (ppm)	THC (ppm)
Zero	0.4	-3.3	-1.4
Low	51.2	573.3	298.4
Mid	NA	NA	494.9
High	93.0	1329.5	849.3
6:35:48	3.4	-3.4	
6:36:03	3.6	-3.4	
6:36:18	2.9	-3.4	
6:36:33	3.0	-3.4	
6:36:48	3.0	-3.4	
6:37:03	1.3	-3.4	
6:37:18	1.3	-3.4	
6:37:33	0.3	-3.3	
6:37:48	-0.3	-3.4	
6:38:03	0.2	-3.3	
6:38:18	41.1	-3.4	
6:38:33	80.1	-3.3	
6:38:48	87.4	-3.3	
6:39:03	91.2	-3.4	
6:39:18	95.3	-3.2	
6:39:33	92.3	-3.3	
6:39:48	92.9	-3.4	
6:40:03	93.4	-3.4	
6:40:18	93.1	-3.4	
6:40:33	92.7	-3.4	
6:40:48	43.2	35.0	
6:41:03	1.1	402.4	
6:41:18	0.7	1004.0	
6:41:33	0.3	1294.1	
6:41:48	0.0	1376.4	
6:42:03	2.0	1380.7	
6:42:18	3.0	1374.0	
6:42:33	2.3	1354.4	
6:42:48	1.6	1373.4	
6:43:03	0.6	1351.1	
6:43:18	2.2	1377.5	
6:43:33	2.0	1362.6	
6:43:48	2.4	1345.6	
6:44:03	1.8	1360.0	
6:44:18	0.5	1326.7	
6:44:33	0.0	1327.5	
6:44:48	0.4	1327.8	
6:45:03	1.2	1336.1	
6:45:18	20.7	1322.0	
6:45:33	53.7	1011.2	
6:45:48	53.0	389.5	
6:46:03	52.9	77.3	
6:46:18	52.4	4.9	
6:46:33	52.6	-1.3	
6:46:48	50.5	-1.4	
6:47:03	49.6	-1.2	
6:47:18	47.8	-1.3	
6:47:33	50.1	-2.6	
6:47:48	51.8	-3.2	
6:48:03	51.7	-3.4	
6:48:18	8.2	66.6	
6:48:33	1.6	286.0	
6:48:48	0.9	509.0	
6:49:03	1.3	560.6	
6:49:18	1.7	568.2	
6:49:33	1.6	565.3	
6:49:48	0.9	573.4	
6:50:03	1.3	566.9	
6:50:18	1.6	570.8	
6:50:33	1.0	576.9	
6:50:48	0.3	574.2	
6:51:03	-0.8	571.5	

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Bias

Project No. 1457A

Date	3/1/01		
Time	NO_X (ppm)	CO (ppm)	THC (ppm)
Zero	1.4	-3.3	NA
Upscale	50.1	559.2	NA
6:53:38	2.3	20.5	-4.4
6:53:53	2.4	9.8	-2.7
6:54:08	1.5	-0.1	-1.2
6:54:23	1.1	-1.1	-1.4
6:54:38	0.7	-2.0	-1.2
6:54:53	2.2	-3.3	-1.4
6:55:08	1.8	-3.3	-1.3
6:55:23	12.0	-3.4	-1.4
6:55:38	41.0	-3.3	-1.2
6:55:53	51.1	-3.4	-1.4
6:56:08	53.9	-3.3	-1.1
6:56:23	50.6	-3.4	-1.4
6:56:38	49.3	-3.4	-1.3
6:56:53	49.9	-3.4	-1.4
6:57:08	50.9	-3.4	-1.2
6:57:23	51.1	-3.4	-1.4
6:57:38	51.3	-3.4	-1.3
6:57:53	51.6	-3.4	-1.4
6:58:08	29.4	19.2	-1.5
6:58:23	6.4	151.4	-1.3
6:58:38	2.4	386.0	-1.4
6:58:53	0.7	506.2	-1.3
6:59:08	2.3	551.4	-1.2
6:59:23	1.9	551.4	-1.4
6:59:38	2.3	559.4	-1.4
6:59:53	2.0	559.4	-1.3
7:00:08	1.3	559.7	-1.5
7:00:23	1.4	558.2	-1.3
7:00:38	0.9	554.9	0.8
7:00:53	0.8	536.2	485.3
7:01:08	0.6	417.2	846.0
7:01:23	0.9	300.1	847.7
7:01:38	1.9	139.5	848.8
7:01:53	2.3	47.4	849.0
7:02:08	2.1	6.0	849.0
7:02:23	1.0	-0.7	849.4
7:02:38	0.3	-1.1	850.0
7:02:53	1.5	-1.3	849.5
7:03:08	1.4	-3.4	848.5
7:03:23	1.1	-3.3	489.5
7:03:38	0.9	-3.4	125.2
7:03:53	2.0	-3.3	623.0
7:04:08	2.5	-3.4	496.1
7:04:23	1.4	-3.4	495.8
7:04:38	1.5	-3.3	495.6
7:04:53	2.4	-3.4	495.1
7:05:08	1.4	-3.4	495.5
7:05:23	0.8	-3.4	495.3
7:05:38	0.4	-3.4	495.0
7:05:53	0.8	-3.4	494.9
7:06:08	1.2	-3.4	494.7
7:06:23	1.6	-3.4	495.2
7:06:38	0.4	-3.4	494.8
7:06:53	0.6	-3.4	495.0
7:07:08	0.3	-3.4	494.1
7:07:23	0.3	-3.4	260.7
7:07:38	1.4	-3.4	10.7
7:07:53	1.1	-3.4	432.2
7:08:08	0.4	-3.4	300.6
7:08:23	0.3	-3.4	298.9
7:08:38	0.3	-3.4	298.7
7:08:53	1.4	-3.4	298.6
7:09:08	1.6	-3.4	298.5
7:09:23	2.0	-3.3	298.2
7:09:38	1.2	-3.4	298.3

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Run 1

Project No. 1457A

Date	3/1/01		
Time	NO_X (ppm)	CO (ppm)	THC (ppm)
Average	15.3	366.4	41.1
11:38:03	16.5	346.7	38.9
11:39:03	14.3	349.7	39.4
11:40:03	14.8	360.0	40.2
11:41:03	14.5	368.6	40.7
11:42:03	15.1	372.8	41.3
11:43:03	15.1	378.8	42.0
11:44:03	14.1	385.7	43.3
11:45:03	13.3	404.0	45.7
11:46:03	12.7	422.8	47.4
11:47:03	10.7	424.1	47.9
11:48:03	11.1	445.2	48.8
11:49:03	14.5	431.2	49.1
11:50:03	15.1	381.5	49.1
11:51:03	15.0	401.1	48.5
11:52:03	15.7	398.2	48.6
11:53:03	16.6	398.0	48.8
11:54:03	17.0	401.9	49.3
11:55:03	17.2	398.8	48.9
11:56:03	17.0	396.8	48.7
11:57:03	15.7	422.6	48.4
11:58:03	15.1	426.9	47.9
11:59:03	15.4	427.3	47.9
12:00:03	15.3	434.8	47.2
12:01:03	15.0	427.3	47.3
12:02:03	14.7	426.1	46.9
12:03:03	15.1	417.7	46.6
12:04:03	17.5	416.8	46.3
12:05:03	16.3	420.1	45.8
12:06:03	14.6	419.3	46.1
12:07:03	15.7	416.5	45.4
12:08:03	15.7	416.3	44.6
12:09:03	15.6	406.5	44.4
12:10:03	16.1	404.8	44.5
12:11:03	15.8	401.6	44.2
12:12:03	16.9	399.6	43.7
12:13:03	15.5	396.0	43.3
12:14:03	16.0	387.7	42.7
12:15:03	16.1	382.6	42.2
12:16:03	15.0	380.3	41.3
12:17:03	15.1	374.1	40.8
12:18:03	15.7	367.2	40.3
12:19:03	15.3	358.9	39.3
12:20:03	15.1	349.2	38.4
12:21:03	15.7	338.9	37.4
12:22:03	15.2	329.5	36.1
12:23:03	14.9	320.5	35.2
12:24:03	14.9	310.2	34.3
12:25:03	14.4	300.7	33.6
12:26:03	14.4	294.0	33.0
12:27:03	15.0	294.3	32.5
12:28:03	14.6	289.5	32.4
12:29:03	16.7	285.7	31.8
12:30:03	15.7	283.0	31.3
12:31:03	15.8	278.2	30.9
12:32:03	15.6	274.3	30.5
12:33:03	16.5	272.2	30.2
12:34:03	16.2	267.2	30.0
12:35:03	16.3	267.1	29.6
12:36:03	16.3	268.5	29.4
12:37:03	15.4	269.0	29.6
12:38:03	16.7	260.5	29.7

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Cal 1

Project No. 1457A

Date	3/1/01		
Time	NO_X (ppm)	CO (ppm)	THC (ppm)
Zero	-0.7	-3.3	2.2
Upscale	49.8	598.8	308.7
12:41:17	-0.7	-3.4	6.2
12:41:32	-0.5	-3.2	5.7
12:41:47	-0.6	-3.3	5.6
12:42:02	0.2	-3.2	5.4
12:42:17	-0.6	-3.3	5.0
12:42:32	-0.5	-3.3	4.6
12:42:47	0.1	-3.3	4.5
12:43:02	2.2	-3.3	4.3
12:43:17	2.9	-3.2	4.1
12:43:32	2.0	-3.3	4.0
12:43:47	0.2	-3.3	3.8
12:44:02	13.5	-3.4	3.7
12:44:17	42.8	-3.3	3.3
12:44:32	50.6	-3.2	3.5
12:44:47	49.0	-3.4	3.3
12:45:02	49.7	-3.3	3.1
12:45:17	49.9	-3.1	3.1
12:45:32	48.5	-3.3	3.0
12:45:47	49.3	-3.2	2.9
12:46:02	43.2	0.9	2.7
12:46:17	11.5	75.5	2.4
12:46:32	2.1	337.2	2.7
12:46:47	0.7	506.7	2.5
12:47:02	0.6	590.2	2.3
12:47:17	0.8	598.3	2.3
12:47:32	1.1	607.3	2.2
12:47:47	0.4	599.4	2.1
12:48:02	-0.4	604.7	2.2
12:48:17	-2.0	600.8	2.0
12:48:32	-2.8	603.5	2.3
12:48:47	-1.1	604.8	1.9
12:49:02	0.3	604.7	1.9
12:49:17	-0.1	604.8	166.0
12:49:32	0.2	585.6	307.5
12:49:47	-1.1	459.2	308.3
12:50:02	-1.1	190.1	308.6
12:50:17	-0.6	51.4	308.5
12:50:32	-1.1	4.7	308.5
12:50:47	-0.3	-0.6	308.9
12:51:02	-1.1	-1.1	308.7

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Run 2

Project No. 1457A

Date	3/1/01		
Time	NO_X (ppm)	CO (ppm)	THC (ppm)
Average	17.9	331.3	35.9
13:08:07	19.0	274.4	31.1
13:09:07	19.4	268.5	30.6
13:10:07	18.6	270.7	30.2
13:11:07	20.3	267.8	29.7
13:12:07	19.6	265.3	29.2
13:13:07	18.4	258.4	29.1
13:14:07	18.6	259.5	28.8
13:15:07	19.2	262.0	29.2
13:16:07	19.8	268.9	29.7
13:17:07	19.0	276.7	30.8
13:18:07	19.9	285.9	31.4
13:19:07	19.5	296.5	32.3
13:20:07	19.0	298.8	32.9
13:21:07	18.7	302.6	33.5
13:22:07	18.8	305.4	33.9
13:23:07	19.7	307.4	34.1
13:24:07	19.7	311.0	34.1
13:25:07	18.6	313.5	34.2
13:26:07	19.5	316.1	34.5
13:27:07	19.6	319.3	34.1
13:28:07	18.8	314.9	34.4
13:29:07	17.7	315.2	34.7
13:30:07	16.9	312.0	34.7
13:31:07	16.3	314.4	34.6
13:32:07	17.2	311.0	34.6
13:33:07	17.4	314.2	34.1
13:34:07	16.7	308.6	34.3
13:35:07	17.0	304.5	34.4
13:36:07	18.6	301.7	34.4
13:37:07	17.2	305.7	34.2
13:38:07	16.9	311.3	34.3
13:39:07	17.0	311.3	34.5
13:40:07	16.7	313.0	34.8
13:41:07	15.7	316.1	35.1
13:42:07	16.1	325.4	36.0
13:43:07	16.2	329.7	36.5
13:44:07	16.8	335.8	37.4
13:45:07	15.6	343.3	37.9
13:46:07	16.9	350.7	38.6
13:47:07	17.1	361.5	39.0
13:48:07	17.4	365.0	39.4
13:49:07	17.6	365.0	39.8
13:50:07	16.8	367.4	39.6
13:51:07	18.9	367.4	39.5
13:52:07	19.6	362.8	39.3
13:53:07	17.9	359.0	39.2
13:54:07	16.2	354.4	38.9
13:55:07	16.7	351.4	38.8
13:56:07	17.5	356.9	39.0
13:57:07	17.9	376.3	39.7
13:58:07	17.8	386.0	39.9
13:59:07	17.8	394.6	40.5
14:00:07	16.8	402.3	40.9
14:01:07	17.2	407.6	41.3
14:02:07	18.5	414.8	41.8
14:03:07	19.1	411.6	42.1
14:04:07	17.8	414.8	42.0
14:05:07	17.6	416.7	41.7
14:06:07	17.1	411.5	41.8
14:07:07	17.1	409.8	41.9
14:08:07	16.8	387.7	41.6

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Cal 2

Project No. 1457A

Date	3/1/01		
Time	NO_X (ppm)	CO (ppm)	THC (ppm)
Zero	-0.6	-3.3	1.7
Upscale	50.7	604.9	279.7

14:11:48	-0.9	-3.4	5.5
14:12:03	-1.0	-3.4	5.4
14:12:18	-1.2	-3.2	5.3
14:12:33	-1.7	-3.3	4.7
14:12:48	-1.1	-3.3	4.8
14:13:03	-1.1	-3.2	4.3
14:13:18	21.5	-3.3	4.2
14:13:33	51.6	-3.4	3.9
14:13:48	56.8	-3.1	3.8
14:14:03	58.3	-3.4	3.6
14:14:18	53.4	-3.2	3.6
14:14:33	49.8	-3.3	3.3
14:14:48	48.5	-3.3	3.3
14:15:03	49.5	-3.3	2.9
14:15:18	49.1	-3.2	2.8
14:15:33	49.8	-3.3	2.7
14:15:48	50.8	-3.3	2.7
14:16:03	50.7	-3.4	2.5
14:16:18	50.5	-3.4	2.3
14:16:33	50.8	-3.4	2.4
14:16:48	49.8	-3.3	2.1
14:17:03	38.6	5.6	2.3
14:17:18	9.5	141.5	1.8
14:17:33	2.8	384.6	2.0
14:17:48	2.3	565.3	1.7
14:18:03	1.4	607.8	1.7
14:18:18	1.0	630.3	1.9
14:18:33	1.4	628.7	1.5
14:18:48	-1.6	631.1	1.5
14:19:03	-0.8	624.9	1.6
14:19:18	-2.1	631.1	26.7
14:19:33	0.9	606.4	110.5
14:19:48	8.3	589.9	103.9
14:20:03	10.1	564.3	105.1
14:20:18	9.1	547.6	70.9
14:20:33	7.8	552.6	42.3
14:20:48	5.1	571.8	29.6
14:21:03	2.7	593.8	25.7
14:21:18	2.9	606.1	24.5
14:21:33	1.7	611.8	35.1
14:21:48	1.1	608.1	274.4
14:22:03	-0.1	553.9	277.7
14:22:18	-0.6	317.7	279.7
14:22:33	-0.5	111.3	279.7
14:22:48	-0.5	15.5	279.5
14:23:03	-0.8	1.5	279.8

CEM Data
Run 3

Date	3/1/01		
Time	NO_x (ppm)	CO (ppm)	THC (ppm)
Average	17.1	466.8	50.3
14:26:00	16.8	456.5	45.4
14:27:00	16.5	448.1	45.4
14:28:00	16.0	450.0	45.7
14:29:00	16.2	440.1	45.5
14:30:00	16.7	425.6	45.5
14:31:00	16.7	423.8	45.7
14:32:00	17.2	430.2	46.4
14:33:00	17.5	437.4	47.2
14:34:00	16.7	437.6	48.0
14:35:00	17.8	448.6	48.4
14:36:00	17.0	453.9	49.0
14:37:00	16.9	457.1	49.5
14:38:00	17.3	455.4	50.1
14:39:00	18.0	454.9	49.6
14:40:00	17.2	461.3	49.4
14:41:00	16.3	457.2	49.5
14:42:00	16.8	463.9	49.8
14:43:00	17.2	463.7	50.8
14:44:00	17.4	474.0	51.0
14:45:00	17.5	482.3	51.6
14:46:00	16.8	493.7	52.3
14:47:00	16.7	495.5	53.0
14:48:00	17.4	504.0	54.3
14:49:00	17.3	501.9	54.4
14:50:00	17.2	520.4	55.6
14:51:00	18.0	537.2	55.7
14:52:00	16.9	531.9	55.8
14:53:00	16.8	536.2	55.8
14:54:00	16.8	532.3	56.2
14:55:00	17.9	531.8	56.4
14:56:00	17.3	531.0	56.8
14:57:00	16.4	535.7	57.2
14:58:00	16.4	535.4	56.9
14:59:00	16.0	533.9	56.5
15:00:00	15.9	527.5	56.1
15:01:00	17.0	520.6	55.4
15:02:00	17.2	514.1	54.5
15:03:00	15.5	512.1	53.9
15:04:00	16.8	492.3	52.8
15:05:00	18.3	473.7	52.0
15:06:00	18.8	469.2	51.4
15:07:00	19.4	464.3	51.0
15:08:00	16.5	462.8	50.7
15:09:00	16.3	454.6	50.5
15:10:00	16.0	446.7	49.8
15:11:00	15.5	445.3	49.2
15:12:00	16.8	432.9	48.8
15:13:00	17.4	421.2	47.6
15:14:00	17.1	417.3	46.4
15:15:00	15.9	411.0	45.6
15:16:00	17.4	407.9	45.6
15:17:00	18.5	408.3	45.5
15:18:00	18.0	415.9	45.5
15:19:00	17.9	422.4	45.7
15:20:00	18.6	424.2	46.2
15:21:00	18.2	426.5	46.5
15:22:00	17.7	428.1	46.7
15:23:00	18.1	426.9	46.8
15:24:00	16.9	430.0	47.1
15:25:00	15.8	434.2	47.7
15:26:00	16.7	443.7	48.8

Solvay Minerals, Inc.
Calciner No. 4

CEM Data
Cal 3

Project No. 1457A

Date	3/1/01		
Time	NO_x (ppm)	CO (ppm)	THC (ppm)
Zero	0.5	-3.3	5.7
Upscale	49.7	576.8	270.5
15:29:10	1.4	-2.9	9.2
15:29:25	1.6	-2.1	8.9
15:29:40	1.7	-3.4	8.2
15:29:55	2.0	-3.2	7.7
15:30:10	1.7	-3.4	7.6
15:30:25	0.9	-3.3	6.9
15:30:40	1.8	-3.3	6.8
15:30:55	34.0	-3.4	6.5
15:31:10	50.1	-3.4	6.2
15:31:25	48.8	-3.3	5.9
15:31:40	49.2	-3.3	5.4
15:31:55	50.6	-3.4	5.3
15:32:10	49.8	-3.4	5.0
15:32:25	48.2	-3.3	4.7
15:32:40	47.8	-3.3	29.1
15:32:55	39.8	-2.1	90.1
15:33:10	24.5	8.6	73.7
15:33:25	14.1	66.2	49.8
15:33:40	7.2	164.6	37.9
15:33:55	4.5	267.9	33.3
15:34:10	4.0	343.8	32.0
15:34:25	2.7	491.2	49.5
15:34:40	2.9	535.5	59.0
15:34:55	4.9	550.9	60.9
15:35:10	4.5	552.1	61.2
15:35:25	4.7	547.6	61.1
15:35:40	5.3	579.7	65.4
15:35:55	5.5	578.9	70.6
15:36:10	5.5	584.2	71.4
15:36:25	5.0	575.0	71.9
15:36:40	5.2	575.0	71.8
15:36:55	5.0	581.5	71.9
15:37:10	4.5	576.1	77.5
15:37:25	6.4	565.6	109.6
15:37:40	5.3	584.2	271.6
15:37:55	1.4	474.1	271.2
15:38:10	0.5	265.8	270.8
15:38:25	0.1	62.0	271.0
15:38:40	0.3	11.4	270.3
15:38:55	1.0	0.0	270.6
15:39:10	0.8	-1.4	270.0

Laboratory Data

SOLVAY2016_6_002595

Particulate Parameters		Run 1	Run 2	Run 3	Blank
Filter ID		*083905*	*083096*	*083097*	
Filter tare weight (g)	Trial 1	0.3470	0.3500	0.3496	
	Trial 2	0.3466	0.3504	0.3497	
	Average	0.3468	0.3502	0.3497	
Filter final weight (g)	Trial 1	0.3470	0.3534	0.3504	
	Trial 2	0.3470	0.3532	0.3504	
	Average	0.3470	0.3533	0.3504	
Filter net weight, m_f (g)		**0.0002**	**0.0031**	**0.0007**	
Front 1/2 Beaker ID		*AW 101*	*AW 29*	*AW 37*	*AW 33*
Sample Volume (ml)		110	105	140	150
Beaker tare weight (g)	Trial 1	101.3978	113.8156	113.8796	111.9136
	Trial 2	101.3980	113.8154	113.8796	111.9138
	Average	101.3979	113.8155	113.8796	111.9137
Beaker final weight (g)	Trial 1	101.4024	113.8190	113.8830	111.9146
	Trial 2	101.4026	113.8194	113.8832	111.9146
	Average	101.4025	113.8192	113.8831	111.9146
Blank correction factor (g)		0.0007	0.0006	0.0008	
Beaker net weight, m_{wf} (g)		**0.0039**	**0.0031**	**0.0027**	**0.0009**
Back 1/2 Inorganic Beaker ID		*AW 13*	*AW 42*	*AW 4*	*AW 21*
Sample Volume (ml)		775	810	860	150
H_2O Condensate (ml)		295.3	345.0	338.9	
Sample Volume-H_2O (ml)		479.7	465.0	521.1	
Beaker tare weight (g)	Trial 1	105.2882	109.5978	105.1710	104.0292
	Trial 2	105.2878	109.5976	105.1708	104.0292
	Average	105.2880	109.5977	105.1709	104.0292
Beaker final weight (g)	Trial 1	105.3016	109.6146	105.2018	104.0304
	Trial 2	105.3018	109.6142	105.2014	104.0302
	Average	105.3017	109.6144	105.2016	104.0303
Blank correction factor (g)		0.0035	0.0034	0.0038	
Beaker net weight, m_{wbi} (g)		**0.0102**	**0.0133**	**0.0269**	**0.0011**
Back 1/2 Organic Beaker ID		*AW 44*	*AW 9*	*AW 26*	*AW 41*
Sample Volume (ml)		200	210	210	225
Beaker tare weight (g)	Trial 1	112.5964	104.7708	107.4306	114.3530
	Trial 2	112.5964	104.7706	107.4304	114.3528
	Average	112.5964	104.7707	107.4305	114.3529
Beaker final weight (g)	Trial 1	112.6568	104.8342	107.5840	114.3540
	Trial 2	112.6564	104.8342	107.5836	114.3536
	Average	112.6566	104.8342	107.5838	114.3538
Blank correction factor (g)		0.0008	0.0008	0.0008	
Beaker net weight, m_{wbo} (g)		**0.0594**	**0.0627**	**0.1525**	**0.0009**
Total front half particulate (g)		**0.0041**	**0.0062**	**0.0034**	
Total back half particulate (g)		**0.0696**	**0.0759**	**0.1793**	
Total particulate (g)		**0.0737**	**0.0821**	**0.1827**	

AIRTECH ENVIRONMENTAL SERVICES INC.
Gravimetric Data Sheet

Page	1	of	4

PROJECT NO. 1457A

Client	Solvay Minerals
Plant	Green River WY
Scale ID	Sartorius A210P
Units of Measure	Grams

Relative Humidity (%)	
Barometric (inHg)	23.90
Ambient Temp (°F)	75

CA-4

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
BLANK	Filter		Tare	0.3463	2/26 1121	0.3467	2/27 745			0.3465
			Tech		TW		TW			
ID		CLEAN	Final	0.3464	2/28 756	0.3464	2/28 1810			0.3464
			Tech		TW		TW			
083090			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
1	Filter	Very	Tare	0.3470	2/26 1125	0.3466	2/27 747			0.3468
		Slight	Tech		TW		TW			
ID	CA4	Stain	Final	0.3470	3/4 0820	0.3470	3/4 1428			0.3470
			Tech		RML		RML			
083095	3-2-01		Notes						Net Weight	.0002

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
2	Filter	Slight	Tare	0.3500	2/26 1125	0.3504	2/27 751			0.3502
			Tech		TW		TW			
ID	CA-4	Brown	Final	0.3534	3/4 0822	0.3532	3/4 1430			0.3533
		Stain	Tech		RML		RML			
083096	3-2-01		Notes						Net Weight	.0031

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
3	Filter	Slight	Tare	0.3496	2/26 1127	0.3497	2/27 752			0.3497
			Tech		TW		TW			
ID	CA-4	Brown	Final	0.3504	3/4 0825	0.3504	3/4 1432			0.3504
		Stain	Tech		RML		RML			
083097	3-2-01		Notes						Net Weight	.0007

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

AIRTECH ENVIRONMENTAL SERVICES INC.
Gravimetric Data Sheet

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PROJECT NO. 1457A

Client	Solvay Minerals
Plant	Green River, WY
Scale ID	Sartorius A210P
Units of Measure	Grams

CA-4

Relative Humidity (%)	
Barometric (inHg)	23.90
Ambient Temp (°F)	75

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
Blank	F&DI H_2O Blank	Clear	Tare	111.9136	2/26 1130	111.9138	2/27 801			111.9137
			Tech		TW		TW			
ID			Final	111.9146	2/28 1814	111.9146	3/1 635			111.9146
			Tech		TW		TW			
AW33	Vol = 150 ml		Notes						Net Weight	0.0009

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
1	F&DI H_2O wash	Brownish/ white Residue	Tare	101.3978	2/26 1134	101.3980	2/27 759			101.3979
			Tech		TW		TW			
ID	Vol = 110 ml		Final	101.4024	3/4 0839	101.4026	3/4 1434			101.4025
			Tech		RML		RML			
AW101	3-2-01		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
2	F&DI H_2O wash	Brownish/ white Residue	Tare	113.8156	2/26 1134	113.8154	2/27 756			113.8155
			Tech		TW		TW			
ID	Vol = 105 ml		Final	113.8190	3/4 0835	113.8194	3/4 1437			113.8192
			Tech		RML		RML			
AW29	3-2-01		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
3	F&DI H_2O wash	Brownish/ white Residue	Tare	113.8786	2/26 1136	113.8796	2/27 756			113.8796
			Tech		TW		TW			
ID	Vol = 140 ml		Final	113.8830	3/4 0830	113.8832	3/4 1440			113.8831
			Tech		RML		RML			
AW37	3-2-01		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

AIRTECH ENVIRONMENTAL SERVICES INC.
Gravimetric Data Sheet

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PROJECT NO. 1457A

Client	SOLVAY MINERALS
Plant	GREEN RIVER, WY
Scale ID	SARTORIUS A210P
Units of Measure	GRAMS

CA-4

Relative Humidity (%)	
Barometric (InHg)	
Ambient Temp (°F)	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
BLANK	B½ INORGANIC	Clear	Tare	104.0292	3/6 705	104.0292	3/6 1344	—	—	104.0292
	DI H_2O		Tech		MJP		TW		-	
ID	BLANK		Final	104.0304	3-12/0846	104.0302	3-12/1437			104.0303
	150 ml		Tech		MJP		MJP			
AW21	Vol = ~~775~~ 150		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
1	B½ INORGANIC	Oily Brown Residue	Tare	105.2882	3/6 715	105.2878	3/6 1337	-	—	105.2880
			Tech		MJP		TW		—	
ID			Final	105.3016	3-13/0725	105.3018	3-14/0434			105.3017
			Tech		MJP		MJP			
AW13	Vol = 775 ml		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
2	B½ INORGANIC	Oily Brown Residue	Tare	109.5978	3/6 708	109.5976	3/6 1342	—	—	109.5977
			Tech		MJP		TW		—	
ID			Final	109.6146	3/12 0740	109.6142	3-12/1437			109.6144
			Tech		MJP		MJP			
AW42	Vol = 810 ml		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
3	B½ INORGANIC	Oily Brown Residue	Tare	105.1710	3/6 711	105.1708	3/6 1340	—	—	105.1709
			Tech		MJP		TW		—	
ID			Final	105.2026	3-12/0741	105.2018	3-12/1438	105.2014	3-13/0720	105.2016
			Tech		MJP		MJP		MJP	
AW4	Vol = 860 ml		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
BLANK	$MeCl_2$ BLANK	Clear	Tare	114.3530	3/6 700	114.3528	3/6 1343	—	-	114.3529
			Tech		MJP		TW			
ID			Final	114.3540	3-12/0842	114.3536	3-12/1434			114.3538
			Tech		MJP		MJP			
AW41	Vol = 225 ml		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
1	B½ ORGANIC	Oily Brown Residue	Tare	112.5964	3/6/01 717	112.5964	3/6 1335	—	—	112.5964
			Tech		MJP		TW		-	
ID			Final	112.6568	3-12/0847	112.6564	3-12/1431			112.6566
			Tech		MJP		MJP			
AW44	Vol = 200 ml		Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
2	B½ ORGANIC	Oily Brown Residue	Tare	104.7708	3/6 713	104.7706	3/6 1339	—	—	104.7707
			Tech		MJP		TW		—	
ID			Final	~~95.1950~~	~~3-12/0743~~	104.8354	3-12/0849	104.8342	3-12/1432	104.8348
			Tech	MJP	MJP		MJP		MJP	
AW9	Vol = 210		Notes	3rd weight below					Net Weight	

104.8342 3-13/0719
MJP

GDS.R0.AES.2/5/98

SOLVAY2016_6_002599

AIRTECH ENVIRONMENTAL SERVICES INC.
Gravimetric Data Sheet

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PROJECT NO. 1457A

Client	SOLVAY MINERALS
Plant	GREEN RIVER, WY
Scale ID	SARTORIUS A210P
Units of Measure	GRAMS

Relative Humidity (%)	
Barometric (inHg)	
Ambient Temp (°F)	

CA-4

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
3	B1/2 ORGANIC	B1	Tare	107.4306	3/6 715	107.4304	3/6 1337	–	–	107.4305
		Oily	Tech		MJP		TW		–	
ID			Final	107.5840	3-12 / 0845	107.5836	3-12 / 1435			107.5838
		Brown	Tech		MJP		MJP			
AW26	Vol = 210	Residue	Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

Run	Media / Volume	Appearance		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Average
			Tare							
			Tech							
ID			Final							
			Tech							
			Notes						Net Weight	

GDS.R0.AES.2/5/98

AIRTECH ENVIRONMENTAL SERVICES INC.

Chain of Custody

10001

Project Number	1457A	Location	CA-4 Stack
Client	Solvay Minerals	Date	3-2-01
Plant	Green River, WY	Completed By	MJP

Comments:

Page 1 of 2

ID No.	Run No.	Date	Sample Description	US Gravimetric	Archive	Analyzed on Site						Notes
	Blank	2-27-01	Filter 083090	X	X	X						
	1	3-2-01	Filter 083095	X	X	X						
	2	3-2-01	Filter 083094	X	X	X						
	3	3-2-01	Filter 083097									
	Blank	2-27-01	Diuf H_2O #AW33	X	X	X						
	1	3-2-01	F½ Wash #AW101	X	X	X						
	2	3-2-01	F½ Wash #AW29	X	X	X						
	3	3-2-01	F½ Wash #AW37	X	X	X						

Relinquished By (signature)		Relinquished By (signature)		Carrier	MJP
(printed)		(printed)		Laboratory	Airtech
Date/Time		Date/Time		Contact	M. Pierce / T. Wojtach
Accepted By (signature)	Michael Pierce	Accepted By (signature)		Address	8760 Hwy 73 Evergreen, CO 80439
(printed)	Michael Pierce	(printed)		Phone	303-670-0530
Date/Time	3-2-01	Date/Time		Fax	303-670-4130
				Date/Time	3-2-01

AIRTECH Environmental Services Inc.

Airtech Environmental Services Inc.
601A Country Club Drive
Bensenville, IL 60106
Phone: (630) 860-4740, Fax: (630) 860 4745

SOLVAY2016_6_002601

AIRTECH ENVIRONMENTAL SERVICES INC.

Chain of Custody

0001

Project Number	1457A	Location	CA-4 Stack	Page	2 of 2
Client	Solvay Minerals	Date	3-2-01		
Plant	Green River, WY	Completed By	WTP		

Comments:

ID No.	Run No.	Date	Sample Description	M202 Gravimetric								Notes
	BLANK	2-27-01	$MeCl_2$ #AW41	X								
	1	3-2-01	BK $MeCl_2$ Rinse #AW44	X								
	2	3-2-01	BK $MeCl_2$ Rinse #AW9	X								
	3	3-2-01	BK $MeCl_2$ Rinse #AW26	X								
	BLANK	2-27-01	Impinger DILUE H_2O #AW21	X								
	1	3-2-01	Impinger Contents, Condensate & Rinse #AW13	X								
	2	3-2-01	Impinger Contents, Condensate & Rinse #AW42	X								
	3	3-2-01	Impinger Contents, Condensate & Rinse #AW4	X								

Relinquished By (signature)		Relinquished By (signature)		Carrier	WTP
(printed)		(printed)		Laboratory	Airtech Environmental
Date/Time		Date/Time		Contact	M. Pierce / T. Wojatch
Accepted By (signature)	Michael Pierce	Accepted By (signature)		Address	8760 Hwy 73 Evergreen, CO 80439
(printed)	Michael Pierce	(printed)		Phone	303-670-0530
Date/Time	3-2-01	Date/Time		Fax	303-670-4130
				Date/Time	3-5-01

SOLVAY_0016_0002602

AIRTECH Environmental Services Inc.

Airtech Environmental Services Inc.
601A Country Club Drive
Bensenville, IL 60106
Phone: (630) 860-4740, Fax: (630) 860 4745

Calibration Data

SOLVAY2016_6_002603

Airtech Environmental Services, Inc.

Meter Box Full Test Calibration

Date: 8/22/00

Operator: T. Wojtach

Meter Box ID	M1	Meter Box ΔH@	1.9285	Meter Box Y_d	1.0226	Barometric Pressure (in. Hg.)	22.11

Time	Orifice Data				Meter Box Data								Results		
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.2391	18.0	70.0	1.148	215.300	216.850	1.550	0.25	72.0	70.0	71	1.139	0.230	1.0077	1.906
5.0	0.2391	18.0	70.0	1.148	216.850	218.410	1.560	0.25	74.0	71.0	72.5	1.144	0.230	1.0040	1.887
5.0	0.2391	18.0	69.0	1.149	218.410	219.960	1.550	0.25	74.0	71.0	72.5	1.136	0.230	1.0115	1.911
5.0	0.4641	16.0	70.0	2.229	220.200	223.180	2.980	0.92	73.0	72.0	72.5	2.189	0.446	1.0179	1.903
5.0	0.4641	16.0	70.0	2.229	223.180	226.160	2.980	0.92	77.0	73.0	75	2.179	0.446	1.0227	1.912
5.0	0.4641	16.0	70.0	2.229	226.160	229.140	2.980	0.92	77.0	74.0	75.5	2.177	0.446	1.0237	1.914
5.0	0.8284	13.0	71.0	3.974	229.780	234.980	5.200	2.90	78.0	74.0	76	3.820	0.795	1.0403	1.983
5.0	0.8284	13.0	71.0	3.974	234.980	240.190	5.210	2.90	78.0	74.0	76	3.828	0.795	1.0383	1.975
5.0	0.8284	13.0	71.0	3.974	240.180	245.410	5.230	2.90	80.0	75.0	77.5	3.832	0.795	1.0372	1.966
													Average	1.0226	1.9285

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{avg}	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Thermometers (°F)		
Standard	DGM Inlet	DGM Outlet
50.0	51.0	50.0
100.0	100.0	101.0
150.0	150.0	151.0
200.0	201.0	202.0
250.0	250.0	250.0
300.0	300.0	301.0
350.0	351.0	351.0
400.0	401.0	402.0
450.0	452.0	451.0
500.0	502.0	502.0

Equations

$$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)\,\hat{}\,0.5}$$

$$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{avg} + 460)}$$

$$Q - V_{cr} / \theta$$

$$Y_d = V_{cr} / V_{mstd}$$

$$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta\hat{}2}{P_b * Y_d\hat{}2 * V_m\hat{}2}$$

SOLVAY2016_6_002604

Post Test Meter Calibration

Average Field Sample Rate (cfm)	0.7123	**Date**	3/16/01
Highest Field Vacuum (inches Hg)	14.0	**Client**	Solvay Minerals
Critical Orifice ID	73	**Project No.**	1457A
Orifice Flow Rate (cfm)	1.0687	**Meter ID**	M1

	Run 1	**Run 2**	**Run 3**	
Initial Volume (ft^3)	965.10	970.46	975.8	
Final Volume (ft^3)	970.46	975.8	981.13	
Volume Metered (ft^3)	5.36	5.34	5.33	
DGM Inlet Temperature (°F)	68	69	70	
DGM Outlet Temperature (°F)	66	67	67	
Average DGM Temperature (°F)	67.0	68.0	68.5	
Ambient Temperature (°F)	63	64	64	
Elapsed Time (min.)	5.0	5.0	5.0	
ΔH (inches H_2O)	0.88	0.88	0.88	
Barometric Pressure (inches Hg)	22.25	22.25	22.25	
Pump Vacuum (inches Hg)	12	12	12	
K'	0.8284	0.8284	0.8284	
Vcr (ft^3)	4.030	4.026	4.026	
Vmstd (ft^3)	4.004	3.981	3.970	
Post Test Yc	1.0066	1.0113	1.0142	
Full Test Yd	1.0226	1.0226	1.0226	
% Difference	1.57	1.11	0.83	
	Average Difference		**1.17**	

Post Test Meter Calibration

Average Field Sample Rate (cfm)	0.7123	**Date**	3/16/01
Highest Field Vacuum (inches Hg)	14.0	**Client**	Solvay Minerals
Critical Orifice ID	55	**Project No.**	1457A
Orifice Flow Rate (cfm)	0.6070	**Meter ID**	M1

	Run 1	**Run 2**	**Run 3**	
Initial Volume (ft^3)	955.20	958.24	961.28	
Final Volume (ft^3)	958.24	961.28	964.31	
Volume Metered (ft^3)	3.04	3.04	3.02	
DGM Inlet Temperature (°F)	68	68	67	
DGM Outlet Temperature (°F)	66	66	66	
Average DGM Temperature (°F)	67.0	67.0	66.5	
Ambient Temperature (°F)	63	63	63	
Elapsed Time (min.)	5.0	5.0	5.0	
ΔH (inches H_2O)	0.88	0.88	0.88	
Barometric Pressure (inches Hg)	22.25	22.25	22.25	
Pump Vacuum (inches Hg)	16	16	16	
K'	0.4641	0.4641	0.4641	
Vcr (ft^3)	2.258	2.258	2.258	
Vmstd (ft^3)	2.271	2.271	2.262	
Post Test Yc	0.9943	0.9943	0.9983	
Full Test Yd	1.0226	1.0226	1.0226	
% Difference	2.77	2.77	2.38	
	Average Difference		**2.64**	

Post Test Meter Calibration

Average Field Sample Rate (cfm)	0.7123	Date	3/16/01
Highest Field Vacuum (inches Hg)	14.0	Client	Solvay Minerals
Critical Orifice ID	40	Project No.	1457A
Orifice Flow Rate (cfm)	0.3160	Meter ID	M1

	Run 1	Run 2	Run 3	
Initial Volume (ft^3)	949.80	951.38	952.96	
Final Volume (ft^3)	951.38	952.96	954.54	
Volume Metered (ft^3)	1.58	1.58	1.58	
DGM Inlet Temperature (°F)	68	68	68	
DGM Outlet Temperature (°F)	67	67	66	
Average DGM Temperature (°F)	67.5	67.5	67.0	
Ambient Temperature (°F)	62	63	63	
Elapsed Time (min.)	5.0	5.0	5.0	
ΔH (inches H_2O)	0.23	0.23	0.23	
Barometric Pressure (inches Hg)	22.25	22.25	22.25	
Pump Vacuum (inches Hg)	18	18	18	
K'	0.2391	0.2391	0.2391	
Vcr (ft^3)	1.164	1.163	1.163	
Vmstd (ft^3)	1.177	1.177	1.178	
Post Test Yc	0.9896	0.9886	0.9877	
Full Test Yd	1.0226	1.0226	1.0226	
% Difference	3.23	3.32	3.41	
	Average Difference		3.32	

Airtech Environmental Services, Inc.

Nozzle Calibration Form

	Nozzle 1	Nozzle 2	Nozzle 3
Date	2/26/01		
Nozzle ID	GLASS		
Operator	T. WOJTACH		
Test Location	CALCINER 4		
Run Number (s)	1-		
Diameter 1	0.308		
Diameter 2	0.308		
Diameter 3	0.309		
Average	0.308		

	Nozzle 4	Nozzle 5	Nozzle 6
Date			
Nozzle ID			
Operator			
Test Location			
Run Number (s)			
Diameter 1			
Diameter 2			
Diameter 3			
Average			

Notes:
Measurements must be made to the nearest 0.001 inches.
Three different diameters should be measured.
The difference between the high and low measurement must be less than 0.004 inches.

Signed _____ Date 2/26/01

TYPE S PITOT TUBE INSPECTION DATA

Date: April 12, 2000 Pitot Number: 4-12-00-1

Pitot tube assembly level? yes x no _____

Pitot tube opening damage? yes _____ no x
If yes explain below.

$\alpha 1$ 0 (<10 °) $\alpha 2$ 0 (<10°)

$\beta 1$ = 0 (< 5°) $\beta 2$ 1 (< 5°)

γ = 1 ° θ = 0 ° A = 0.739 cm (in)

Z = A SINE γ = 0.013 cm (in) Where Z is <0.32 cm (<1/8 in)

W = A SINE θ = 0.000 cm (in) Where W is <0.08 cm (<1/32 in)

Pa = 0.370 cm, in Pb = 0.370 cm, in

P = Pa + Pb / 2 = 0.370 cm, in

Dt = 0.250 cm , in P/Dt = 1.478 Where P / Dþ $\geq$ 1.05 and $\leq$ 1.50

Comments: Client: Airtech Environmental

Type of Probe and Effective length: 6' pitot assembly

Cp = 0.84

SOLVAY2016_6_002609

AIRTECH ENVIRONMENTAL SERVICES INC.
Type S Pitot Tube Inspection Sheet

Pitot ID	IP-1
Operator	KURT WEPPRECHT
Date	1/20/2000

Parameter	Measured	Allowed
Outside Tube Diameter - Dt (Inches)	0.25	NA
Base To Opening Distance - Pa (Inches)	0.38	NA
Base To Opening Distance - Pb (Inches)	0.36	NA
Pa/Dt	1.50	1.05 to 1.50
Pb/Dt	1.43	1.05 to 1.50
Angle α1(°)	0.00	10
Angle α2(°)	0.00	10
Angle B1(°)	0.00	5
Angle B1(°)	2.00	5
Opening to Opening Distance Pa+Pb (Inches)	0.74	NA
Angle Z (°)	0.00	NA
z (Inches)	0.000	< 0.125
Angle W (°)	0.00	NA
w (Inches)	0.000	< 0.031
Distance from nozzle (inches)	<.75	< 0.75
Distance from thermocouple (Inches)	1.87	< 2.00
Distance from sample probe (Inches)	<3.00	< 3.00

Note any damage, nicks or dents to pitot tube

Does the pitot tube meet all of the above requirements?	[YES] [NO]
Is the pitot tube free from damage?	[YES] [NO]

IF YES TO BOTH, ASSIGN A COEFFICIENCT OF 0.84 TO THE PITOT TUBE.
IF NO TO EITHER, THE PITOT TUBE MUST BE CALIBRATED.

Signed Kurt Wepprecht Date 1/20/00

Airgas

ASG-West Chicago

1250 W. Washington
West Chicago, IL 60185
Phone: (630) 231-9280
FAX: (630) 231-4071

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Cylinder No.:	CC53923	Order No.	GM 2000590
Cylinder Pressure:	2000 psig	Expiration Date:	8/14/02
Certification Date	8/14/00	Laboratory:	W. Chicago

Reference Standard Information:

Type	Component	Cyl. Number	Concentration
GMIS 3199	Nitric Oxide	CC38007	49.85 ppm
NTRM 81684	Nitric Oxide	CC65721	96.9 ppm

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Nicolet/8220/AAB9400246	FTIR

Analytical Methodology does not require correction for analytical interferences.

Analytical Results:

1st Component: Nitric Oxide

1st Analysis Date:		8/7/00						
R	49.053	S	49.195	Z	0.304	Conc	50.039	ppm
S	49.015	Z	0.132	R	48.971	Conc	49.945	ppm
Z	0.184	R	48.737	S	48.783	Conc	49.708	ppm
						AVG:	49.898	ppm

2nd Analysis Date:		8/14/00						
R	48.972	S	49.570	Z	0.070	Conc	50.350	ppm
S	49.376	Z	0.467	R	49.036	Conc	50.146	ppm
Z	0.406	R	49.253	S	49.198	Conc	49.984	ppm
						AVG:	50.153	ppm

Certified Concentrations:

Component	Concentration	Accuracy	Procedure
Nitric Oxide	50.03 ppm	+/- 1%	G1
Nitrogen	Balance		

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed

Do not use cylinder below 150 psig.

Edward Johnson
Approved for Release

SOLVAY2016_6_002611

Airgas
Specialty Gases
11711 S. A ameda Street
geles, CA 90059-2130
(323) 357-6891
FAX: (323) 567-3686

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Customer:	Airtech Environmental	P.O.	SG 83691
Cylinder No :	CC101269	Order No.	750360-00
Cylinder Pressure:	2000 PSIG	Expiration Date:	4/17/02
Certification Date	4/17/00	Laboratory:	LOS ANGELES

Reference Standard Information:

Type	Component	Cyl. Number	Concentration
NTRM 81684	Nitric Oxide	CC66829	96.9 PPM

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Siemens/Ultramat 5E	NDIR

Analytical Methodology does not require correction for analytical interferences.

Certified Concentrations:

Component	Concentration		Accuracy	Procedure
Nitric Oxide	91.7	PPM	+/- 1%	G1
Nox	92.3	PPM		
Nitrogen	Balance			

Analytical Results:

1st Component: Nitric Oxide

1st Analysis Date: 4/10/00

R	96.500	S	91.600	Z	0.000	Conc	91.980 PPM
S	91.600	Z	0.000	R	96.500	Conc	91.980 PPM
Z	0.000	R	96.500	S	91.600	Conc	91.980 PPM
						AVG:	91.980 PPM

2nd Analysis Date: 4/17/00

R	96.500	S	91.000	Z	0.000	Conc	91.377 PPM
S	91.000	Z	0.000	R	96.500	Conc	91.377 PPM
Z	0.000	R	96.500	S	91.000	Conc	91.377 PPM
						AVG:	91.377 PPM

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed.

Do not use cylinder below 150 psig.

Approved for Release

SOLVAY2016_6_002612

Airgas
Specialty Gases
11711 S. Alameda Street
Los Angeles, CA 90059-2130
(323) 357-6891
FAX: (323) 567-3586

CERTIFICATE OF ANALYSIS

Date : 04/10/00

Reference Number:

Customer Name: AirTech Environmental
Address: 8760 Hwy 73
Evergreen, CO. 80439-0000
c/o Airgas North Central

Purchase Order #: SG 83691

Grade of Product: Certified Standard

Cylinder Number:	Component	Required Concentration	Actual Concentration
CC52887	Carbon Monoxide	600 PPM	590 PPM
	Nitrogen	Balance	Balance

Uncertainty of Analytical Result :± 2.0 %

Method of Analysis: NDIR

Expiration Date : 04/10/02

Delivery Ticket # : 750393-00

Approval Signature

Airgas
Specialty Gases
11711 S. Alameda Street
Angeles, CA 90059-2130
) 357-6891
FAX: (323) 567-3686

CERTIFICATE OF ANALYSIS

Date : 04/10/00

Reference Number:

Customer Name: AirTech Environmental
Address: 8760 Hwy 73
Evergreen, CO. 80439-0000
c/o Airgas North Central

Purchase Order #: SG 83691

Grade of Product: Certified Standard

Cylinder Number:	Component	Required Concentration	Actual Concentration
CC113505	Carbon Monoxide	1300 PPM	1320 PPM
	Nitrogen	Balance	Balance

Uncertainty of Analytical Result :± 2.0 %

Method of Analysis: NDIR

Expiration Date : 04/10/02

Delivery Ticket # : 750393-00

Approval Signature

Airgas

ASG-West Chicago

1350 W. Washington
West Chicago, IL 60185
Phone: (630) 231-9260
FAX: (630) 231-4071

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Cylinder No.:	CC96227	Order No.	GM 2000748
Cylinder Pressure:	2000 psig	Expiration Date	9/15/03
Certification Date	9/15/00	Laboratory	W. Chicago

Reference Standard Information:

Type	Component	Cyl. Number	Concentration
GMIS 99284	Propane	CC92028	502.6 ppm

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Nicolet/8220/AAB9400246	FTIR

Analytical Methodology does not require correction for analytical interferences.

Analytical Results:

1st Component: Propane

1st Analysis Date: 9/15/00

R	502.855	S	300.799	Z	-0.111	Conc	300.233	ppm
S	300.797	Z	-0.097	R	503.356	Conc	300.281	ppm
Z	-0.104	R	503.762	S	300.310	Conc	300.310	ppm
						AVG:	300.291	ppm

2nd Analysis Date: none

R	0.000	S	0.000	Z	0.000	Conc	0.000	ppm
S	0.000	Z	0.000	R	0.000	Conc	0.000	ppm
Z	0.000	R	0.000	S	0.000	Conc	0.000	ppm
						AVG:	0.000	ppm

Certified Concentrations:

Component	Concentration	Accuracy	Procedure
Propane	300.29 ppm	+/- 1%	G1
Nitrogen	Balance		

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed.

Do not use cylinder below 150 psig.

Edward Johnson
Approved for Release

SOLVAY2016_6_002615

Airgas

ASG-West Chicago

1250 W. Washington
West Chicago, IL 60185
Phone: (630) 231-9363
FAX: (630) 231-4071

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Cylinder No.:	CC84315	Order No.	GM 2000745
Cylinder Pressure:	2000 psig	Expiration Date:	9/15/03
Certification Date:	9/15/00	Laboratory:	W. Chicago

Reference Standard Information:

Type	Component	Cyl. Number	Concentration
GMIS 99284	Propane	CC92028	502.8 ppm

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Nicolet/8220/AAB9400245	FTIR

Analytical Methodology does not require correction for analytical interferences.

Analytical Results:

1st Component: Propane

1st Analysis Date: 9/15/00

R	502.885	S	498.223	Z	-0.111	Conc	495.394	ppm
S	498.076	Z	-0.097	R	503.956	Conc	495.756	ppm
Z	-0.104	R	503.762	S	493.076	Conc	492.183	ppm
						AVG:	494.458	ppm

2nd Analysis Date: none

R	0.000	S	0.000	Z	0.000	Conc	0.000	ppm
S	0.000	Z	0.000	R	0.000	Conc	0.000	ppm
Z	0.000	R	0.000	S	0.000	Conc	0.000	ppm
						AVG:	0.000	ppm

Certified Concentrations:

Component	Concentration	Accuracy	Procedure
Propane	494.41 ppm	+/- 1%	G1
Nitrogen	Balance		

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed.

Do not use cylinder below 150 psig.

Edward Johnson
Approved for Release

SOLVAY2016_6_002616

Airgas

ASG-West Chicago

1212 Belvidere
Waukegan, IL 60085
847-336-7121
Fax 847-336-9600

Certificate of Analysis: E.P.A. Protocol Gas Mixture

Cylinder No.:	CC65661	Order No.	GM 99743
Cylinder Pressure:	2000 psig	Expiration Date:	10/27/02
Certification Date	10/27/99	Laboratory:	W. Chicago

Reference Standard Information:

Type	Component	Cyl. Number	Concentration
SRM 1669b	Propane	CAL-010835	497 ppm
SRM 2728	Propane	CLM-002675	3010 ppm

Instrumentation:

Instrument/Model/Serial No.	Analytical Principle
Nicolet/8220/AAB9400246	FTIR

Analytical Methodology does not require correction for analytical interferences.

Analytical Results:

1st Component: Propane

1st Analysis Date: 10/27/99

R	490.286	S	835.051	Z	-7.624	Conc	845.355 ppm
S	835.881	Z	-7.619	R	487.144	Conc	846.189 ppm
Z	-7.608	R	486.916	S	835.619	Conc	845.925 ppm
						AVG	845.823 ppm

2nd Analysis Date: none

R	0.000	S	0.000	Z	0.000	Conc	0.000 ppm
S	0.000	Z	0.000	R	0.000	Conc	0.000 ppm
Z	0.000	R	0.000	S	0.000	Conc	0.000 ppm
						AVG	0.000 ppm

Certified Concentrations:

Component	Concentration	Accuracy	Procedure
Propane	845.82 ppm	+/- 1%	G1
Nitrogen	Balance		

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed

Do not use cylinder below 150 psig.

Edward Johnson
Approved for Release

SOLVAY2016_6_002617

GC Operating Conditions

Gas Chomatograph	Hewlett Packard 5890 II
Data Acquisition	Hewlett Packard Chemstation
Carrier Gas	Zero Nitrogen
Carrier Flowrate (cc/min)	11.0
Injection Type	Syringe
Injection Volume (ml)	0.1
Injection Temperature (^{0}C)	225
Column Type	GS Alumina
Column Length (m)	50
Film Thickness (um)	0.53
Column Temperature (^{0}C)	35.0
Detector Type	FID
Detector Temperature (^{0}C)	225

Calibration Parameters	Bag 1	Bag 2	Bag 3	Bag 4	Bag 5
Barometric Pressure (in.Hg)	23.70	23.70	23.70	23.70	23.70
Ambient Temperature (^{0}F)	72	72	72	72	72

Calibration Summary

Methane (ppm)	1,030	515	340	258	103
Peak Area # 1	173,821	84,831	50,441	34,516	13,195
Peak Area # 2	171,312	82,023	52,159	35,906	13,337
Average	172,567	83,427	51,300	35,211	13,266
%RSD	**1.03**	**2.38**	**2.37**	**2.79**	**0.76**

RESULTS

Methane (ppm)	1,030	515	340	258	103

Detection Limit Parameters	Methane Bag 4
Injection 1	34,516
Injection 2	35,903
Injection 3	37,382
Injection 4	34,360
Injection 5	36,135
Injection 6	36,670
Injection 7	37,968
Average	36,133

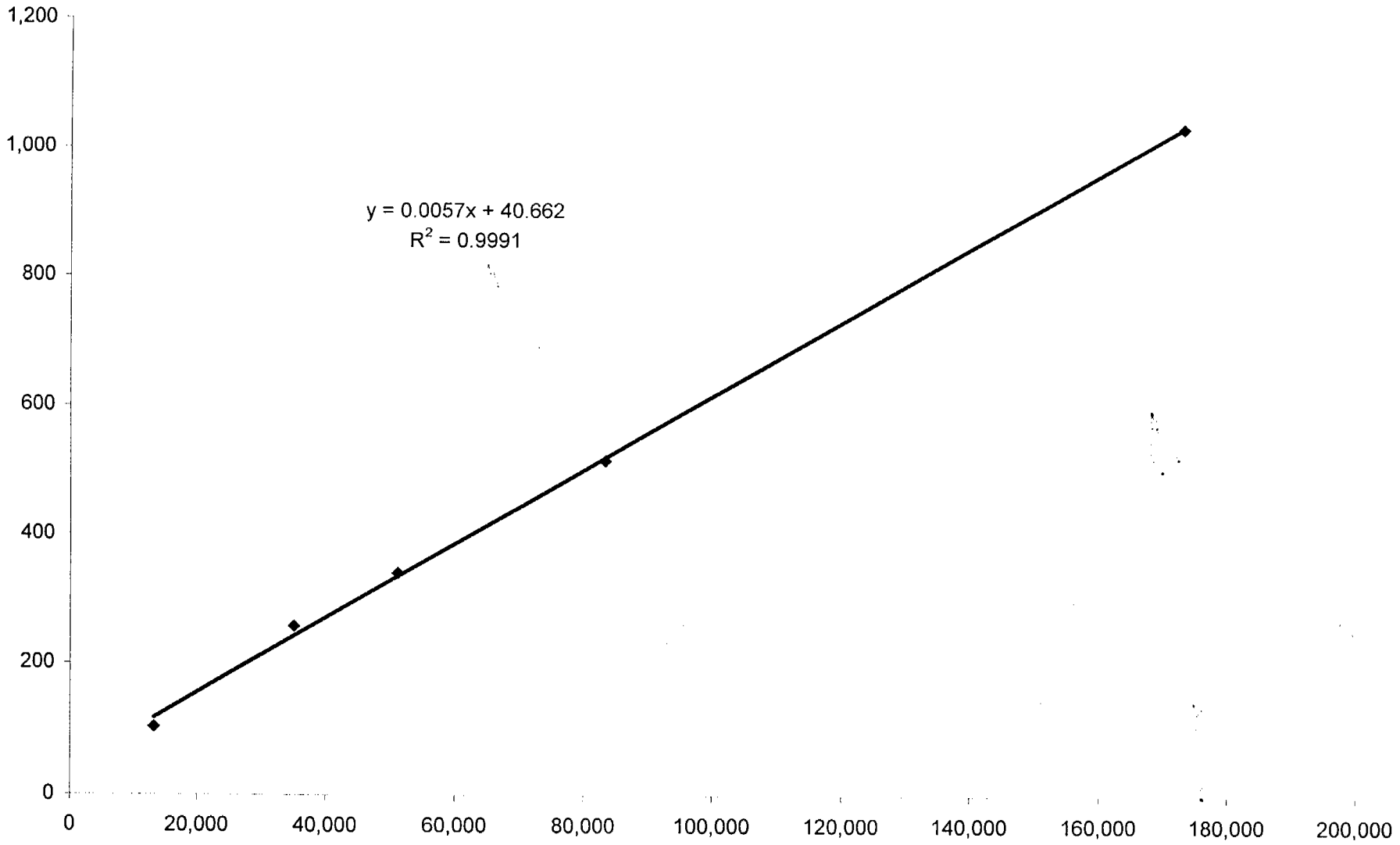
RESULTS	
Response Factor	7.13E-03
Standard Deviation	1,356
No of Samples (n)	7
Student t value ($t_{(0.975)}$)	2.447
Calculated Limit of Detection (ppm)	23.6

Methane	Bag 1	Bag 2	Bag 3	Bag 4	Bag 5
Response	172,567	83,427	51,300	35,211	13,266
Concentration (ppm)	1,030	515	340	258	103

Solvay Minerals, Inc.
Calciner No. 4

Airtech Project No. 1457A

Methane Response Curve



SOLVAY2016_6_002620

Process Data

SOLVAY2016_6_002621

AQD #80 CA-4

3/1/2001

	Run #1	Run #2	Run #3	TEST AVERAGE
Start Time	11:37	13:10	14:32	
Stop Time	12:17	13:50	15:12	
Fuel Flow MSCFH	249.0	247.1	245.5	247.2
Fuel Btu Value	1030	1030	1030	1030
Ore Rate TPH	255	255	255	255
Opacity	1.6	1.5	1.3	1.5

PRECIPITATOR READINGS

EP-7	TIME		
FIELD 1A	11:45	13:30	14:45
PRIMARY AC VOLTAGE	270	254	251
SECONDARY VOLTAGE	49	47	48
FIELD 1B			
PRIMARY AC VOLTAGE	232	247	276
SECONDARY VOLTAGE	41	43	46
FIELD 2A			
PRIMARY AC VOLTAGE	374	360	376
SECONDARY VOLTAGE	45	44	46
FIELD 2B			
PRIMARY AC VOLTAGE	311	315	311
SECONDARY VOLTAGE	53	54	53
FIELD 3A			
PRIMARY AC VOLTAGE	350	349	347
SECONDARY VOLTAGE	55	55	55
FIELD 3B			
PRIMARY AC VOLTAGE	365	359	365
SECONDARY VOLTAGE	55	55	56
FIELD 4A			
PRIMARY AC VOLTAGE	399	396	394
SECONDARY VOLTAGE	55	55	55
FIELD 4B			
PRIMARY AC VOLTAGE	362	357	355
SECONDARY VOLTAGE	55	55	55
FIELD 5A			
PRIMARY AC VOLTAGE	366	366	364
SECONDARY VOLTAGE	55	55	55
FIELD 5B			
PRIMARY AC VOLTAGE	355	358	351
SECONDARY VOLTAGE	55	56	55
FIELD 6A			
PRIMARY AC VOLTAGE	375	371	372
SECONDARY VOLTAGE	55	55	55
FIELD 6B			
PRIMARY AC VOLTAGE	369	366	361
SECONDARY VOLTAGE	55	56	55

AQD #80 CA-4
PARTICULATE TESTING

3/2/01

	Run #1	Run #2	Run #3	TEST AVERAGE
Start Time	**8:05**	**10:45**	**12:44**	
Stop Time	**9:18**	**11:51**	**13:50**	
Fuel Flow MSCFH	251.8	258.9	255.1	**255.3**
Fuel Btu Value	1065	1065	1065	**1065**
Ore Rate TPH	255	255	255	**255**
Opacity	7.7	2.3	1.3	**3.8**

PRECIPITATOR READINGS

EP-7	TIME		
FIELD 1A	**8:35**	**11:30**	**13:15**
PRIMARY AC VOLTAGE	245	252	272
SECONDARY VOLTAGE	45	46	51
FIELD 1B			
PRIMARY AC VOLTAGE	270	228	258
SECONDARY VOLTAGE	45	40	44
FIELD 2A			
PRIMARY AC VOLTAGE	301	299	303
SECONDARY VOLTAGE	38	38	38
FIELD 2B			
PRIMARY AC VOLTAGE	306	308	303
SECONDARY VOLTAGE	52	53	52
FIELD 3A			
PRIMARY AC VOLTAGE	356	355	352
SECONDARY VOLTAGE	56	55	55
FIELD 3B			
PRIMARY AC VOLTAGE	368	372	369
SECONDARY VOLTAGE	55	56	55
FIELD 4A			
PRIMARY AC VOLTAGE	403	400	396
SECONDARY VOLTAGE	56	55	55
FIELD 4B			
PRIMARY AC VOLTAGE	358	361	358
SECONDARY VOLTAGE	55	55	55
FIELD 5A			
PRIMARY AC VOLTAGE	369	372	368
SECONDARY VOLTAGE	55	55	55
FIELD 5B			
PRIMARY AC VOLTAGE	353	357	359
SECONDARY VOLTAGE	55	55	56
FIELD 6A			
PRIMARY AC VOLTAGE	374	374	372
SECONDARY VOLTAGE	56	55	55
FIELD 6B			
PRIMARY AC VOLTAGE	362	365	371
SECONDARY VOLTAGE	55	55	56

SOLVAY MINERALS

May 21, 2001

Tony Hoyt
WDEQ-Air Quality Division
250 Lincoln Street
Lander, WY 82520

RE: Compliance Stack Test Report for AQD #80

Dear Tony:

Enclosed you will find Stack Test Report No. 1457A for AQD #80 (Calciner #4). The testing was conducted on March 1 and March 2, 2001 by AIRTECH Environmental Services Inc.. The purpose of the testing was to demonstrate compliance with the emission limits set forth in CT-1347, which was issued February 6, 1998.

Nitrous Oxide (NO_X) emissions were determined by EPA Reference Method 7, Particulate emissions were determined by the sum of EPA Reference Method 5 front half and Method 202 back half inorganic. EPA Reference Method 10 was used to determine Carbon Monoxide (CO) emissions, and Methods 25a and 18 were used to determine Total Non-Methane Hydrocarbon (TNMHC) emissions. The TNMHC emissions are considered to be Volatile Organic Compound (VOC) emissions.

Results of the tests are tabulated below:

Pollutant	Permit Limit (or *Estimate) PPH	Test Result PPH	% of Emission Limit (or Estimate)	Prod'n Feed Limit TPH	Test Prod'n Feed TPH	% of Prod'n Feed Limit
NO_X	20.0	12.0	60	275	255	93
Particulate	12.25	7.93	65	275	255	93
CO	*1048	168	*16	275	255	93
TNMHC	*534	17.3	*3	275	255	93

* Refers to permit estimate, not permit limit. CO and TNMHC (VOC) emissions are not "limited", but estimates were provided in the permit application for CT-1347.

Solvay Minerals, Inc.
P.O. Box 1167, Green River, Wyoming 82935 307/875-6500 Fax: 307/872-6510

SOLVAY2016_6_002624
Responsible Care
SMI 57C0262 3/96

SOLVAY MINERALS

As evidenced by the test results, AQD #80 is in compliance with NO_X and Particulate emission limits, as well as within the estimates for CO and VOC emissions.

If you have any questions concerning the test results, please feel free to contact me at (307) 872-6571.

Sincerely,

Dolly A. Potter
Environmental Services Supervisor

Enclosure

cc: Dan Olson w/ enclosure