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REPORT ON GC/MS HAPS TESTING

Performed for:
SOLVAY MINERALS, INC.
CA-3 (AQD #48) & CA 1&2 (AQD #17) CALCINER STACKS
GREEN RIVER, WYOMING

Client Reference No: C03069
CAE Project No: 7837-1
Revision 0: January 8, 1997

To the best of our knowledge, the data presented in this report are accurate and complete.

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SOLVAY2016_6_001701

Project Overview

SOLVAY2016_6_001702

PROJECT OVERVIEW

Solvay Minerals contracted Clean Air Engineering to perform an air emissions test program for gas fired calciners CA 1 & 2 (AQD #17) and for gas fired calciner CA-3 (AQD #48). The purpose of the test program was to quantify total non-methane/ethane hydrocarbons (TNM/NEHCs) and specific organic compounds in the exhaust gas of the calciners.

A number of the Method 18 tedlar bags lost sample integrity during shipment to the lab for analysis. In addition, due to the high concentration of methane, the samples required a dilution step before introduction into the GC. It is estimated that this dilution procedure introduced a twenty to thirty percent error to the GC anaylsis. Therefore, concentrations of methane and ethane are suspect and not reported in this document.

The testing took place at the CA-3 Calciner Stack on November 12, 1996 and at the CA 1 & 2 Calciner Stack on November 13 - 14, 1996. EPA Methods performed were 1-4, 18, 25A GCMS (Determination of Gaseous Organic Compounds by Direct Interface Gas Chromatography-Mass Spectrometry).

Each GCMS sample collected during a test run represents an effluent snapshot. Samples were obtained at fifteen minute intervals . Six GCMS samples constitute one run, and correspond with the Method 25A runs. All GCMS samples obtained from the calciner testing are on a dry basis (all samples were collected after passing through the Peltier cooler at approximately 39°F).

The calibration curve developed for the HAPSITE GCMS encompassed a range from 300 part per billion (ppb) to 10 parts per million (ppm). Data reported for analytes at concentrations below 0.15 ppm or above 20 ppm should be considered as estimated concentrations only.

A listing of compounds analyzed for but not detected can be found in Tables 1-3 and 1-4.

During the testing at CA 1&2 Calciner Stack on November 13, CA 1 was the only calciner operating. Throughout the day production was trying to bring CA 2 calciner on line. The unsteady state condition is reflected in the inconsistency of the data. Please refer to Appendix H, operating data.

PROJECT OVERVIEW

Coordinating the field testing were:

D. Potter - Solvay Minerals, Inc.
J. Chapman - Clean Air Engineering
Dr. L Kinner - Emission Monitoring Inc.
J Peeler - Emission Monitoring Inc.

Source identifications are shown in Table 1-1 and Table 1-2.

Table 1-1:
CA-3 Calciner Profile

Unit Identification Number	AQD No. 48, CA-3
Process	Calciner
Fuel	Natural Gas
Heat Content	1080 Btu/ft^3.
Stack Height	180 feet
Stack Diameter	125.5 inches
Diameters to Upstream Disturbance	Approximately 9.0
Diameters to Downstream Disturbance	Approximately 5.5
Primary Control Equipment	Flakt ESP

Table 1-2:
CA 1 & 2 Calciner Profile

Unit Identification Number	AQD No. 17, CA 1 & 2
Process	Calciner
Fuel	Natural Gas
Heat Content	1080 Btu/ft^3
Stack Height	180.5 feet
Stack Diameter	144 inches
Diameters to Upstream Disturbance	Approximately 3.6
Diameters to Downstream Disturbance	Approximately 4.4
Primary Control Equipment	2-Buell ESP

Chemical abstract service (CAS) numbers and molecular weights are listed in Table 1-3 and 1-4.

PROJECT OVERVIEW

Table 1-3:
Compound (CAS) Numbers

Compound Name	Molecular Weight	CAS No.
1,1,1,-Trichloroethane	133.42	71-55-6
1,3 Butadiene	54.09	106-99-0
2-Butanone (MEK)	72.10	78-93-3
Acrylonitrile	53.06	107-13-1
Benzene	78.11	71-43-2
Ethane	30.07	74-84-0
Ethylbenzene	106.16	100-41-4
Hexane	86.17	110-54-3
Methane	16.04	74-82-8
Methylene Chloride	84.94	75-09-2
Styrene	104.14	100-42-5
THCs (as propane)	44.09	74-98-6
Toluene	92.13	108-88-3
Trichloroethene	131.40	79-01-6
Xylene	106.16	1330-20-7
Bromodichloromethane	163.83	75-27-4
Carbon disulfide	76.14	75-15-0
Chloroform	119.39	67-66-3
4-Methyl-2-pentanone	100.16	108-10-1
Tetrachloroethene	165.85	127-18-4
Bromoform	252.77	75-25-2
Vinyl acetate	86.09	108-05-4
Vinyl chloride	62.50	75-01-4
Chloromethane	50.49	74-87-3
cis-1,2-Dichloroethene	96.94	156-59-2
Dibromochloromethane	208.28	124-48-1
1,1-Dichloroethane	98.97	75-34-3
1,2-Dichloropropane	112.99	78-87-5
Chloroethane	64.51	75-00-3
1,1,2,2-Tetrachloroethane	167.86	79-34-5
1,1,2-Trichloroethane	133.42	79-00-5
Bromomethane	94.95	74-83-9
Carbon tetrachloride	153.84	56-23-5
Chlorobenzene	112.56	108-90-7
cis-1,3-Dichloropropene	110.98	10061-01-5

PROJECT OVERVIEW

Table 1-4:
Compound (CAS) Numbers (continued)

Compound Name	Molecular Weight	CAS No.
1,2-Dichloroethane	98.96	107-06-2
1,1-Dichloroethane	98.97	75-34-3
trans-1,2-Dichloroethene	96.94	156-60-5
2-Hexanone	100.16	591-78-6
trans-1,3- Dichloropropene	110.98	10061-02-6

The test conditions and results of analysis are presented in Tables 2-1 through 2-6 on pages 2-1 through 2-6.

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Results

SOLVAY2016_6_001707

RESULTS

Table 2-1:
CA-3 Calciner Stack - Total Hydrocarbons

Run No.		1	2	3	Average
Date (1996)		November 12	November 12	November 12	
Start Time (approx.)		10:17	12:13	13:57	
Stop Time (approx.)		12:00	13:44	15:40	
Process Conditions[1]					
Feed rate (ton/hr)		160	160	160	**160**
Gas Conditions[2]					
T_s	Temperature (°F)	307	312	312	**310**
O_2	Oxygen (dry volume %)	14.2	13.4	12.8	**13.5**
CO_2	Carbon Dioxide (dry volume %)	7.4	8.3	8.8	**8.2**
B_{wo}	Moisture (volume %)	23.65	26.22	24.55	**24.81**
Q_{std}	Standard conditions (dscfm)	68,170	73,260	76,540	**72,657**
Total Hydrocarbons (as propane)					
C	Concentration (ppmdv)	756.3	838.1	767.7	**787.4**
E	Emission rate (lb/hr)	354.0	421.6	403.5	**393.1**
E	Emission rate (lb/ton of trona)	2.2127	2.6351	2.5219	**2.4566**

1 Process conditions obtained from Solvay Minerals, Inc.
2 Gas conditions obtained from concurrent Method 1-4 testing.

RESULTS

Table 2-2:
CA-3 Calciner Stack - GCMS HAPs

Run No.		1	2	3	Average
Date (1996)		November 12	November 12	November 12	
Start Time (approx.)		10:17	12:13	13:57	
Stop Time (approx.)		12:00	13:44	15:40	
Process Conditions[1]					
Feed rate (ton of trona/hr)		160	160	160	**160**
Volumetric Flow Rate[2]					
Q_a	Actual conditions (acfm)	163,300	182,900	186,600	**177,600**
Q_{std}	Standard conditions (dscfm)	68,170	73,260	76,540	**72,660**
Benzene					
C	Concentration (ppm)	4.12	5.44	4.78	**4.78**
E	Emission rate (lb/hr)	3.42	4.85	4.45	**4.24**
E	Emission rate (lb/ton of trona)	0.0214	0.0303	0.0278	**0.0265**
1,3 Butadiene					
C	Concentration (ppm)	0.22	0.25	0.15	**0.21**
E	Emission rate (lb/hr)	0.13	0.15	0.10	**0.13**
E	Emission rate (lb/ton of trona)	0.0008	0.0010	0.0006	**0.0008**
Ethylbenzene					
C	Concentration (ppm)	0.56	0.65	0.69	**0.63**
E	Emission rate (lb/hr)	0.63	0.79	0.87	**0.76**
E	Emission rate (lb/ton of trona)	0.0039	0.0049	0.0055	**0.0048**
2-Butanone					
C	Concentration (ppm)	0.92	1.17	1.16	**1.08**
E	Emission rate (lb/hr)	0.70	0.96	1.00	**0.89**
E	Emission rate (lb/ton of trona)	0.0044	0.0060	0.0062	**0.0055**
Hexane					
C	Concentration (ppm)	0.08	0.08	0.22	**0.13**
E	Emission rate (lb/hr)	0.07	0.08	0.23	**0.13**
E	Emission rate (lb/ton of trona)	0.0005	0.0005	0.0014	**0.0008**
Styrene					
C	Concentration (ppm)	0.38	0.53	0.47	**0.46**
E	Emission rate (lb/hr)	0.42	0.63	0.58	**0.54**
E	Emission rate (lb/ton of trona)	0.0026	0.0039	0.0036	**0.0034**
Toluene					
C	Concentration (ppm)	1.67	2.22	2.08	**1.99**
E	Emission rate (lb/hr)	1.63	2.33	2.28	**2.08**
E	Emission rate (lb/ton of trona)	0.0102	0.0146	0.0143	**0.0130**
Xylene					
C	Concentration (ppm)	2.51	3.22	3.30	**3.01**
E	Emission rate (lb/hr)	2.83	3.90	4.18	**3.63**
E	Emission rate (lb/ton of trona)	0.0177	0.0244	0.0261	**0.0227**
Total HAPs					
E	Emission rate (lb/hr)	9.83	13.69	13.69	**12.40**
E	Emission rate (lb/ton of trona)	0.0615	0.0856	0.0855	**0.0775**

[1] Process conditions provided by Solvay Minerals, Inc.
[2] Flow conditions obtained from concurrent Method 1-4 testing.

RESULTS

Table 2-3:
CA 1&2 Calciner Stack - Total Hydrocarbons

Run No.		1	2	3	Average
Date (1996)		November 13	November 13	November 13	
Start Time (approx.)		11:51	13:38	15:41	
Stop Time (approx.)		13:27	15:26	17:27	
Process Conditions[1]					
Feed rate (ton/hr)		135	135	135	**135**
Gas Conditions[2]					
T_s	Temperature (°F)	238	282	333	**284**
O_2	Oxygen (dry volume %)	17.8	15.1	15.4	**16.1**
CO_2	Carbon Dioxide (dry volume %)	3.3	6.1	5.8	**5.1**
B_{wo}	Moisture (volume %)	11.85	19.94	21.08	**17.62**
Q_{std}	Standard conditions (dscfm)	183,700	142,300	155,100	**160,367**
Total Hydrocarbons (as propane)					
C	Concentration (ppmdv)	400.9	601.0	647.8	**549.9**
E	Emission rate (lb/hr)	505.6	587.3	689.9	**594.3**
E	Emission rate (lb/ton of trona)	3.7455	4.3503	5.1105	**4.4021**

[1] Process conditions obtained from Solvay Minerals, Inc.
[2] Gas conditions obtained from concurrent Method 1-4 testing.

RESULTS

Table 2-4:
CA 1&2 Calciner Stack - GCMS HAPs

Run No.		1	2	3	Average
Date (1996)		November 13	November 13	November 13	
Start Time (approx.)		11:51	13:38	15:41	
Stop Time (approx.)		13:27	15:26	17:27	
Process Conditions[1]					
Feed rate (ton of trona/hr)		135	135	135	**135**
Volumetric Flow Rate[2]					
Q_a	Actual conditions (acfm)	349,100	316,300	373,900	**346,400**
Q_{std}	Standard conditions (dscfm)	183,700	142,300	155,100	**160,400**
Benzene					
C	Concentration (ppm)	1.07	2.63	2.70	**2.13**
E	Emission rate (lb/hr)	2.39	4.55	5.09	**4.01**
E	Emission rate (lb/ton of trona)	0.0177	0.0337	0.0377	**0.0297**
1,3 Butadiene[3]					
C	Concentration (ppm)	0.10	0.02	NF	**0.04**
E	Emission rate (lb/hr)	0.15	0.02	NF	**0.06**
E	Emission rate (lb/ton of trona)	0.0011	0.0002	BDL	**0.0004**
Ethylbenzene					
C	Concentration (ppm)	0.24	0.40	0.55	**0.40**
E	Emission rate (lb/hr)	0.73	0.94	1.41	**1.03**
E	Emission rate (lb/ton of trona)	0.0054	0.0070	0.0104	**0.0076**
2-Butanone					
C	Concentration (ppm)	0.09	0.46	0.58	**0.38**
E	Emission rate (lb/hr)	0.19	0.73	1.01	**0.64**
E	Emission rate (lb/ton of trona)	0.0014	0.0054	0.0075	**0.0048**
Hexane					
C	Concentration (ppm)	0.03	0.06	0.08	**0.06**
E	Emission rate (lb/hr)	0.07	0.11	0.17	**0.12**
E	Emission rate (lb/ton of trona)	0.0005	0.0008	0.0012	**0.0009**
Styrene					
C	Concentration (ppm)	0.08	0.30	0.26	**0.21**
E	Emission rate (lb/hr)	0.24	0.69	0.65	**0.53**
E	Emission rate (lb/ton of trona)	0.0018	0.0051	0.0048	**0.0039**
Toluene					
C	Concentration (ppm)	0.45	1.09	1.20	**0.91**
E	Emission rate (lb/hr)	1.19	2.23	2.67	**2.03**
E	Emission rate (lb/ton of trona)	0.0088	0.0165	0.0198	**0.0150**
Xylene					
C	Concentration (ppm)	1.22	1.84	2.08	**1.71**
E	Emission rate (lb/hr)	3.70	4.33	5.33	**4.46**
E	Emission rate (lb/ton of trona)	0.0274	0.0321	0.0395	**0.0330**
Total HAPs					
E	Emission rate (lb/hr)	8.66	13.61	16.34	**12.87**
E	Emission rate (lb/ton of trona)	0.0642	0.1008	0.1210	**0.0953**

[1] Process conditions provided by Solvay Minerals, Inc.
[2] Flow conditions obtained from concurrent Method 1-4 testing.
[3] NF indicates the compound was not found. A value of zero is used for NF to calculate the average.

SOLVAY2016_6_001711

RESULTS

Table 2-5:
CA 1&2 Calciner Stack - Total Hydrocarbons

Run No.		4	5	6	Average
Date (1996)		November 14	November 14	November 14	
Start Time (approx.)		09:17	10:45	12:19	
Stop Time (approx.)		10:34	12:09	13:40	
Process Conditions[1]					
Feed rate (ton/hr)		152	152	152	**152**
Gas Conditions[2]					
T_s	Temperature (°F)	322	322	322	**322**
O_2	Oxygen (dry volume %)	15.7	15.7	16.0	**15.8**
CO_2	Carbon Dioxide (dry volume %)	5.7	5.7	5.4	**5.6**
B_{wo}	Moisture (volume %)	18.93	19.87	19.20	**19.33**
Q_{std}	Standard conditions (dscfm)	140,800	142,700	140,400	**141,300**
Total Hydrocarbons (as propane)					
C	Concentration (ppmdv)	374.8	379.3	338.4	**364.2**
E	Emission rate (lb/hr)	362.4	371.7	326.3	**353.5**
E	Emission rate (lb/ton of trona)	2.3843	2.4453	2.1466	**2.3254**

1 Process conditions obtained from Solvay Minerals, Inc.
2 Gas conditions obtained from concurrent Method 1-4 testing.

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RESULTS

Table 2-6:
CA 1&2 Calciner Stack - GCMS HAPs

Run No.		4	5	6	Average
Date (1996)		November 14	November 14	November 14	
Start Time (approx.)		09:17	10:45	12:19	
Stop Time (approx.)		10:34	12:09	13:40	
Process Conditions[1]					
Feed rate (ton of trona/hr)		152	152	152	**152**
Volumetric Flow Rate[2]					
Q_a	Actual conditions (acfm)	331,600	339,800	331,600	**334,300**
Q_{std}	Standard conditions (dscfm)	140,800	142,700	140,400	**141,300**
Benzene					
C	Concentration (ppm)	1.33	1.42	1.22	**1.32**
E	Emission rate (lb/hr)	2.28	2.46	2.08	**2.28**
E	Emission rate (lb/ton of trona)	0.0150	0.0162	0.0137	**0.0150**
1,3 Butadiene					
C	Concentration (ppm)	0.09	0.10	0.11	**0.10**
E	Emission rate (lb/hr)	0.11	0.12	0.13	**0.12**
E	Emission rate (lb/ton of trona)	0.0007	0.0008	0.0009	**0.0008**
Ethylbenzene					
C	Concentration (ppm)	0.09	0.10	0.09	**0.09**
E	Emission rate (lb/hr)	0.21	0.24	0.21	**0.22**
E	Emission rate (lb/ton of trona)	0.0014	0.0016	0.0014	**0.0014**
2-Butanone					
C	Concentration (ppm)	0.40	0.40	0.36	**0.39**
E	Emission rate (lb/hr)	0.63	0.64	0.57	**0.61**
E	Emission rate (lb/ton of trona)	0.0042	0.0042	0.0037	**0.0040**
Hexane					
C	Concentration (ppm)	0.08	0.07	0.07	**0.07**
E	Emission rate (lb/hr)	0.15	0.13	0.13	**0.14**
E	Emission rate (lb/ton of trona)	0.0010	0.0009	0.0009	**0.0009**
Styrene					
C	Concentration (ppm)	0.12	0.13	0.09	**0.11**
E	Emission rate (lb/hr)	0.27	0.30	0.20	**0.26**
E	Emission rate (lb/ton of trona)	0.0018	0.0020	0.0013	**0.0017**
Toluene					
C	Concentration (ppm)	0.62	0.65	0.59	**0.62**
E	Emission rate (lb/hr)	1.25	1.33	1.19	**1.26**
E	Emission rate (lb/ton of trona)	0.0082	0.0088	0.0078	**0.0083**
Xylene					
C	Concentration (ppm)	0.81	0.80	0.80	**0.80**
E	Emission rate (lb/hr)	1.89	1.89	1.86	**1.88**
E	Emission rate (lb/ton of trona)	0.0124	0.0124	0.0122	**0.0123**
Total HAPs					
E	Emission rate (lb/hr)	6.79	7.11	6.37	**6.76**
E	Emission rate (lb/ton of trona)	0.0447	0.0468	0.0419	**0.0445**

[1] Process conditions provided by Solvay Minerals, Inc.
[2] Flow conditions obtained from concurrent Method 1-4 testing.

SOLVAY2016-6-001713

Description of Installation

SOLVAY2016_6_001714

DESCRIPTION OF INSTALLATION

Solvay Minerals, Inc., located near Green River, Wyoming, is a mine and refinery with corporate offices in Houston, Texas. Soda ash operations at the Green River, Wyoming facility began initial production in May of 1982. On May 27, 1992 Solvay S.A. of Belgium purchased the Green River facilities from Tenneco, Inc. and changed the name to Solvay Minerals, Inc.

The primary raw material for the Green River facility is sodium sesquicarbonate which is 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. At the completion of the refining process the caustic soda and the sodium sulfite 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.

A schematic of the process shown in Figure 3-1.

DESCRIPTION OF INSTALLATION

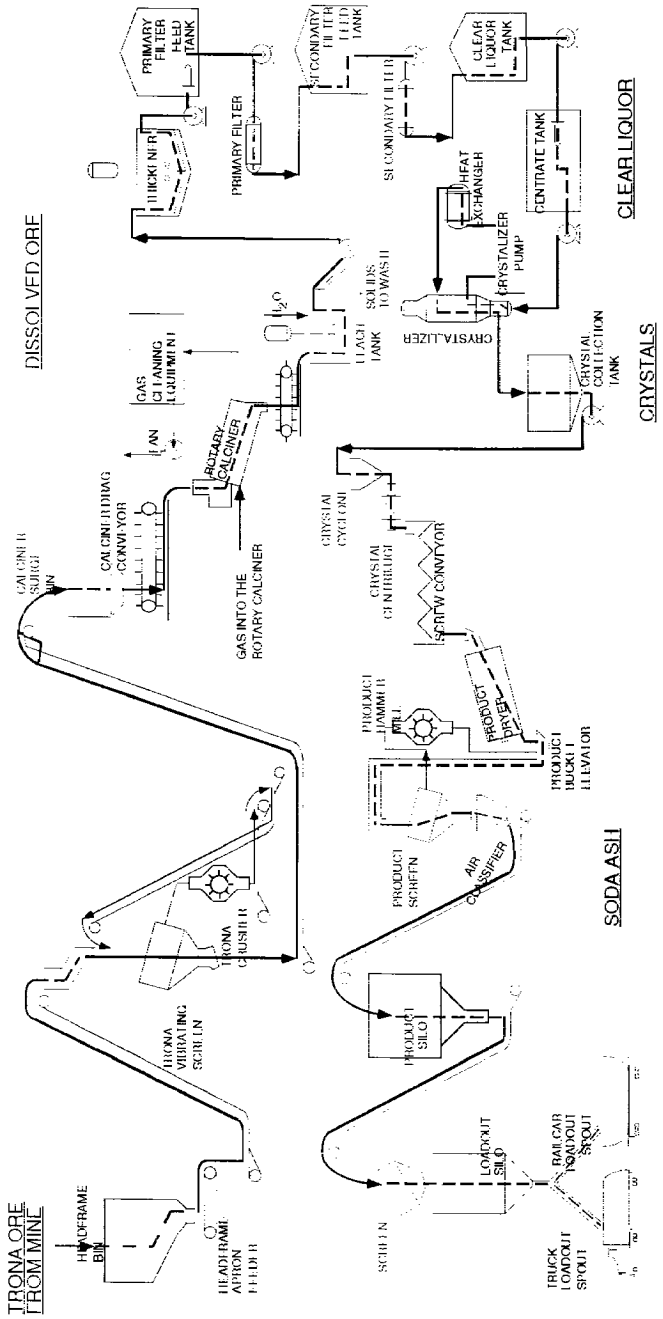


Figure 3-1: Process Schematic

SOLVAY2016_6_001716

Methodology

METHODOLOGY

The sampling followed procedures as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3, 4, 25A and HAPSITE GCMS. The following table summarizes the methods and their respective sources.

Table 4-1:
Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A	
Method 1	"Sample and Velocity Traverses 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 Dry Molecular Weight"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 25A	"Determination of Total Gaseous Organic Concentrations using a Flame Ionization Analyzer (FIA)"
GCMS	Determination of Gaseous Organic Compounds by Direct Interface Gas Chromatography-Mass Spectrometry

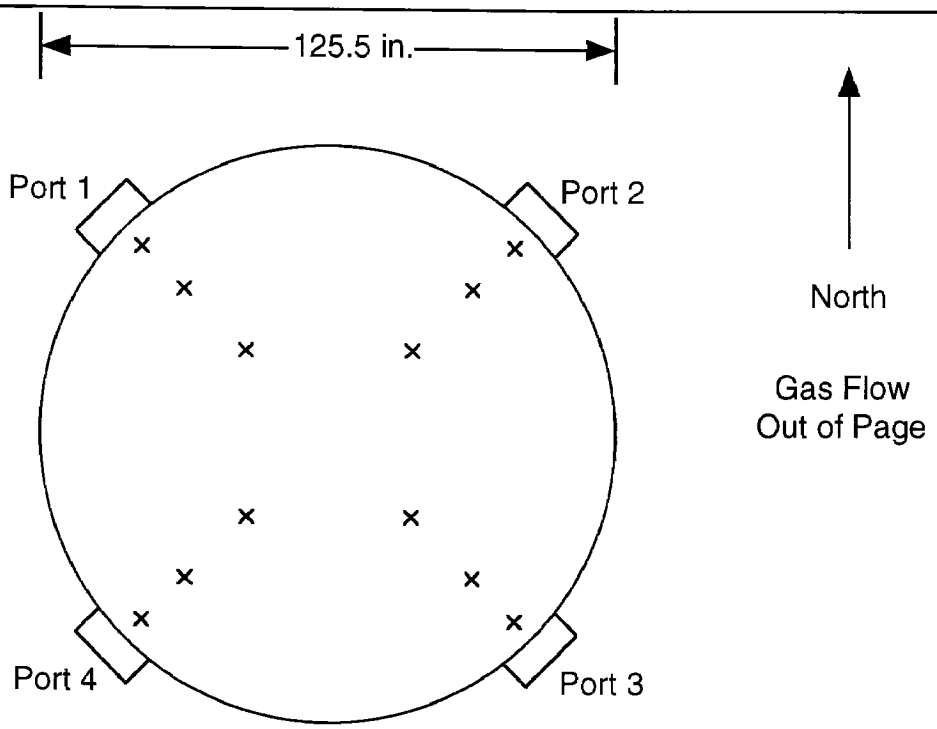
These sampling, recovery and analytical procedures are summarized on pages 4-2 through 4-11.

All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site. A post calibration was performed on each meter box at the conclusion of testing to verify that calibration was maintained throughout the test program. Calibration sheets can be found in Appendix Section C.

METHODOLOGY

SAMPLING POINT DETERMINATION

Sampling point locations were determined according to EPA Method 1.



Traverse Point	Port to Point Distance (in.)
1	37.1
2	18.3
3	5.5

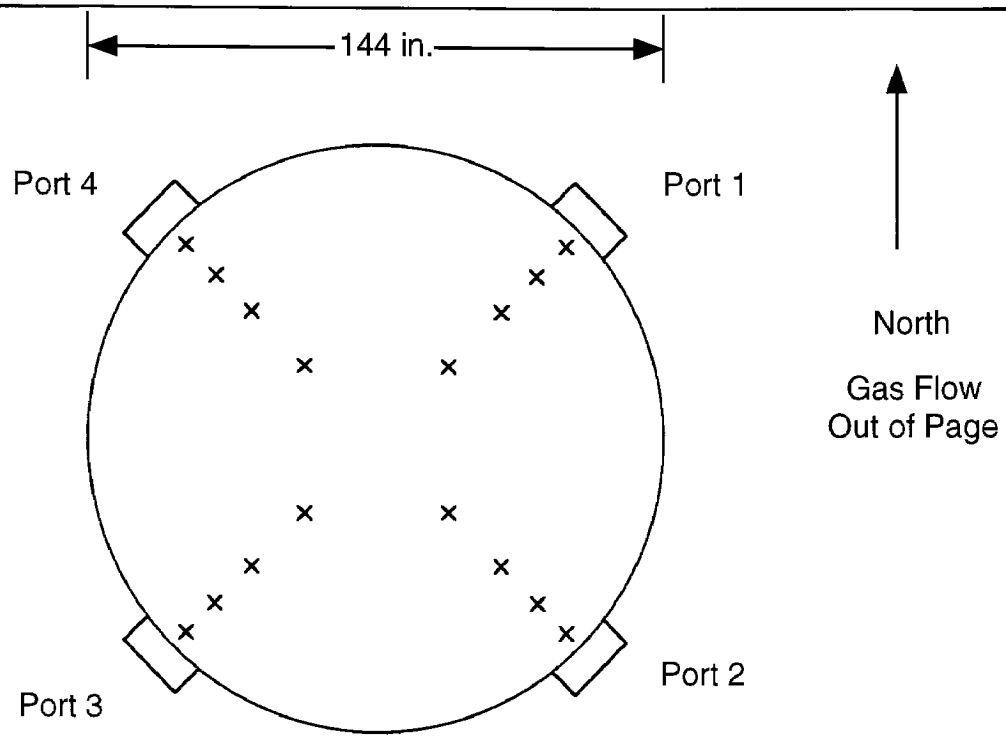
Diameters to upstream disturbance: 9.0 Limit: 2.0
Diameters to downstream disturbance: 5.5 Limit: 0.5

Figure 4-1: CA-3 Calciner Stack Velocity and Moisture Sampling Point Determination (EPA Method 1)

SOLVAY2016_4_001719

METHODOLOGY

SAMPLING POINT DETERMINATION (CONTINUED)



Traverse Point	Port to Point Distance (in.)
1	46.5
2	27.9
3	15.1
4	4.6

Diameters to upstream disturbance: 3.6 Limit: 2.0
Diameters to downstream disturbance: 4.4 Limit: 0.5

Figure 4-2: CA 1 & 2 Calciner Stack Velocity and Moisture Sampling Point Determination (EPA Method 1)

SOLVAY2016-6-001720

METHODOLOGY

VELOCITY AND VOLUMETRIC FLOW RATE - EPA METHOD 2

EPA Method 2 was used, in conjunction with Method 25A and GCMS testing, to determine the gas velocity and flow rate at the sampling sites. Figure 4-3 includes the components of the EPA Method 2 sampling apparatus.

Each set of velocity determinations included the measurement of gas velocity pressure and gas temperature at each of the EPA Method 1 traverse points. The velocity pressures were measured with a Type S pitot tube. Gas temperature measurements were made using a Type K thermocouple and digital pyrometer.

GAS COMPOSITION AND MOLECULAR WEIGHT - EPA METHOD 3

In order to determine the oxygen (O_2) concentration, carbon dioxide (CO_2) concentration and gas molecular weight, a time-integrated sample of the gas was obtained and analyzed in accordance with EPA Method 3. The gas sample was collected into a vinyl sample bag from the Method 4 testing. The contents of the bag were analyzed for O_2 and CO_2 concentrations using an Orsat gas analyzer.

MOISTURE CONTENT - EPA METHOD 4

The flue gas moisture content at the sampling sites was determined in accordance with EPA Method 4. Figure 4-4 includes the components of the EPA Method 4 sampling apparatus. The gas moisture was determined by quantitatively condensing the water in chilled knock-out jars. The amount of moisture condensed was determined gravimetrically. A dry gas meter was used to measure the volume of gas sampled. The amount of water condensed and the volume of gas sampled were used to calculate the gas moisture content in accordance with EPA Method 4.

METHODOLOGY

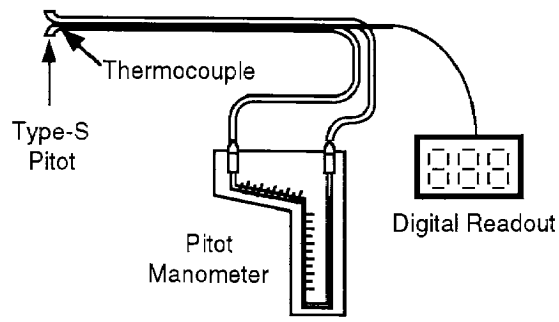
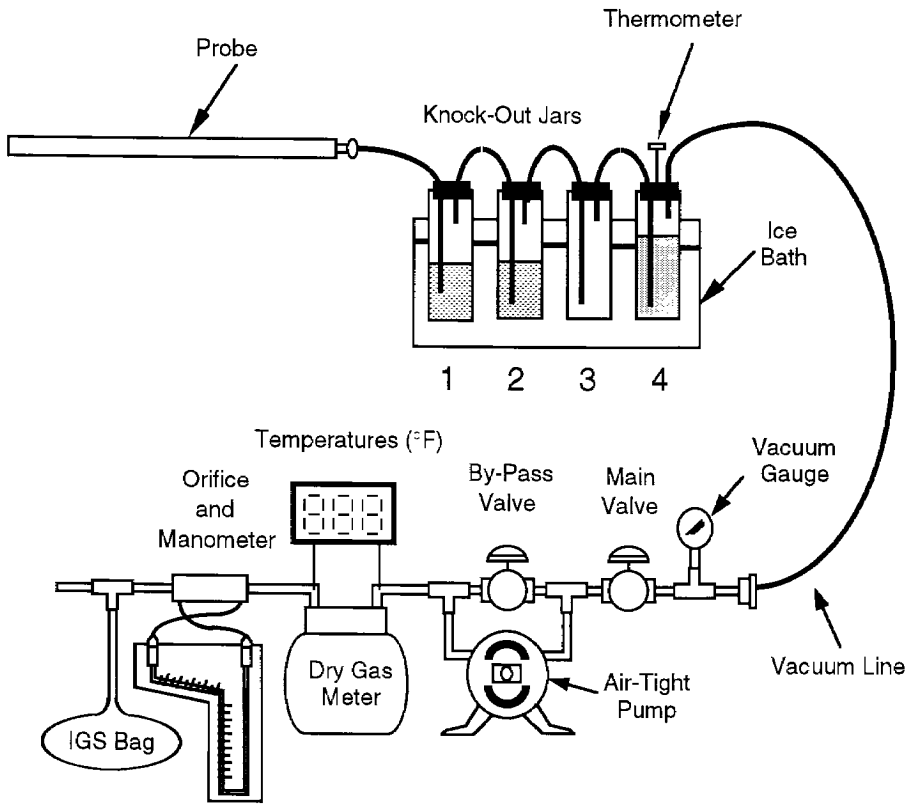


Figure 4-3: EPA Method 2 Sampling Apparatus



Knock-out Jar Contents
1) 100 ml water
2) 100 ml water
3) Empty
4) 300 g silica gel

Figure 4-4: EPA Methods 3 and 4 Sampling Apparatus

SOLVAY2016_8_001722

METHODOLOGY

TOTAL HYDROCARBONS - EPA METHOD 25A

Gaseous monitoring of total hydrocarbon (THC) emissions from the CA-3 and CA 1 & 2 Calciner Stacks was performed using EPA Method 25A. A gas sample was continuously extracted from the stack and delivered to a Flame Ionization Analyzer (FIA) which measured the THC concentration in the gas on a wet volumetric basis. The analyzer was calibrated on-site using certified mixtures of calibration gases.

Figure 4-5 contains a general schematic of the THC monitoring system. The system utilized a heated stainless steel probe for gas withdrawal. The end of the probe was equipped with a glass fiber filter for particulate removal. The exit of the probe was connected to a heated three-way stainless steel valve which facilitated system calibrations. A heated Teflon sample line delivered the sample gases from the stack to the instrumental system, which was located at ground level. The heated sample line was designed to maintain the gas temperature above 250°F in order to prevent condensation of stack gas moisture within the line.

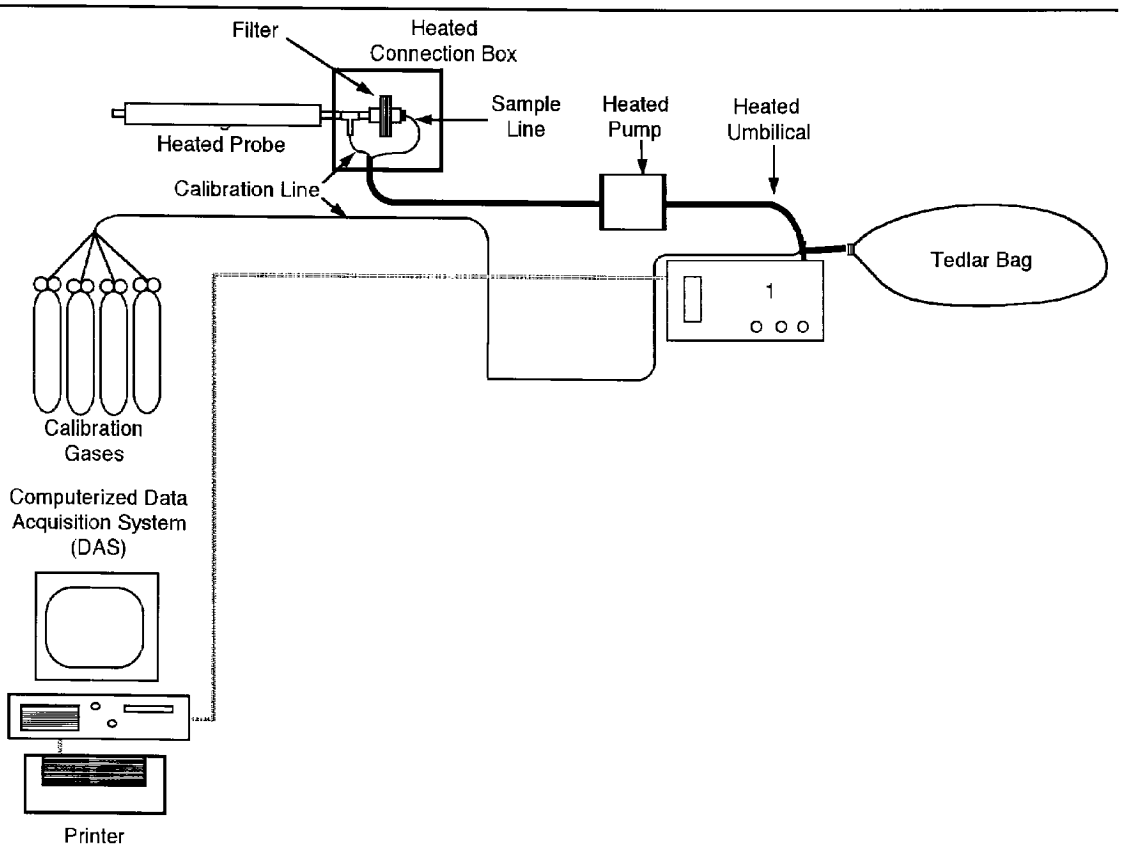
The gas stream remained heated and was transported directly into a J.U.M. Engineering Model VE-7 Flame Ionization Analyzer. The THC analyzer contained a heated pump for gas delivery.

The analyzer was calibrated according to the reference method procedures using EPA Protocol No. 1 certified gas mixtures of propane in nitrogen. Before testing, the analyzer was calibrated by introducing zero and high-level (80-90% of span) gases into the sampling line at the exit of the heated probe and making any appropriate analyzer adjustments based on the analyzer response. Then, the calibration error of the system was determined by introducing low-level (25-35% of span) and mid-level (45-55% of span) gases into the analyzer system and recording the response without any adjustments made to the analyzer. The calibration errors for the low-level and mid-level gases were demonstrated to be less than 5% of the respective gas cylinder values.

Immediately following each of the three test runs, the zero gas and one up-scale gas were introduced into the sampling system to check for calibration drift. In order for a test run to be considered valid, the calibration drift between the pre-test and post-test calibrations were required to be demonstrated to be less than 3% of the analyzer span. The results of the pre-test and post-test drift checks were used to correct the average flue gas concentration measured during each test run for analyzer drift during that period.

METHODOLOGY

TOTAL HYDROCARBONS (CONTINUED)



No	Gas	Monitor	Range Used	Calibration Gas Concentrations
1)	THC	JUM VE-7	0-1000 ppm	252.45 ppm, 470.0 ppm, 852.2 ppm

Figure 4-5: THC Sampling System Schematic

METHODOLOGY

DETERMINATION OF ORGANIC COMPOUNDS USING DIRECT INTERFACE GCMS

The Leybold Inficon GCMS instrument (HAPSITE) is a field-portable gas chromatograph/mass spectrometer that accepts gaseous samples. It has two major components; an analytical module and a service module. The instrument can be used to sample and analyze ambient air or it can be used with a separate sampling system for direct interface source testing applications. Its initial design is for analysis of gaseous samples containing ppb to ppm levels of 36 selected volatile organic compounds.

The analytical module may be connected to the service module for continuous uninterrupted operation. The instrument consists of a:

(1) heated transfer line and inlet valve array,
(2) GC oven and column system,
(3) membrane interface,
(4) quadrupole mass spectrometer,
(5) roughing and turbo molecular pumps, and
(6) computer and data storage capabilities.

The instrument uses two internal compressed gas cylinders (canisters) containing approximately 20 standard liters of gas. Ultra pure nitrogen is used as a carrier gas. A mixture of two internal standards is used to continually monitor and verify instrument performance. Alternately, the HAPSITE may be operated using an external cylinder of nitrogen as the carrier gas.

A field analytical method has been prepared that can quantify 36 volatile organic hazardous air pollutants ("VOHAP'S"), which are part of the 189 HAP compounds listed in the 1990 Clean Air Act Amendments, Title III; and which also comprise part of the target analyte list in US EPA SW0846 Method 8240B (Federal Register, Vol. 52, No. 131, July 8, 1987, Appendix IX). The target analytes of interest at this time are specified in the draft method. The measurement system is capable of quantifying other compounds, and the target analyte list may be expanded in future work. The dynamic measurement range for the individual VOHAP'S is from approximately 150 ppb to 100 ppm. Higher concentrations can be quantified by using appropriate dynamic dilution techniques.

METHODOLOGY

DETERMINATION OF ORGANIC COMPOUNDS USING DIRECT INTERFACE GCMS (CONTINUED)

Two internal standards (1,3,5-trifluoromethylbenzene and Bromopentafluorobenzene) at approximately 100 and 50 ppm concentrations are prepared in a balance of nitrogen. This blend is used to:

(1) establish the initial instrument performance,
(2) continually verify instrument performance based upon their co-injection into the gas chromatograph with both effluent and calibration gas samples at a 1:10 ratio,
(3) compensate for potential mass spectrometer drift (by the use of relative response factors during initial calibration, continuing system calibration, and in data quantification).

The mixture is prepared and certified by Scott Specially Gases, Inc. to provide enhanced quality and traceability as compared to relying on individual analysts to prepare standards. These two internal standards were chosen because:

(1) they are not naturally occurring and are not found in source effluent,
(2) they have retention times that span the measurement range (tris elutes after 2 minutes and BPFB elutes after 6 minutes),
(3) they have major mass fragments that are close to those of the target analyte major mass fragments (tris major mass fragment is 69, and BPFB major mass fragment is 117),
(4) they are stable in the internal standard canisters, and
(5) they have sufficient vapor pressure so that they may be pressurized at the requisite concentrations.

The gas sample containing the internal standards is injected on the capillary GC column. The GC is operated under isothermal conditions (60°C), and the analytes are separated during a 10 to 12 minute period. The instrument is capable of directly sampling a humidified air sample containing up to 8% moisture by volume. Gas samples having a moisture content greater than 8% must be dried before introduction into the GC in order to prevent condensation within the instrument. A prototype sampling system capable of providing appropriately conditioned samples to the instrument is described below.

METHODOLOGY

DETERMINATION OF ORGANIC COMPOUNDS USING DIRECT INTERFACE GCMS (CONTINUED)

Gas samples must be introduced at the inlet to the instrument at atmospheric pressure to ensure that a uniform amount of internal standard mixture is co-added to every sample. Monitoring the response factors of the internal standards from run to run and maintaining the strict QA standards ensures uniform injection. Components elute from the GC column and enter the mass spectrometer ionizer assembly through a polydimethylsilicone membrane interface. The membrane is maintained at constant temperature (70°C), and excludes the majority of GC carrier gas from the MS vacuum. Operation of the column and membrane at these temperatures ensures that the retention times remain constant. Monitoring the retention time QA criteria ensures that these temperatures remain stable.

The separated compounds produce characteristic 70 eV electron ionization spectra under instrument tune conditions that produce a "standard" spectrum for the MS tuning compounds on every run. Ion intensity data may be acquired in either full-scan or selected-ion monitoring (SIM) modes. Target compounds are identified by their GC retention times and by comparison of their mass spectra to calibration and National Institute of Standards (NIST) Library spectra. Quantification is accomplished by applying a relative response factor (derived from the initial calibration), and ratioing the designated target analyte quant-ion to the nearest internal standard quant-ion. Average relative response factors (ARRFs) are obtained from an initial 3-point calibration and compared to relative response factors (RRF's) derived from continuing calibrations. The run-to-run stability of the analyte RRF's is assured by comparing the individual internal standard mass spectra from each run with that from the initial calibrations.

The HAPSITE instrument may be operated in the SIM or SCAN mode. The decision point to use either the SIM or SCAN modes depends on the required detection limits. In full SCAN, the quadrapole scans all masses from 45 to 300 amu. In contrast, use of the SIM mode allows the quadrupole mass filter to scan across a very small mass range or perhaps even a single ion. Increasing the number of scans or integration time across each GC peak increases the sensitivity (S/N ratio) and thus lowers the detection limits for the particular compounds (s) of interest. The S/N ratio increases by the square root of the number of scans across the individual eluting peaks. The trade off between the SIM and SCAN modes is a relative loss in information because the compounds mass spectrum is limited to only the ions scanned. The same mode must be consistently used for constructing the initial three-point calibration, performing continuing calibrations, and analyzing samples. The method described here uses the instrument in the full scan mode for the concurrent measurement of the target analytes.

METHODOLOGY

DETERMINATION OF ORGANIC COMPOUNDS USING DIRECT INTERFACE GCMS (CONTINUED)

Instrument Analytical Method

This GCMS analytical method involves the following basic steps in the measurement process:

(1) establish instrumental function in tune,
(2) generate instrument calibration and,
(3) analyze unknown samples.

Mixtures are injected on the GC column for separation, and eluting compounds interface with the mass spectrometer through the membrane. Compounds are ionized and the resulting positively charged mass fragments are separated by the quadrupole mass filter. Detection of the ions is accomplished with an electron multiplier. The nature of the measurement process allows for the positive identification and quantification of many compounds because they are separated both by their GC retention time and by their mass spectra. The GCMS method is virtually free of analytical interference's because of the two fold separation of compounds.

Appendix

APPENDIX

SAMPLE CALCULATIONS ..... A
PARAMETERS ..... B
CALIBRATION DATA C
FIELD DATA ..... D
FIELD DATA PRINTOUTS ..... E
OPERATING DATA ..... F

SOLVAY2016_6_001730

A

SAMPLE CALCULATIONS

A

SAMPLE CALCULATIONS
CA 3 CALCINER STACK - RUN 1

The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04707)(V_{lc})$$
$$= (0.04707)(220.0)$$
$$= 10.36 \text{ wscf}$$

Where:

V_{lc}	total volume of liquid collected in impingers and silica gel (ml)
V_{wstd}	volume of water collected at standard conditions (ft^3)
0.04707	conversion factor (ft^3/ml)

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$
$$= \frac{(17.64)(43.38)\left(23.80 + \frac{1.50}{13.6}\right)(0.9936)}{(460 + 84)}$$
$$= 33.44 \text{ dscf}$$

Where:

P_{bar}	barometric pressure (in. Hg)
T_m	average dry gas meter temperature (°F)
V_m	volume of gas sample through the dry gas meter at meter conditions (ft^3)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
Y_d	gas meter correction factor (dimensionless)
ΔH	average pressure drop across meter box orifice (in. H_2O)
17.64	conversion factor (°R/in. Hg)
13.6	conversion factor (in. H_2O/in. Hg)
460	°F to °R conversion constant

SAMPLE CALCULATIONS (CONTINUED)

3. Sample gas pressure (in. Hg)

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

$$= 23.80 + \left(\frac{-0.3}{13.6}\right)$$

$$= 23.78 \text{ in. Hg}$$

Where:

P_{bar}	barometric pressure (in. Hg)
P_g	sample gas static pressure (in. H_2O)
P_s	absolute sample gas pressure (in. Hg)
13.6	conversion factor (in. H_2O/in. Hg)

4. Actual vapor pressure (in. Hg)[1]

$$P_v = P_s$$

$$= 23.78 \text{ in. Hg}$$

Where:

P_v	vapor pressure, actual (in. Hg)
P_s	absolute sample gas pressure (in. Hg)

5. Moisture content (%)

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$$

$$= \frac{10.36}{33.44 + 10.36}$$

$$= 0.2365$$

$$\times 100\% = 23.65\,\%$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume (%)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
V_{wstd}	volume of water collected at standard conditions (ft^3)

[1] For effluent gas temperatures over 212°F, P_v is assumed to be equal to P_s.

SAMPLE CALCULATIONS (CONTINUED)

6. Saturated moisture content (%)

$$B_{ws} = \frac{(P_v)}{(P_s)}$$

$$= \frac{(23.78)}{(23.78)}$$

$$= 1.0$$

$$\times 100\% = 100.0\ \%$$

Where:

B_{ws}	proportion of water vapor in the gas stream by volume at saturated conditions (%)
P_s	absolute sample gas pressure (in. Hg)
P_v	vapor pressure, actual (in. Hg)

Whichever moisture value is smaller is used for B_{wo} in the following calculations.

7. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = M_{CO_2}\frac{(CO_2)}{(100)} + M_{O_2}\frac{(O_2)}{(100)} + M_{CO+N_2}\frac{(CO+N_2)}{(100)}$$

$$= 44.0\frac{(7.4)}{(100)} + 32.0\frac{(14.2)}{(100)} + 28.0\frac{(78.4)}{(100)}$$

$$= 29.75\ \frac{lb}{lb \cdot mole}$$

Where:

M_d	dry molecular weight of sample gas (lb/lb·mole)
M_{CO_2}	molecular weight of carbon dioxide (lb/lb·mole)
M_{O_2}	molecular weight of oxygen (lb/lb·mole)
M_{CO+N2}	molecular weight of carbon monoxide and nitrogen (lb/lb·mole)
CO_2	proportion of carbon dioxide in the gas stream by volume (%)
O_2	proportion of oxygen in the gas stream by volume (%)
$CO+N_2$	proportion of carbon monoxide and nitrogen in the gas stream by volume (%)
100	conversion factor (%)

SAMPLE CALCULATIONS (CONTINUED)

8. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_{wo}) + (M_{H_2O})(B_{wo})$$
$$= (29.75)(1 - 0.2365) + (18.0)(0.2365)$$
$$= 26.97 \frac{\text{lb}}{\text{lb} \cdot \text{mole}}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
M_d	dry molecular weight of sample gas (lb/lb·mole)
M_{H_2O}	molecular weight of water (lb/lb·mole)
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)

9. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_p)(\sqrt{\Delta P})\left(\sqrt{\frac{(T_s + 460)}{(M_s)(P_s)}}\right)$$
$$= (85.49)(0.84)(0.403)\left(\sqrt{\frac{(307 + 460)}{(26.97)(23.78)}}\right)$$
$$= 31.7 \frac{\text{ft}}{\text{sec}}$$

Where:

K_p	velocity pressure coefficient (dimensionless)
C_p	pitot tube constant
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)
P_s	absolute sample gas pressure (in. Hg)
T_s	average sample gas temperature (°F)
V_s	sample gas velocity (ft/sec)
$\sqrt{\Delta P}$	average square roots of velocity heads of sample gas (in. H_2O)
460	°F to °R conversion constant

10. Total flow of sample gas (acfm)

$$Q_a = (60)(A_s)(V_s)$$
$$= (60)(85.90)(31.7)$$
$$= 163{,}300 \text{ acfm}$$

Where:

A_s	cross sectional area of sampling location (ft^2)
Q_a	volumetric flow rate at actual conditions (acfm)
V_s	sample gas velocity (ft/sec)
60	conversion factor (sec/min)

SAMPLE CALCULATIONS (CONTINUED)

11. Total flow of sample gas (dscfm)

$$Q_{std} = \frac{(Q_a)(P_s)(17.64)(1-B_{wo})}{(\overline{T_s}+460)}$$

$$= \frac{(163{,}300)(23.78)(17.64)(1-0.2365)}{(307+460)}$$

$$= 68{,}170 \text{ dscfm}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
P_s	absolute sample gas pressure (in. Hg)
Q_a	volumetric flow rate at actual conditions (acfm)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
T_s	average sample gas temperature (°F)
17.64	conversion factor (°R/in. Hg)
460	°F to °R conversion constant

12. Continuous emissions monitoring for total hydrocarbons (drift corrected in ppmwv)

$$C_{gas} = \left((C_{avg}) - \left(\frac{C_{oi}+C_{of}}{2}\right)\right)\frac{(C_{ma})}{\left(\left(\frac{C_{mi}+C_{mf}}{2}\right) - \left(\frac{C_{oi}+C_{of}}{2}\right)\right)}$$

$$= \left((586.0) - \left(\frac{0.5+6.8}{2}\right)\right)\frac{(852.2)}{\left(\left(\frac{854.4+871.8}{2}\right) - \left(\frac{0.5+6.8}{2}\right)\right)}$$

$$= 577.4 \text{ ppmwv}$$

Where:

C_{gas}	concentration corrected for drift (ppmwv)
C_{avg}	measured concentration in the gas stream (ppmwv)
C_{ma}	actual concentration of the upscale calibration gas (ppm)
C_{mi}	initial system calibration bias check response for the upscale calibration gas (ppm)
C_{mf}	final system calibration bias check response for the upscale calibration gas (ppm)
C_{oi}	initial system calibration bias check response for the zero gas (ppm)
C_{of}	final system calibration bias check response for the zero gas (ppm)

SAMPLE CALCULATIONS (CONTINUED)

13. Continuous emissions monitoring for total hydrocarbons as propane (moisture corrected to ppmdv)

$$C_{ppmdv} = \frac{(C_{ppmwv})}{(1-B_{wo})}$$

$$= \frac{(577.4)}{(1-0.2365)}$$

$$= 756.3 \text{ ppmdv}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
C_{ppmdv}	concentration calibrated for drift (ppmdv)
C_{ppmwv}	concentration calibrated for drift (ppmwv)

14. Continuous emissions monitoring for total hydrocarbons (lb/hr)[1]

$$E_{lb/hr} = \frac{(C_{ppm})(M_{THC})(Q_{std})(60)}{(385.3)(10^6)}$$

$$= \frac{(756.3)(44.10)(68,170)(60)}{(385.3)(10^6)}$$

$$= 354.0 \frac{lb}{hr}$$

Where:

C	measured concentration in the gas stream (ppmdv)
$E_{lb/hr}$	emission rate (lb/hr)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
M_{THC}	molecular weight of total hydrocarbons
10^6	conversion factor (ppm)
385.3	conversion factor (ft^3/lb·mole)
60	conversion factor (min/hr)

[1] The calculations for organic compounds are performed in a similar manner using their respective molecular weights.

SAMPLE CALCULATIONS (CONTINUED)

15. Continuous emissions monitoring for total hydrocarbons (lb/ton of trona)[1]

$$E_{lb/ton\ of\ trona} = \frac{\left(E_{lb/hr}\right)}{\left(E_{ton\ of\ trona/hr}\right)}$$

$$= \frac{(354.0)}{(160)}$$

$$= 2.2127 \frac{lb}{ton\ of\ trona}$$

Where:

$E_{lb/hr}$	emission rate (lb/hr)
$E_{ton\ of\ trona/hr}$	feed rate (ton of trona/hr)
$E_{lb/ton\ of\ trona}$	emission rate (lb/ton of trona)

[1] The calculations for organic compounds are performed in a similar manner.

B

PARAMETERS

B

SOLVAY MINERALS, INC.
CAE Project No: 7837-1
CA-3 Calciner Stack

VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (1996)		November 12	November 12	November 12
Start Time (approx.)		10:25	12:40	14:10
Stop Time (approx.)		11:30	13:43	15:15
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9936	0.9936	0.9936
C_p	Pitot tube coefficient	0.84	0.84	0.84
Pg	Static pressure (in. H_2O)	-0.3	-0.3	-0.3
A_s	Sample location area (ft^2)	85.90	85.90	85.90
P_{bar}	Barometric pressure (in. Hg)	23.80	23.80	23.80
O_2	Oxygen (dry volume %)	14.2	13.4	12.8
CO_2	Carbon dioxide (dry volume %)	7.4	8.3	8.8
V_c	Liquid collected (ml)	220.0	252.0	232.0
V_m	Volume metered, meter conditions (ft^3)	43.38	43.87	44.25
T_m	Dry gas meter temperature (°F)	84	91	93
T_s	Sample temperature (°F)	307	312	312
ΔH	Meter box orifice pressure drop (in. H_2O)	1.50	1.50	1.50
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	10.36	11.86	10.92
V_{mstd}	Volume metered, standard (ft^3)	33.44	33.37	33.56
P_s	Sample gas pressure, absolute (in. Hg)	23.78	23.78	23.78
P_v	Vapor pressure, actual (in. Hg)	23.78	23.78	23.78
B_{wo}	Moisture in sample (% by volume)	23.65	26.22	24.55
B_{ws}	Saturated moisture (% by volume)	100.00	100.00	100.00
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.403	0.448	0.460
M_d	MW of sample gas, dry (lb/lb-mole)	29.75	29.86	29.92
M_s	MW of sample gas, wet (lb/lb-mole)	26.97	26.75	26.99
V_s	Velocity of sample (ft/sec)	31.7	35.5	36.2
Q_a	Volumetric flow rate, actual (acfm)	163,300	182,900	186,600
Q_{std}	Volumetric flow rate, standard (dscfm)	68,170	73,260	76,540

SOLVAY MINERALS, INC.
CAE Project No: 7837-1
CA-3 Calciner Stack

CEM PARAMETERS

Run No.		1	2	3
Date (1996)		November 12	November 12	November 12
Start Time (approx.)		10:17	12:13	13:57
Stop Time (approx.)		12:00	13:44	15:40
Gas Conditions				
O_2	Oxygen (dry volume %)	14.2	13.4	12.8
CO_2	Carbon Dioxide (dry volume %)	7.4	8.3	8.8
B_{wo}	Moisture in sample (% by volume)	23.65	26.22	24.55
Q_{std}	Volumetric flow rate, standard (dscfm)	68,170	73,260	76,540
TOTAL HYDROCARBONS				
Data Acquisition				
C	Effluent gas concentration (ppmwv)	586.0	644.4	614.2
Calibration Gases				
C_{zi}	Calibration bias check, initial zero gas	0.5	6.8	15.7
C_{mi}	Calibration bias check, initial upscale gas	854.4	871.8	895.9
C_{zf}	Calibration bias check, final zero gas	6.8	15.7	0.3
C_{mf}	Calibration bias check, final upscale gas	871.8	895.9	903.8
C_{ma}	Actual concentration of upscale gas	852.2	852.2	852.2
Calculated Results				
C_{gas}	Concentration drift corrected (ppmwv)	577.4	618.3	579.2
C_{gas}	Concentration moisture corrected (ppmdv)	756.3	838.1	767.7
E	Emission rate (lb/hr)	354.0	421.6	403.5

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
CA 3 Calciner Stack

ORGANIC COMPOUNDS PARAMETERS

Run No.		**1**	**2**	**3**
Date (1996)		November 12	November 12	November 12
Start Time (approx.)		10:17	12:13	13:57
Stop Time (approx.)		12:00	13:44	15:40
Flow Results[1]				
Q_a	Volumetric flow rate, actual (acfm)	163,300	182,900	186,600
Q_{std}	Volumetric flow rate, standard (dscfm)	68,170	73,260	76,540
Benzene (MW=78.11)				
C	Concentration (ppm)	4.12	5.44	4.78
E	Emission rate (lb/hr)	3.42	4.85	4.45
1,3-Butadiene (MW=54.09)				
C	Concentration (ppm)	0.22	0.25	0.15
E	Emission rate (lb/hr)	0.13	0.15	0.10
Ethylbenzene (MW=106.16)				
C	Concentration (ppm)	0.56	0.65	0.69
E	Emission rate (lb/hr)	0.63	0.79	0.87
2-Butanone (MW=72.10)				
C	Concentration (ppm)	0.92	1.17	1.16
E	Emission rate (lb/hr)	0.70	0.96	1.00
n-Hexane (MW=86.17)				
C	Concentration (ppm)	0.08	0.08	0.22
E	Emission rate (lb/hr)	0.07	0.08	0.23
Styrene (MW=104.14)				
C	Concentration (ppm)	0.38	0.53	0.47
E	Emission rate (lb/hr)	0.42	0.63	0.58
Toluene (MW=92.13)				
C	Concentration (ppm)	1.67	2.22	2.08
E	Emission rate (lb/hr)	1.63	2.33	2.28
Xylene (MW=106.16)				
C	Concentration (ppm)	2.51	3.22	3.30
E	Emission rate (lb/hr)	2.83	3.90	4.18

[1] Flow conditions obtained from concurrent Method 1-4 testing.

SOLVAY MINERALS, INC.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (1996)		November 13	November 13	November 13
Start Time (approx.)		12:06	14:16	15:52
Stop Time (approx.)		13:14	15:21	17:00
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9936	0.9936	0.9936
C_p	Pitot tube coefficient	0.84	0.84	0.84
Pg	Static pressure (in. H_2O)	-0.3	-0.4	-0.4
A_s	Sample location area (ft^2)	113.10	113.10	113.10
P_{bar}	Barometric pressure (in. Hg)	23.65	23.65	23.65
O_2	Oxygen (dry volume %)	17.8	15.1	15.4
CO_2	Carbon dioxide (dry volume %)	3.3	6.1	5.8
V_b	Liquid collected (ml)	104.0	190.0	204.0
V_m	Volume metered, meter conditions (ft^3)	46.83	46.36	46.07
T_m	Dry gas meter temperature (°F)	75	78	74
T_s	Sample temperature (°F)	238	282	333
ΔH	Meter box orifice pressure drop (in. H_2O)	1.50	1.50	1.50
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	4.90	8.94	9.60
V_{mstd}	Volume metered, standard (ft^3)	36.43	35.91	35.95
P_s	Sample gas pressure, absolute (in. Hg)	23.63	23.62	23.62
P_v	Vapor pressure, actual (in. Hg)	23.63	23.62	23.62
B_{wo}	Moisture in sample (% by volume)	11.85	19.94	21.08
B_{ws}	Saturated moisture (% by volume)	100.00	100.00	100.00
$\sqrt{\Delta P}$	Velocity head ($\sqrt{\text{in. } H_2O}$)	0.696	0.605	0.690
M_d	MW of sample gas, dry (lb/lb-mole)	29.24	29.58	29.54
M_s	MW of sample gas, wet (lb/lb-mole)	27.91	27.27	27.11
V_s	Velocity of sample (ft/sec)	51.4	46.6	55.1
Q_a	Volumetric flow rate, actual (acfm)	349,100	316,300	373,900
Q_{std}	Volumetric flow rate, standard (dscfm)	183,700	142,300	155,100

SOLVAY MINERALS, INC.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM PARAMETERS

Run No.		1	2	3
Date (1996)		November 13	November 13	November 13
Start Time (approx.)		11:51	13:38	15:41
Stop Time (approx.)		13:27	15:26	17:27
Gas Conditions				
O_2	Oxygen (dry volume %)	17.8	15.1	15.4
CO_2	Carbon Dioxide (dry volume %)	3.3	6.1	5.8
B_{wo}	Moisture in sample (% by volume)	11.85	19.94	21.08
Q_{std}	Volumetric flow rate, standard (dscfm)	183,700	142,300	155,100
TOTAL HYDROCARBONS				
Data Acquisition				
C	Effluent gas concentration (ppmwv)	357.8	493.7	538.6
Calibration Gases				
C_{ti}	Calibration bias check, initial zero gas	2.1	4.6	18.9
C_{mi}	Calibration bias check, initial upscale gas	482.3	467.2	497.8
C_{tf}	Calibration bias check, final zero gas	4.6	18.9	20.5
C_{mf}	Calibration bias check, final upscale gas	467.2	497.8	495.7
C_{ma}	Actual concentration of upscale gas	470.0	470.0	470.0
Calculated Results				
C_{gas}	Concentration drift corrected (ppmwv)	353.4	481.2	511.2
C_{gas}	Concentration moisture corrected (ppmdv)	400.9	601.0	647.8
E	Emission rate (lb/hr)	505.6	587.3	689.9

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
CA 1&2 Calciner Stack

ORGANIC COMPOUNDS PARAMETERS

Run No.		**1**	**2**	**3**
Date (1996)		November 13	November 13	November 13
Start Time (approx.)		11:51	13:38	15:41
Stop Time (approx.)		13:27	15:26	17:27
Flow Results[1]				
Q_a	Volumetric flow rate, actual (acfm)	349,100	316,300	373,900
Q_{std}	Volumetric flow rate, standard (dscfm)	183,700	142,300	155,100
Benzene (MW=78.11)				
C	Concentration (ppm)	1.07	2.63	2.70
E	Emission rate (lb/hr)	2.39	4.55	5.09
1,3-Butadiene (MW=54.09)[2]				
C	Concentration (ppm)	0.10	0.02	NF
E	Emission rate (lb/hr)	0.15	0.02	NF
Ethylbenzene (MW=106.16)				
C	Concentration (ppm)	0.24	0.40	0.55
E	Emission rate (lb/hr)	0.73	0.94	1.41
2-Butanone (MW=72.10)				
C	Concentration (ppm)	0.09	0.46	0.58
E	Emission rate (lb/hr)	0.19	0.73	1.01
n-Hexane (MW=86.17)				
C	Concentration (ppm)	0.03	0.06	0.08
E	Emission rate (lb/hr)	0.07	0.11	0.17
Styrene (MW=104.14)				
C	Concentration (ppm)	0.08	0.30	0.26
E	Emission rate (lb/hr)	0.24	0.69	0.65
Toluene (MW=92.13)				
C	Concentration (ppm)	0.45	1.09	1.20
E	Emission rate (lb/hr)	1.19	2.23	2.67
Xylene (MW=106.16)				
C	Concentration (ppm)	1.22	1.84	2.08
E	Emission rate (lb/hr)	3.70	4.33	5.33

[1] Flow conditions obtained from concurrent Method 1-4 testing.
[2] NF indicates the compound was not found.

SOLVAY MINERALS, INC.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

VELOCITY AND MOISTURE PARAMETERS

Run No.		4	5	6
Date (1996)		November 14	November 14	November 14
Start Time (approx.)		09:15	10:53	12:30
Stop Time (approx.)		10:21	11:58	13:37
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9936	0.9936	0.9936
C_p	Pitot tube coefficient	0.84	0.84	0.84
Pg	Static pressure (in. H_2O)	-0.3	-0.3	-0.3
A_s	Sample location area (ft^2)	113.10	113.10	113.10
P_{bar}	Barometric pressure (in. Hg)	23.25	23.25	23.25
O_2	Oxygen (dry volume %)	15.7	15.7	16.0
CO_2	Carbon dioxide (dry volume %)	5.7	5.7	5.4
V_c	Liquid collected (ml)	180.0	191.0	180.0
V_m	Volume metered, meter conditions (ft^3)	45.56	45.37	44.75
T_m	Dry gas meter temperature (°F)	54	52	54
T_s	Sample temperature (°F)	322	322	322
ΔH	Meter box orifice pressure drop (in. H_2O)	1.50	1.50	1.50
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	8.47	8.99	8.47
V_{mstd}	Volume metered, standard (ft^3)	36.29	36.25	35.66
P_s	Sample gas pressure, absolute (in. Hg)	23.23	23.23	23.23
P_v	Vapor pressure, actual (in. Hg)	23.23	23.23	23.23
B_{wo}	Moisture in sample (% by volume)	18.93	19.87	19.20
B_{ws}	Saturated moisture (% by volume)	100.00	100.00	100.00
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.613	0.627	0.613
M_d	MW of sample gas, dry (lb/lb-mole)	29.54	29.54	29.50
M_s	MW of sample gas, wet (lb/lb-mole)	27.36	27.25	27.30
V_s	Velocity of sample (ft/sec)	48.9	50.1	48.9
Q_a	Volumetric flow rate, actual (acfm)	331,600	339,800	331,600
Q_{std}	Volumetric flow rate, standard (dscfm)	140,800	142,700	140,400

SOLVAY MINERALS, INC.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM PARAMETERS

Run No.		4	5	6
Date (1996)		November 14	November 14	November 14
Start Time (approx.)		09:17	10:45	12:19
Stop Time (approx.)		10:34	12:09	13:40
Gas Conditions				
O_2	Oxygen (dry volume %)	15.7	15.7	16.0
CO_2	Carbon Dioxide (dry volume %)	5.7	5.7	5.4
B_{wo}	Moisture in sample (% by volume)	18.93	19.87	19.20
Q_{std}	Volumetric flow rate, standard (dscfm)	140,800	142,700	140,400
TOTAL HYDROCARBONS				
Data Acquisition				
C	Effluent gas concentration (ppmwv)	308.8	307.5	279.8
Calibration Gases				
C_{zi}	Calibration bias check, initial zero gas	0.6	5.4	6.7
C_{mi}	Calibration bias check, initial upscale gas	477.4	474.5	469.9
C_{zf}	Calibration bias check, final zero gas	5.4	6.7	6.1
C_{mf}	Calibration bias check, final upscale gas	474.5	469.9	482.7
C_{ma}	Actual concentration of upscale gas	470.0	470.0	470.0
Calculated Results				
C_{gas}	Concentration drift corrected (ppmwv)	303.9	303.9	273.5
C_{gas}	Concentration moisture corrected (ppmdv)	374.8	379.3	338.4
E	Emission rate (lb/hr)	362.4	371.7	326.3

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
CA 1&2 Calciner Stack

ORGANIC COMPOUNDS PARAMETERS

Run No.		**4**	**5**	**6**
Date (1996)		November 14	November 14	November 14
Start Time (approx.)		09:17	10:45	12:19
Stop Time (approx.)		10:34	12:09	13:40
Flow Results[1]				
Q_a	Volumetric flow rate, actual (acfm)	331,600	339,800	331,600
Q_{std}	Volumetric flow rate, standard (dscfm)	140,800	142,700	140,400
Benzene (MW=78.11)				
C	Concentration (ppm)	1.33	1.42	1.22
E	Emission rate (lb/hr)	2.28	2.46	2.08
1,3-Butadiene (MW=54.09)				
C	Concentration (ppm)	0.09	0.10	0.11
E	Emission rate (lb/hr)	0.11	0.12	0.13
Ethylbenzene (MW=106.16)				
C	Concentration (ppm)	0.09	0.10	0.09
E	Emission rate (lb/hr)	0.21	0.24	0.21
2-Butanone (MW=72.10)				
C	Concentration (ppm)	0.40	0.40	0.36
E	Emission rate (lb/hr)	0.63	0.64	0.57
n-Hexane (MW=86.17)				
C	Concentration (ppm)	0.08	0.07	0.07
E	Emission rate (lb/hr)	0.15	0.13	0.13
Styrene (MW=104.14)				
C	Concentration (ppm)	0.12	0.13	0.09
E	Emission rate (lb/hr)	0.27	0.30	0.20
Toluene (MW=92.13)				
C	Concentration (ppm)	0.62	0.65	0.59
E	Emission rate (lb/hr)	1.25	1.33	1.19
Xylene (MW=106.16)				
C	Concentration (ppm)	0.81	0.80	0.80
E	Emission rate (lb/hr)	1.89	1.89	1.86

[1] Flow conditions obtained from concurrent Method 1-4 testing.

CALIBRATION DATA

C

Meter Box Full Test Calibration

DATE: June 18, 1996 Operator: R. Lindbereg

Meter Box No: D5	Meter Box ΔH@: 1.7527	Meter Box Yd: 0.9936	Barometric Pressure: 24.87

				Standard Meter Gas Volume			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)					
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds}	Initial	Final	V_d	Inlet	Outlet	T_{ds}	Inlet	T_o	T_d	Time	Y_d	H@
0.37	0.50	-1.00	1.0000	0.000	5.173	5.173	672.692	677.917	5.225	77.0	77.0	77.0	80	77	78.5	11.52	0.9884	1.7080
0.37	0.50	-1.00	1.0000	0.000	5.152	5.152	677.917	683.109	5.192	78.0	78.0	78.0	81	78	79.5	11.48	0.9907	1.7132
0.62	1.50	-1.60	1.0000	0.000	10.125	10.125	691.728	701.933	10.205	78.0	78.0	78.0	85	79	82.0	13.37	0.9904	1.8016
0.62	1.50	-1.60	1.0000	0.000	10.138	10.138	701.933	712.150	10.217	78.0	78.0	78.0	86	80	83.0	13.39	0.9924	1.7990
0.88	3.00	-2.40	1.0000	0.000	10.119	10.119	728.546	738.667	10.121	78.0	78.0	78.0	91	82	86.5	9.33	0.9995	1.7470
0.88	3.00	-2.40	1.0000	0.000	10.163	10.163	738.661	748.831	10.170	78.0	78.0	78.0	91	83	87.0	9.38	1.0000	1.7473
																AVERAGE	0.9936	1.7527

Nomenclature

P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential (in. H_20)
ΔP	Inlet Pressure Differential (in. H_20)
V_d	Gas Meter Volume - Dry (ft^3)
V_{ds}	Standard Meter Volume - Dry (ft^3)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless)
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_20)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P / 13.6}{P_b + \Delta H / 13.6}\right]$$

$$\Delta H@ = \frac{0.0319(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64\ (V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in. Hg)	Vacuum Gauge
5.1	5.0
7.6	7.5
10.2	10.0
12.8	12.5
15.4	15.0

Clean Air Engineering

SOLVAY2016_6_0017753

Meter Box Post Test Calibration

DATE: 11/20/96

Operator: R. Lindberg

Project Number: 7837

Client/Owner: SOLVAY MINERALS

Meter Box No: D-5				Meter Box Vacuum: 10.0						Meter Box Yd: 0.9936						Barometric Pressure: 24.64		
				Standard Meter Gas Volume			Meter Box Gas Volume (ft ^{3})			Std. Meter Temperature (°F)			Meter Box Temperature (°F)					
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds}	Initial	Final	V_d	Inlet	Outlet	T_{ds}	Inlet	T_o	Tî	Time	Y_d	H@
0.60	1.50	-1.40	1.0000	0.0	10.128	10.128	802.704	812.809	10.105	68.0	68.0	68.0	84.0	77.0	80.5	13.82	1.0172	1.8772
0.60	1.50	-1.40	1.0000	0.0	10.178	10.178	812.809	822.962	10.153	69.0	69.0	69.0	84.0	78.0	81.0	13.88	1.0164	1.8786
0.60	1.50	-1.40	1.0000	0.0	10.282	10.282	822.962	833.236	10.274	69.0	69.0	69.0	85.0	78.0	81.5	14.00	1.0156	1.8727
																AVERAGE	1.0164	

Nomenclature

P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential (in. H_20)
ΔP	Inlet Pressure Differential (in. H_20)
V_d	Gas Meter Volume - Dry (ft^3)
V_{ds}	Standard Meter Volume - Dry (ft^3)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless)
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_20)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P / 13.6}{P_b + \Delta H / 13.6}\right]$$

$$\Delta H@ = \frac{0.0319(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64\ (V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

CAE Clean Air Engineering

SOLVAY2016_6_001754

Pyrometer Calibration Sheet

Pyrometer No.: Meter D-5
Calibrated By: R. Lindberg
Date: NOV. 20, 1996

Office: Denver
Client: SOLVAY MINERALS
Job or Reference No. 7837

Temperature Scale Used: X **Fahrenheit** ____ Celsius

Calibration: ____ Pre-Test ____X **Post Test**

Calibration Reference Settings for Fahrenheit Scale	Pyrometer Reading	Calibration Reference Settings for Celsius Scale
50° F	51°	25° C
100° F	101°	50° C
150° F	151°	75° C
200° F	202°	100° C
250° F	252°	125° C
300° F	302°	150° C
350° F	351°	175° C
400° F	399°	200° C
450° F	449°	225° C
500° F	498°	250° C
550° F	548°	275° C
600° F	599°	300° C

Calibration Reference Information

Reference Used: Omega Serial No: T-87031

Calibrated By: R&R INSTRM. Date Calibrated: 12/27/96

Calibration Report No.: 52722-1

CAE
Clean Air Engineering

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE, IL 60067

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : 12021-71500
Scott Project # : 570587

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards: Procedure G1; September, 1993.

Cylinder Number : ALM023815
Cylinder Pressure + : 1900 psig
Certificate Date : 9/7/94
Previous Certificate Date : None
Expiration Date : 9/7/97

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	252.4 ppm	±1% NIST Directly Traceable

Balance Gas: Nitrogen

+Do not use when cylinder pressure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 2646	10/14/95	AAL18426	973.2 ppm Propane in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Propane : Beckman/400/1002059	8/15/94	Flame Ionization Detection

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components: Propane

First Triad Analysis

Date: 9/7/94 Response Units: ppm

Z1=0.00	R1=97.30	T1=26.30
R2=97.30	Z2=0.00	T2=25.20
Z3=0.00	T3=26.20	R3=97.30

Avg. Conc. of Cust. Cyl. 262.4 ppm

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4

r=1.00000	NTRM 2646
Constants:	A=0.040241000
B=10.002000000	C=0.000000000
D=0.000000000	E=0.000000000

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE, IL 60067

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : 15283-71500
Scott Project # : 98220

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September, 1993.

Cylinder Number : ALM042439
Cylinder Pressure + : 2000 psig
Certificate Date : 6/26/96
Previous Certificate Date : None
Expiration Date : 6/26/99

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	470.0 PPM	±1% NIST Directly Traceable

Balance Gas: Nitrogen

+Do not use when cylinder pressure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM2648A	7/24/99	SX20435	99.1 PPM Propane in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
C3: Varian 1400/08982426	6/26/96	Gas Chromatography

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 6/26/96 Response Units: mv Z1=0.00 R1=2,619.35 T1=2,985.00 R2=2,619.35 Z2=0.00 T2=2,589.00 Z3=0.00 T3=2,687.00 R3=2,619.35 Avg Calib. of Cert. Cyl. 470.0 PPM		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=1.00000 SRM2648A Constants: A=0.705101000 B=0.181351000 C=0.000000000 D=0.000000000 E=0.000000000

Special Notes

Mail

Operator

SOLVAY2016_6_001757

MISP/P-1

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE, IL 60067

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : 14478-71500
Scott Project # : 590306

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; Seplember, 1993.

Cylinder Number : ALM058541
Cylinder Pressure + : 2000 psig
Certificate Date : 1/4/96
Previous Certificate Date : None
Expiration Date : 1/4/99

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	852.2 PPM	±1% NIST Directly Traceable

Balance Gas: Nitrogen

+Do not use when cylinder presssure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1668	6/7/96	ALM032015	95.5 PPM Propane in Air

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
C3H8: VARIAN 1400/08982426	1/4/96	Gas Chromatography

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components: Propane

First Triad Analysis

Date: 1/4/96 Response Units: mv

Z1=0.00	R1=100.00	T1=4,666.38
R2=100.00	Z2=0.00	T2=4,673.52
Z3=0.00	T3=4,668.20	
R3=100.00		

Avg. Conc. of Cust. Cyl. 852.2 PPM

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4

r=1.00000	NTRM1668
Constants:	A=0.130667400
B=0.182486400	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

Cylinder

SOLVAY2016_6_001758

Analyst

TYPE S PITOT TUBE INSPECTION DATA

DATE 8-15-96

PITOT NUMBER 12-1-94-2
M-6-3-65

Pitot Tube Assembly Level YES

Pitot Tube openings damaged? NO (Yes{explain, see comments} or No)

α_1 = 2 deg. (<10), α_2 = 1 deg. (<10), β_1 = 2 deg. (<5), β_2 = 3 deg. (<5)

Y = 2 deg., θ = 2 deg., A = .699 in.

Z = A sin Y = .024 in.; <1/8 in.

W = A sin θ = .024 in.; <1/32 in.

Pa .350 in. Pb .349

P = (Pa +Pb)/2 .3495 in.

Dt (tube dia.) = .25 in.

P/Dt = 1.40 ($\geq$ 1.05 and $\leq$ 1.50)

COMMENTS: 6' EFF M-5 PROBE

WIND TUNNEL CALIBRATION REQUIRED? NO (Yes or No)

CALIBRATION BY: R. Lindsey

TYPE S PITOT TUBE INSPECTION DATA

DATE 11-6-96 PITOT NUMBER 19-8P-4-
8-9-96-1

Pitot tube assembly level ? X yes, _____ no

Pitot tube openings damaged ? _____ yes (explain below) X no

α_1 = 1 ° (<10°), α_2 = 1 ° (<10°),

β_1 = 1 ° (<5°), β_2 = 2 ° (<5°)

Y = 1 °, Θ = 2 °, A = .754 cm (in.)

Z = A sin Y = .013 cm (in.); < 0.32 cm (< 1/8 in.),

W = A sin Θ = .026 cm (in.); < 0.08 cm (< 1/32 in.)

P_a = .379 cm (in.), P_b = .374 cm (in.)

$P = \frac{(P_a + P_b)}{2}$ = .376 cm (in.)

D_t = .250 cm (in.)

$\frac{P}{D_t}$ = 1.50 (≥ 1.05 and ≤ 1.50)

COMMENTS: Pitot - ok. Cp = .84

Calibration required ? _____ YES, X NO.

Calibrated by: EM

SOLVAY2016_6_001760

Reference Method Sampling System

Client: SOLVAY MINERALS
Job #: 7837
Plant: GREEN RIVER WY
Operator: J. CHAPMAN
Unit: 1+2 + 3 CA
Date: 11-11-96
Location: CA 1+2, CA 3 STACK
Data Acquisition: Chart / Computer
Run #'s:
File Names:

Instrumentation Data for Reference Method:

#	Constituent	Manufacturer	Serial/Asset#	Range Used	Oper. Principle	Units Reported
1	THC	JUM VET	2867	0-1000 ppm	FID	PPM
2						
3						
4						
5						
6						

Reference Method System Performance Checks:

System Leak Check Passed: ✓
System Response Time: 45 SEC
Calibration Error Check Passed: ✓

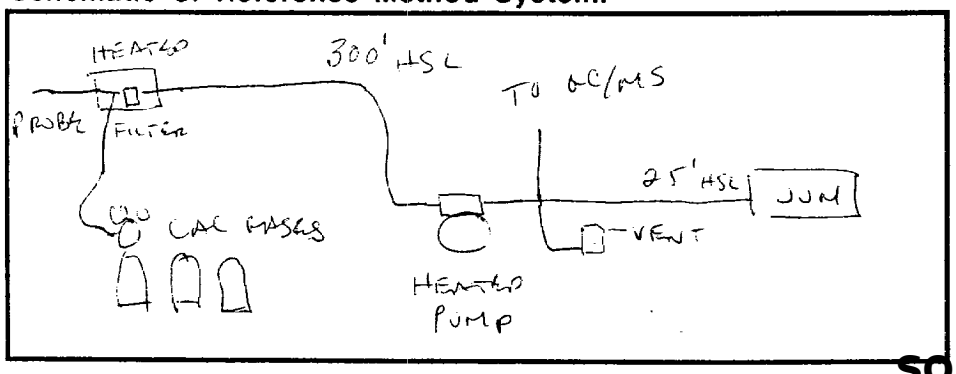
RATA: Yes / No (circle one)
If yes, circle the units the RATA is based on, and include DS 077 to describe the facility's CEM system.

Calibration Materials Data:

#	Constituent	Concentration	Cylinder ID	Protocol?
1	PROPANE	852.2		YES / NO
2		470.0		YES / NO
3		252.4		YES / NO
4	N_2	—		YES / NO
5				YES / NO
6				YES / NO
7				YES / NO
8				YES / NO
9				YES / NO
10				YES / NO
11				YES / NO
12				YES / NO
13				YES / NO
14				YES / NO

Comments:

Schematic of Reference Method System:



SOLVAY2016 6 001761

Clean Air Engineering

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA-3 Calciner Stack

CEM CALIBRATION DATA SHEET

November 12, 1996
Run 1

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	0.5	0.5	0.1%	0.5	0.0%	6.8	0.6%	0.6%
Low Span	252.4	257.8	5.4	2.1%	257.8				
Mid Span	470.0	480.9	10.9	2.3%	480.9				
High Span	852.2	854.4	2.2	0.3%	854.4	0.0%	871.8	1.7%	1.7%

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA-3 Calciner Stack

CEM CALIBRATION DATA SHEET

November 12, 1996
Run 2

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	0.5	0.5	0.1%	6.8	0.6%	15.7	1.5%	0.9%
Low Span	252.4	257.8	5.4	2.1%					
Mid Span	470.0	480.9	10.9	1.1%					
High Span	852.2	854.4	2.2	0.2%	871.8	1.7%	895.9	4.2%	2.4%

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA-3 Calciner Stack

CEM CALIBRATION DATA SHEET

November 12, 1996
Run 3

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	0.5	0.5	0.1%	15.7	1.5%	0.3	0.0%	-1.5%
Low Span	252.40	257.8	5.4	2.1%					
Mid Span	470.0	480.9	10.9	1.1%					
High Span	852.2	854.4	2.2	0.2%	895.9	4.2%	903.8	4.9%	0.8%

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM CALIBRATION DATA SHEET

November 13, 1996
Run 1

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	2.1	2.1	0.2%	2.1	0.0%	4.6	0.3%	0.3%
Low Span	252.4	256.0	3.6	1.4%	256.0				
Mid Span	470.0	482.3	12.3	2.6%	482.3	0.0%	467.2	-1.5%	-1.5%
High Span	852.2	852.2	0.0	0.0%	852.2				

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM CALIBRATION DATA SHEET

November 13, 1996
Run 2

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	2.1	2.1	0.2%	4.6	0.3%	18.9	1.7%	1.4%
Low Span	252.4	256.0	3.6	1.4%					
Mid Span	470.0	482.3	12.3	1.2%	467.2	-1.5%	497.8	1.6%	3.1%
High Span	852.2	852.2	0.0	0.0%					

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM CALIBRATION DATA SHEET

November 13, 1996
Run 3

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	2.1	2.1	0.2%	18.9	1.7%	20.5	1.8%	0.2%
Low Span	252.40	256.0	3.6	1.4%					
Mid Span	470.0	482.3	12.3	1.2%	497.8	1.6%	495.7	1.3%	-0.2%
High Span	852.2	852.2	0.0	0.0%					

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM CALIBRATION DATA SHEET

November 14, 1996
Run 1

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	0.6	0.6	0.1%	0.6	0.0%	5.4	0.5%	0.5%
Low Span	252.4	252.5	0.1	0.0%	252.5				
Mid Span	470.0	477.4	7.4	1.6%	477.4	0.0%	474.5	-0.3%	-0.3%
High Span	852.2	848.6	3.6	0.4%	848.6				

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM CALIBRATION DATA SHEET

November 14, 1996
Run 2

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	0.6	0.6	0.1%	5.4	0.5%	6.7	0.6%	0.1%
Low Span	252.4	252.5	0.1	0.0%					
Mid Span	470.0	477.4	7.4	0.7%	474.5	-0.3%	469.9	-0.8%	-0.5%
High Span	852.2	848.6	3.6	0.4%					

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

Solvay Minerals, Inc.
CAE Project No: 7837-1
CA 1&2 Calciner Stack

CEM CALIBRATION DATA SHEET

November 14, 1996
Run 3

	A	B	C	D*	E	F	G	H	I
Total Hydrocarbons									
Zero	0.0	0.6	0.6	0.1%	6.7	0.6%	6.1	0.6%	-0.1%
Low Span	252.40	252.5	0.1	0.0%					
Mid Span	470.0	477.4	7.4	0.7%	469.9	-0.8%	482.7	0.5%	1.3%
High Span	852.2	848.6	3.6	0.4%					

Calibration Error Check
A - Cylinder Value
B - Analyzer Calibration Response
C- Absolute Difference
D - Difference (% of Span)
*THC- Difference (% of Gas)

System Bias Check
E - System Calibration Response (Pre Test)
F - System Calibration Bias (% of Span) (Pre Test)
G - System Calibration Response (Post Test)
H - System Calibration Bias (% of Span) (Post Test)
I - Drift (% of Span)

D

FIELD DATA

D

Velocity

MOISTURE DETERMINATION FIELD DATA SHEET

TEST LOCATION: Calciner Stack

PAGE 1 OF 1

UNIT: 3 RUN: 1

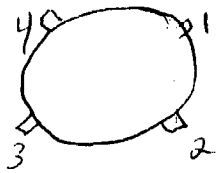
Client: Solvay	Project No.: 7837
Plant: Green River WY	Date: 11-12-96
Meter Operator: Ron Humberg	
Probe Operator: Ron Laikoret	

Meter Box No.	D-5
Meter Yd	.9936

Leak Rate Before	.003 (cfm) @	18	(in.Hg)
Leak Rate After	.002 (cfm) @	8	(in.Hg)

PHOT: BEFORE: OK AFTER: OK

Cross-Section of Test Location



Duct Dimensions (in.) 125.5" Dia

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	4.75 / 12.5		

Amb. Temp. (°F) 60	Bar. Press. 23.80 [in. Hg] [mbar]
Liner Material S.S	

Probe # M-6-365

H_2O 212 [ml] [gm]	Silica Gel (gm) 8
Total V_{lc} 220	

Start Time: 1025	Stop Time: 1130

Traverse Point Number	Min/pt 5 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 300.520	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes ΔP
1-1	5	1.5	304.05	311	67	82	74	4	.16
2	10		307.67	310	66	84	75	6	.18
3	15		311.39	305	65	87	78	5	.13
2-1	20		314.95	312	65	87	78	5	.23
2	25		318.55	313	65	90	80	5	.22
3	30		322.15	305	65	92	81	5	.17
3-1	35		325.80	309	59	91	81	5	.20
2	40		329.38	307	61	92	82	6	.18
3	45		333.20	301	57	87	80	5	.12
4-1	50		336.77	304	60	88	82	5	.15
2	55		340.32	308	64	88	82	5	.14
3	60		343.90	303	65	87	81	6	.10
	Total		43.38						
	Average	1.5		307		84			.364

SOLVAY2016_6_001773

CS 004 Moisture

Circle correct bracketed units on data sheet.

VELOCITY + MOISTURE DETERMINATION

FIELD DATA SHEET

TEST LOCATION: CALCINER STACK

PAGE 1 OF 1

UNIT: 3 RUN: 2

Client SOLVAY	Project No. 7837
Plant GREEN RIVER W/	Date 11-12-96
Meter Operator RON LINDBERG	
Probe Operator RON LINDBERG	

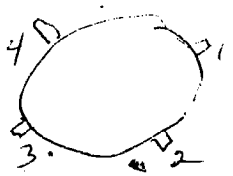
Meter Box No. A-5	
Meter Yd .9936	

Leak Rate Before .004 (cfm) @ 17 (in.Hg)	
Leak Rate After .004 (cfm) @ 10 (in.Hg)	

PITOT BEFORE: OK AFTER: OK

Cross-Section of Test Location

[N] [UP]



Duct Dimensions (in.) 125.5 DIA

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	4.75 / 12.5	[Out]	[In]

Amb. Temp. (°F) 62	Bar. Press. 23.80 [in. Hg] [mbar]
Liner Material S.S.	

PROBE # M-6-3-65

H_2O 242 [ml] [gm]	Silica Gel (gm) 10
Total V_{lc} 252	

Start Time: 1240	Stop Time: 1343

Traverse Point Number	Min/pt 5 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 344.318	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
1-1	5	1.5	348.04	312	56	89	84	5	.23	
2	10		351.68	311	55	90	84	5	.17	
3	15		355.32	306	62	92	85	5	.16	
3-1	20		358.98	315	66	92	86	5	.25	
2	25		362.59	316	64	92	86	5	.27	
3	30		366.20	310	64	94	86	5	.20	
2-1	35		369.90	317	62	96	88	5	.23	
2	40		373.43	316	62	97	89	5	.21	
3	45		377.12	307	60	97	89	5	.17	
1-1	50		380.82	315	60	97	90	5	.20	
2	55		384.48	314	60	98	90	5	.18	
3	60		388.188	309	62	99	91	5	.16	
	Total									
	Average		43.87	312		91			.448	

Circle correct bracketed units on data sheet.

CS 004 Moisture

SOLVAY2016_6_0017774

TEST LOCATION: Calciner Stack

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 1 OF 1

UNIT: 3 RUN: 3

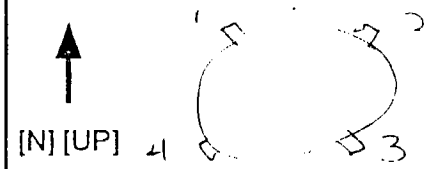
Client: Solvay WV	Project No.: 783
Plant: Green River	Date: 11-12-96
Meter Operator: Ron Linbegher	
Probe Operator: Ron Linbegher	

Meter Box No.	D-5
Meter Yd	.9936

Leak Rate Before	.002 (cfm) @	15	(in.Hg)
Leak Rate After	.002 (cfm) @	14	(in.Hg)

Pitot Before ✓ After ✓

Cross-Section of Test Location



Duct Dimensions (in.)	125 5	D/A	
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	4.75 / 2.5		

Amb. Temp. (°F)	62	Bar. Press.	23.80 [in. Hg] [mbar]
Liner Material	S.S		

Probe # M-6 3-6.5

H_2O	212 [ml] [gm]	Silica Gel (gm)	20
Total V_{lc}	~~212~~ 232		~~20~~ RMC

Start Time:	1410	Stop Time:	15:15

Traverse Point Number	Min/pt 5 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 389.31	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes ΔP
1-1	5	1.5	392.99	314	60	97	92	5	.19
2	10		396.69	317	56	98	92	5	.18
3	15		400.39	312	51	98	92	5	.17
1	20		404.09	314	50	96	92	5	.28
2	25		407.73	317	48	97	92	5	.27
3	30		411.42	310	47	95	91	5	.21
1	35		415.09	310	47	93	89	5	.24
2	40		418.75	313	47	93	89	5	.26
3	45		422.43	309	48	93	89	5	.19
1	50		426.10	311	49	93	88	5	.20
2	55		429.80	308	50	93	88	5	.22
3	60		433.56	306	50	93	88	5	.15
	Total		44.25						.4599
	Average			312		93			

Circle correct bracketed units on data sheet.

SOLVAY2016_6_001775

Clean Air Engineering

Orsat Readings

Page _____ of _____

Client	SOLVAY MIN.	Project Number	7837
Plant	GREEN RIVER, WY	Unit	3
Date	11/12/96	Fuel Type	NAT GAS
Orsat ID	85	Leak Check?	OK

$F_o = \frac{20.9 - \%O_2}{\%CO_2}$

F_o = 1.083 to 1.230 (for bituminous coal)

Run Number	Location	Bag ID	Trial	Percent CO_2	Percent $CO_2 + O_2$	Percent O_2	F_o	Sample Time	Analysis Time	Analyst
1	CA 3		1	7.4	21.6				1230	JC
			2	7.4	21.6					
			3	7.4	21.6					
			Avg.	7.4		14.2				
2	CA 3		1	8.4	21.8				1430	JC
			2	8.2	21.8					
			3	8.4	21.6					
			Avg.	8.3	21.7	13.4				
3	CA 3		1	8.8	21.8				1545	JC
			2	8.8	21.6					
			3	8.8	21.6					
			Avg.	8.8	21.6	12.8				
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							

CAE P3 ver 1.0
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Effluent Measurement Results for EMI Calibrated Compounds																					
CALCINER 3 11/12/96																					
Run Number		1							2						3						
Sample Number		U	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	U
ethylbenzene		0.31	0.62	0.54	0.75	0.96	0.25	0.26	0.45	0.58	0.89	1.06	0.44	0.46	0.80	0.83	1.15	1.02	0.17	0.15	0.25
xylenes	para	1.08	1.33	1.17	1.40	1.60	1.14	1.13	1.18	1.38	1.46	1.68	1.86	2.04	2.40	2.54	1.80	1.65	0.87	0.76	0.88
	meta	0.97	1.05	0.94	1.03	1.25	1.03	1.00	0.94	1.12	1.18	1.44	1.68	1.85	2.09	2.26	1.49	1.40	0.81	0.69	0.80
MEK		2.04	1.40	0.54	0.95	1.25	0.79	0.58	0.88	0.95	0.95	1.25	1.61	1.38	1.85	1.96	1.06	0.92	0.61	0.54	0.67
o-xylene		0.09	0.00	0.00	0.26	0.44	0.17	0.11	0.11	0.15	0.30	0.51	0.22	0.20	0.00	0.00	0.37	0.47	0.12	0.09	0.08
benzene		5.58	4.55	3.75	3.94	4.07	4.13	4.30	3.99	3.85	4.39	4.83	7.25	8.32	7.77	7.85	4.22	3.64	2.73	2.46	4.49
toluene		1.83	1.87	1.45	1.51	1.61	1.76	1.83	1.63	1.56	1.65	2.00	2.97	3.52	3.34	3.33	1.87	1.57	1.21	1.13	1.68
styrene		0.54	0.48	0.37	0.39	0.39	0.30	0.32	0.44	0.40	0.42	0.57	0.58	0.79	0.86	0.83	0.50	0.36	0.09	0.18	0.44
butadiene		0.44	0.41	0.32	0.28	0.32	0.00	0.00	0.35	0.32	0.00	0.36	0.32	0.14	0.00	0.00	0.28	0.28	0.20	0.14	0.35
hexane		0.42	0.20	0.15	0.00	0.13	0.00	0.00	0.00	0.00	0.23	0.23	0.00	0.00	0.61	0.36	0.17	0.17	0.00	0.00	0.15

SOLVAY2016_6_0017777

TEST LOCATION: CALCINER STACK

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 1 OF 2

UNIT: 1 RUN: 1

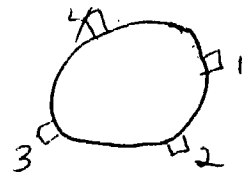
Client SOLVAY	Project No. 7837
Plant GREEN RIVER WY	Date 11-13-96
Meter Operator SON LINDBERG	
Probe Operator RON LUIKAART	

Meter Box No. 5-5	
Meter Yd .9936	

Leak Rate Before .004 (cfm) @ 14 (in.Hg)	
Leak Rate After .002 (cfm) @ 10 (in.Hg)	

Pitot BEFORE: OK AFTER: OK

Cross-Section of Test Location



Duct Dimensions (in.) 144 DIA

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	6		

Amb. Temp. (°F) 60	Bar. Press 23.65 [in. Hg] [mbar]
Liner Material SS	

Probe # M-6-3-65

H_2O 94 [ml] [gm]	Silica Gel (gm) 10
Total V_{lc} 104	

Start Time: 1206	Stop Time: 1314

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 434.50	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
2-1	4	1.5	437.34	232	64	77	70	3	.46	
2	8		440.24	237	63	79	71	3	.50	
3	12		443.13	240	60	79	71	3	.38	
4	16		446.07	234	60	80	71	3	.38	
3-1	20		448.99	223	52	77	72	3	.38	PLANT BRINGING UP
2	24		451.92	211	52	77	72	3	.37	UNIT #2 DURING
3	28		454.82	207	53	78	73	3	.32	this RUN.
4	32		457.71	208	53	78	73	3	.33	
4-1	36		460.83	256	52	77	72	3	~~.33~~ .49	
2	40		463.80	259	53	79	73	3	.70	
3	44		466.75	261	53	79	73	3	.62	
4	48		469.63	252	54	80	74	3	.46	
	Total		46.83							
	Average			238		76			.696	

Circle correct bracketed units on data sheet.

SOLVAY2016_6_001778

Clean Air Engineering

TEST LOCATION: Calciner Stack

MOISTURE DETERMINATION FIELD DATA SHEET

UNIT: 1 RUN: 1

Client Solvay	Project No. 7837
Plant G.R. NY	Date 11-13-96
Meter Operator Ron L L.	
Probe Operator Ron M.L	

Meter Box No. D-5	
Meter Yd 9936	

Leak Rate Before	(cfm) @	(in.Hg)
Leak Rate After	(cfm) @	(in.Hg)

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	6		

Amb. Temp. (°F) 66	Bar. Press. 23.65 [in. Hg] [mbar]
Liner Material S.S.	

H_2O 94 [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3)	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes ΔP
2-1	52	1.5	472.56	243	54	80	73	3	.59
2	56		475.49	242	53	79	73	3	.61
3	60		478.43	251	54	79	73	3	.69
4	64		481.33	256	55	78	73	3	.60
						76			
	Total								
	Average								

SOLVAY2016_6_0017779

DS 004 Moisture
CNVS/TRG.R1-11/2/94

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: CALCINER STACK

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 1 OF 2

UNIT: 1 RUN: 2

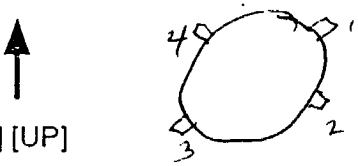
Client SOLVAY	Project No. 7837
Plant GREEN RIVER WY.	Date 11-13-96
Meter Operator RON LINDBERG	
Probe Operator RON LUKART	

Meter Box No. D-5	
Meter Yd .9936	

Leak Rate Before .002 (cfm) @ 11 (in.Hg)	
Leak Rate After .002 (cfm) @ 10 (in.Hg)	

Pitot BEFORE: OK AFTER: OK

Cross-Section of Test Location



Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.4	6	[Out]	[In]

Amb. Temp. (°F) 53	Bar. Press 23.65 [in. Hg] [mbar]
Liner Material S.S.	

PROBE # M-6-3-65

H_2O 180 [ml] [gm]	Silica Gel (gm) 10
Total V_{lc} 190	

Start Time: 1416	Stop Time: 1521

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 482.552	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
4-1	4	1.5	485.45	274	54	76	73	3	.52	PLANT IS trying
2	8		488.34	292	55	77	73	3	.55	to get unit 2 ON
3	12		491.24	297	62	81	74	3	.54	line this run.
4	16		494.17	296	62	81	74	4	.41	
3-1	20		497.07	263	62	80	74	4	.40	
2	24		499.95	259	63	81	75	4	.42	
3	28		502.84	257	65	82	76	4	.39	
4	32		505.81	252	62	82	75	4	.32	
2-1	36		508.58	269	58	80	75	4	.45	
2	40		511.45	282	57	81	76	4	.46	
3	44		514.38	284	57	81	76	4	.45	
4	48		517.31	285	57	81	75	4	.20	
	Total					77				
	Average	1.5	46.36	281		78			.605	$\sqrt{\Delta P}$

Circle correct bracketed units on data sheet.

SOLVAY2016_6_001780

Clean Air Engineering

TEST LOCATION: Calciner Stack

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 2 OF 2

UNIT: 1 RUN: 2

Client Solvay	Project No. 7837
Plant GR / WV	Date 11-13-96
Meter Operator R.L.L.	
Probe Operator R.M.L.	

Meter Box No. D-5
Meter Yd

Leak Rate Before	(cfm) @	(in.Hg)
Leak Rate After	(cfm) @	(in.Hg)

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Liner Material S S.	

Probe #m-6-3-65

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 4 / Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3)	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes ΔP
1-1	52	1.5	520.19	299	57	81	75	4	.48
2	56	↓	523.07	297	56	81	76	4	.20
3	60		525.98	299	55	81	75	4	.20
4	64		528.912	300	56	81	76	4	.10
	Total								
	Average								

SOLVAY2016_6_0017781

CS 004 Moisture

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: CALCINER STACK

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 1 OF 2

UNIT: 1 RUN: 3

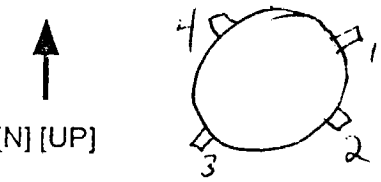
Client SOLVAY	Project No. 7337
Plant GREEN RIVER, WY	Date 11-13-96
Meter Operator Jon Lindberg	
Probe Operator Jon Lindberg	

Meter Box No. D-5	
Meter Yd .9936	

Leak Rate Before .004 (cfm) @ 12 (in.Hg)	
Leak Rate After .003 (cfm) @ 10 (in.Hg)	

Pitot: Before: OK After: OK

Cross-Section of Test Location



Duct Dimensions (in.)			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.4	6	[Out]	[In]

Amb. Temp. (°F) 50	Bar. Press. 23.65 [in. Hg] [mbar]
Liner Material SS	

Pitot/Probe * M-6-3-65

H_2O 194 [ml] [gm]	Silica Gel (gm) 10
Total V_{lc} 204	

Start Time: 1552	Stop Time: 1700

Traverse Point Number	Min/pt 4 / Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 530.545	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
3-1	4	1.5	533.45	327	45	72	71	4	.43	Unit 2 is on
2	8		536.27	328	47	73	72	4	.42	durning this Run.
3	12		539.14	327	51	74	72	5	.41	
4	16		542.00	323	53	75	71	5	.37	
4-1	20		544.88	333	55	76	72	5	.58	
2	24		547.73	331	55	76	72	6	.73	
3	28		550.66	330	54	76	72	6	.65	
4	32		553.34	326	54	76	72	6	.52	
1-1	36		556.43	328	50	74	71	5	.45	
2	40		559.25	335	52	75	71	5	.47	
3	44		562.17	335	52	76	71	5	.47	
4	48		565.08	331	55	78	71	5	.40	
	Total		46.07			73				
	Average	1.5		333		74			.690	$\sqrt{\Delta P}$

Circle correct bracketed units on data sheet.

ES 004 Moisture
SWS/TPG R1-11/2/94

SOLVAY2016_6_0017782

TEST LOCATION: CALCINER STACK

MOISTURE DETERMINATION FIELD DATA SHEET

UNIT: 1 RUN: 3

Client SOLVAY	Project No. 7837
Plant GREEN RIVER, WY	Date 11-13-96
Meter Operator R.L.L.	
Probe Operator R.M.L.	

Meter Box No. D-5	
Meter Yd	

Leak Rate Before	(cfm) @	(in.Hg)
Leak Rate After	(cfm) @	(in.Hg)

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]

Amb. Temp. (°F) 50	Bar. Press. [in. Hg] [mbar]		
Liner Material S.S.			

H_2O 194 [ml] [gm]	Silica Gel (gm) 10
Total V_{lc} 204	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3)	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes ΔP
2-1	52	1.5	568.00	336	54	77	71	5	.47
2	56	↓	570.83	344	55	79	72	5	.48
3	60	↓	573.73	345	55	79	72	5	.46
4	64	↓	576.617	342	58	79	72	5	.37
	Total								
	Average								

SOLVAY2016_6_001783

Circle correct bracketed units on data sheet.

Orsat Readings

Page _____ of _____

Client	SOLVAY MINERALS	Project Number	7837
Plant	GREEN RIVER	Unit	1+2 (1 ONLY)
Date	11-13-96	Fuel Type	NAT GAS
Orsat ID	85	Leak Check?	OK

$F_o = \frac{20.9 - \%O_2}{\%CO_2}$

F_o = 1.083 to 1.230 (for bituminous coal)

Run Number	Location	Bag ID	Trial	Percent CO_2	Percent $CO_2 + O_2$	Percent O_2	F_o	Sample Time	Analysis Time	Analyst
1	CA 1+2		1	3.2	21.0				14:30	JC
(UNIT 2 DOWN)			2	3.4	21.2					
			3	3.2	21.2					
			Avg.	3.3	21.1	17.8				
2	CA 1+2		1	6.2	21.2				1630	JC
UNIT 2 COMING UP			2	6.0	21.2					
			3	6.2	21.2					
			Avg.	6.1	21.2	15.1				
3	CA 1+2		1	5.8	21.2				1745	JC
			2	5.8	21.2					
			3	5.8	21.2					
			Avg.	5.8	21.2	15.4				
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							

CAE P3 ver 1.0
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Effluent Measurement Results for EMI Calibrated Compounds																					
CALCINER 1-2 11/13/96																					
Run Number		4							5						6						
Sample Number		U	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	U
ethylbenzene		0.08	0.34	0.45	0.33	0.13	0.09	0.08	0.35	0.43	0.41	0.61	0.29	0.31	0.67	0.67	0.55	0.56	0.68	0.18	0.14
xylenes	para	0.25	0.56	0.64	0.69	0.64	0.52	0.44	0.51	0.59	0.94	1.2	1.13	1.12	1.52	1.28	1.13	1.14	0.92	0.81	0.57
	meta	0.22	0.36	0.43	0.47	0.45	0.46	0.36	0.32	0.4	0.69	1	1	1.05	0.68	1	0.87	0.84	0.81	0.72	0.49
MEK		0.13	0.12	0	0.26	0.13	0	0	0.1	0.08	0.48	0.64	0.72	0.72	0.68	0.22	0.73	0.72	0.6	0.53	0.49
o-xylene		0.02	0	0	0.23	0.33	0.15	0.6	0	0	0.33	0.44	0.19	0.14	0	0	0.22	0.33	0.14	0.09	0.08
benzene		1.38	1.17	1.05	0.96	0.84	1.2	1.18	1	1.05	1.76	2.57	4.39	4.98	2.8	2.81	2.66	2.6	2.86	2.48	1.06
toluene		0.48	0.44	0.4	0.37	0.33	0.54	0.59	0.41	0.41	0.7	1.06	1.85	2.1	1.29	1.21	1.22	1.05	1.22	1.18	0.86
styrene		0.09	0.08	0.07	0.07	0.06	0.02	0.18	0.13	0.08	0.11	0.22	0.52	0.72	0.31	0.26	0.24	0.23	0.19	0.33	0.18
butadiene		0.11	0.18	0.12	0.07	0.07	0.08	0.06	0.12	0	0	0	0	0	0	0	0	0	0	0	0
hexane		0.04	0.04	0.06	0.06	0	0	0	0	0	0.17	0.21	0	0	0	0	0.26	0.22	0	0	0.2

SOLVAY2016_6_001785

TEST LOCATION: Calciner Stack

MOISTURE DETERMINATION FIELD DATA SHEET

UNIT: 1 + 2 RUN: 4

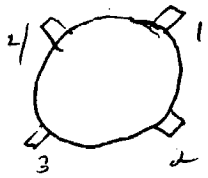
Client Solvay	Project No. 7837
Plant Green River, WY	Date 11-14-96
Meter Operator Ron Lindberg	
Probe Operator Ron Lukkart	

Meter Box No. D-5	
Meter Yd .9936	

Leak Rate Before .003 (cfm) @ 15 (in.Hg)	
Leak Rate After .002 (cfm) @ 10 (in.Hg)	

Pitots: BEFORE: OK AFTER: OK

Cross-Section of Test Location



Duct Dimensions (in.)			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	6	[Out]	[In]

Amb. Temp. (°F) 42	Bar. Press. 23.25 [in. Hg] [mbar]
Liner Material SS	

Probe #M-6-3-65

H_2O 121 [ml] [gm]	Silica Gel (gm) 9
Total V_{lc} 180	

Start Time: 0915	Stop Time: 1021

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 577.836	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
1-1	4	1.5	580.73	324	41	51	48	3	.40	
2	8		583.53	324	42	52	48	3	.41	
3	12		586.33	324	44	54	49	4	.40	
4	16		589.17	320	46	56	49	4	.32	
1-1	20		592.02	324	46	56	49	4	.40	
2	24		594.87	324	49	58	50	4	.40	
3	28		597.72	323	51	58	50	4	.40	
4	32		600.64	319	51	59	51	4	.31	
1	36		603.47	323	48	58	51	4	.39	
2	40		606.32	323	47	59	52	4	.40	
3	44		609.18	323	47	59	52	4	.39	
4	48		612.04	320	47	60	53	4	.33	
	Total		45.56							
	Average			321		54			.613	

Circle correct bracketed units on data sheet.

SOLVAY2016 6 0018789

Clean Air Engineering

TEST LOCATION: Cracker Stack

MOISTURE DETERMINATION FIELD DATA SHEET

UNIT: 1+2 RUN: 4

Client Solvay	Project No. 7837
Plant G.R. WV	Date 11-14-96
Meter Operator RLL	
Probe Operator RML	

Meter Box No. D-5	
Meter Yd	

Leak Rate Before	(cfm) @	(in.Hg)
Leak Rate After	(cfm) @	(in.Hg)

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Liner Material S.S.	

H_2O 171 [ml] [gm]	Silica Gel (gm) 9
Total V_{lc} 180	

Start Time: 0915	Stop Time: 1021

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3)	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes Δp
2-1	52	1.5	614.92	322	47	59	52	4	.37
2	56		617.80	323	48	59	52	4	.39
3	60		620.61	322	49	59	53	4	.39
4	64		623.40	320	49	60	53	4	.33
	Total								
	Average								√Δp

Circle correct bracketed units on data sheet.

DS 004 Moisture
CNVS/TRG.R1-11/2/94

Clean Air Engineering

SOLVAY2016_6_001787

TEST LOCATION: Calciner Stack

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 1 OF 2

UNIT: 1 + 2 RUN: ~~R~~ 5 RLR

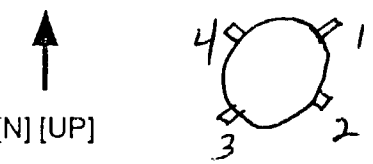
Client: Solvay	Project No.: 7837
Plant: Green River, WY	Date: 11-14-96
Meter Operator: Ron Lindberg	
Probe Operator: Ron Lukaart	

Meter Box No.	D5
Meter Yd	.9936

Leak Rate Before	.002 (cfm) @ 10 (in.Hg)
Leak Rate After	.002 (cfm) @ 8 (in.Hg)

Pitots: Before: OK After: OK

Cross-Section of Test Location



Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.3	6	[Out]	[In]

Amb. Temp. (°F) 40	Bar. Press. 23.25 [in. Hg] [mbar]
Liner Material S.S.	

Probe # M-6-3-65

H_2O 181 [ml] [gm]	Silica Gel (gm) 10
Total V_{lc} 191	

Start Time: 1053	Stop Time: 1158

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 624.00	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
3-1	4	1.5	626.86	322	41	52	50	4	.41	
2	8		629.69	322	41	53	50	4	.41	
3	12		632.56	321	42	54	50	4	.41	
4	16		635.45	317	43	55	50	4	.32	
4-1	20		638.27	322	43	55	50	4	.40	
2	24		641.08	323	44	55	50	4	.42	
3	28		643.91	323	45	55	50	4	.41	
4	32		646.76	320	45	56	50	4	.34	
1-1	36		649.61	323	44	55	50	4	.39	
2	40		652.44	323	44	55	50	4	.41	
3	44		655.25	324	45	56	50	4	.42	
4	48		658.13	320	46	56	50	4	.35	
	Total									
	Average									

SOLVAY2016_6_001788

Circle correct bracketed units on data sheet.

TEST LOCATION: Clinker Stack

MOISTURE DETERMINATION FIELD DATA SHEET

UNIT: 1 + 2 RUN: 5

Client: SOLVAY	Project No.: 7837
Plant: G.R. WY.	Date: 11-14-96
Meter Operator: RLL	
Probe Operator: RMC	

Meter Box No.: D-5	
Meter Yd	

Leak Rate Before	(cfm) @		(in.Hg)
Leak Rate After	(cfm) @		(in.Hg)

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Liner Material	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time: 1053	Stop Time: 1158

Traverse Point Number	Min/pt 4 / Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init Vol. (ft^3)	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
2-1	52	1.5	660.92	321	45	55	50	4	.42	
2	56		663.74	322	45	55	50	4	.43	
3	60		666.57	323	44	55	50	4	.42	
4	64		669.37	320	44	55	50	4	.35	
	Total		45.37							
	Average	1.5		322		53			.627	

SOLVAY2016_6_001789

DS 004 Moisture

Circle correct bracketed units on data sheet

TEST LOCATION: Calciner Stack

MOISTURE DETERMINATION FIELD DATA SHEET

PAGE 1 OF 2

UNIT: 1 + 2 RUN: 6

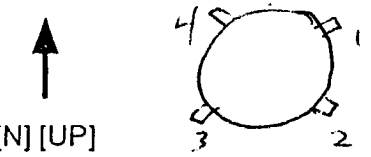
Client: Solvay	Project No.: 7837
Plant: Green River, WY	Date: 11-14-96
Meter Operator: Ken Lindberg	
Probe Operator: Ron Lukkart	

Meter Box No.: D 5	
Meter Yd: .9936	

Leak Rate Before: .002 (cfm) @ 10 (in.Hg)	
Leak Rate After: .002 (cfm) @ 10 (in.Hg)	

Pitots: BEFORE: OK AFTER: OK

Cross-Section of Test Location



Duct Dimensions (in.)			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]
-.2	6		[In]

Amb. Temp. (°F) 40	Bar. Press. 23.25 [in. Hg] [mbar]
Liner Material: S.	

Pitot # M-6-3-65

H_2O 171 [ml] [gm]	Silica Gel (gm) 9
Total V_{lc} 180	

Start Time: 1230	Stop Time: 1337

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3) 670.250	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	ΔP	Notes
1-1	4	1.5	673.07	322	44	52	50	4	.40	
2	8		675.85	324	43	53	50	4	.42	
3	12		678.69	323	45	55	50	4	.40	
4	16		681.53	317	46	55	50	4	.32	
4-1	20		684.34	321	46	55	50	4	.39	
2	24		687.17	323	47	55	51	4	.41	
3	28		689.99	323	48	57	51	4	.40	
4	32		692.83	319	48	57	51	4	.33	
3-1	36		695.69	323	49	56	51	4	.39	
2	40		698.52	324	51	58	51	4	.39	
3	44		701.34	323	53	58	52	4	.38	
4	48		704.24	319	52	58	52	4	.33	
	Total			322		53			.616	
	Average									

SOLVAY2016_6_001790

DS 004 Moisture

Circle correct bracketed units on data sheet.

MOISTURE DETERMINATION FIELD DATA SHEET

TEST LOCATION: Calciner Stack

PAGE 2 OF 2

UNIT: 1 & 2 RUN: 6

Client: SOLVAY	Project No. 7837
Plant: G.R. NY	Date 11-14-96
Meter Operator: RLL	
Probe Operator: RML	

Meter Box No.	D-5
Meter Yd.	

Leak Rate Before	(cfm) @	(in.Hg)
Leak Rate After	(cfm) @	(in.Hg)

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	Point No. 1 all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Liner Material	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time: 1230	Stop Time: 1337

Traverse Point Number	Min/pt 4 Elapsed Time	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft^3)	Stack Temp. t_s (°F)	Condensor Outlet t_c (°F)	DGM Inlet $t_{m\,in}$ (°F)	DGM Outlet $t_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Notes ΔP
2-1	52	1.5	707.05	323	55	57	53	4	.37
2	56	↓	709.86	324	53	58	53	4	.39
3	60	↓	712.77	324	51	59	53	4	.38
4	64	↓	715.00	317	52	59	53	4	.32
	Total		44.75						
	Average	1.5		322		55			.610 $\sqrt{\Delta P}$

SOLVAY2016_6_001791

ES 004 Moisture
SWRTRG B1-11/2/94

Circle correct bracketed units on data sheet.

Clean Air Engineering

Orsat Readings

Page _____ of _____

Client	SOLVAY MINERALS	Project Number	7837
Plant	GREEN RIVER WY	Unit	CA 1+2
Date	11-14-96	Fuel Type	NAT GAS
Orsat ID	85	Leak Check?	OK

$$F_o = \frac{20.9 - \%O_2}{\%CO_2}$$

F_o = 1.083 to 1.230 (for bituminous coal)

Run Number	Location	Bag ID	Trial	Percent CO_2	Percent $CO_2 + O_2$	Percent O_2	F_o	Sample Time	Analysis Time	Analyst
4	CA 1+2		1	5.6	21.4				1100	JC
	STACK		2	5.8	21.4					
			3	5.8	21.4					
			Avg.	5.7	21.4	15.7				
5	CA 1+2		1	5.6	21.4				1230	JC
	STACK		2	5.6	21.4					
			3	5.8	21.4					
			Avg.	5.7	21.4	15.7				
6	CA 1+2		1	5.4	21.4				1400	JC
	STACK		2	5.4	21.4					
			3	5.4	21.4					
			Avg.	5.4	21.4	16.0				
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							

CAE P3 ver 1.0
D:\vpforms\orsat

Effluent Measurement Results for EMI Calibrated Compounds																			
CALCINER 1-2 11/14/96 - Ore from silo																			
Run Number		1						2						3					
Sample Number		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
ethylbenzene		0.1	0.09	0.09	0.09	0.09	0.1	0.09	0.09	0.1	0.1	0.11	0.11	0.11	0.1		0.08	0.07	0.07
xylenes	para	0.4	0.4	0.4	0.4	0.43	0.43	0.4	0.39	0.37	0.4	0.45	0.46	0.43	0.45		0.41	0.35	0.36
	meta	0.35	0.42	0.35	0.35	0.38	0.38	0.35	0.27	0.33	0.35	0.39	0.41	0.39	0.4		0.36	0.35	0.32
MEK		0.41	0.42	0.39	0.38	0.4	0.41	0.41	0.27	0.39	0.41	0.46	0.48	0.39	0.41		0.36	0.35	0.29
o-xylene		0.03	0.05	0.01	0.03	0.02	0.02	0.03	0.07	0.02	0.03	0.03	0.04	0.04	0.03		0.03	0.05	0.01
benzene		1.28	1.38	1.37	1.32	1.28	1.33	1.34	1.25	1.3	1.48	1.6	1.52	1.49	1.4		1.04	1.09	1.1
toluene		0.6	0.62	0.63	0.62	0.63	0.63	0.61	0.59	0.61	0.67	0.7	0.69	0.67	0.66		0.55	0.53	0.53
styrene		0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.12	0.12	0.15	0.14	0.13	0.12		0.07	0.07	0.06
butadiene		0.12	0.12	0.12	0	0.1	0.1	0	0.11	0.12	0.14	0.13	0.12	0.14	0.12		0.1	0.07	0.1
hexane		0.1	0.06	0.08	0.1	0.08	0.08	0.07	0.05	0.09	0.1	0.03	0.05	0.1	0.05		0.05	0.05	0.08

SOLVAY2016_6_001793

E

FIELD DATA PRINTOUTS

E

Field Data Printout

Location:	CA-3 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.80
Test Run:	1	Testing Type:	Velocity/Bwo	Actual Moisture (%):	23.6
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/12/96			O_2 (dry volume %):	14.2
Meter ΔH@:	1.7527	Area (ft^2):	85.90	CO_2 (dry volume %):	7.4
Meter Y_d:	0.9936			Start Time (approx.):	10:25
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	11:30
Static P:	-0.3	Thimble No:	N/A	H_2O (condensate, ml):	212.0
Leak Rate Before:	0.003 cfm @ 18"Hg	Beaker No:	N/A	H_2O (silica, g):	8.0
Leak Rate After:	0.002 cfm @ 8"Hg				

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)
	0.0			300.52					
1-01	5.0	0.16	1.50	304.05	311	82	74	0.40	3.53
1-02	10.0	0.18	1.50	307.67	310	84	75	0.42	3.62
1-03	15.0	0.13	1.50	311.39	305	87	78	0.36	3.72
2-01	20.0	0.23	1.50	314.95	312	87	78	0.48	3.56
2-02	25.0	0.22	1.50	318.55	313	90	80	0.47	3.60
2-03	30.0	0.17	1.50	322.15	305	92	81	0.41	3.60
3-01	35.0	0.20	1.50	325.80	309	91	81	0.45	3.65
3-02	40.0	0.18	1.50	329.38	307	92	82	0.42	3.58
3-03	45.0	0.12	1.50	333.20	301	87	80	0.35	3.82
4-01	50.0	0.15	1.50	336.77	304	88	82	0.39	3.57
4-02	55.0	0.14	1.50	340.32	308	88	82	0.37	3.55
4-03	60.0	0.10	1.50	343.90	303	87	81	0.32	3.58
Final	60.0	0.40	1.50	43.38	307	84			

Field Data Printout

Location:	CA-3 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.80
Test Run:	2	Testing Type:	Velocity/Bwo	Actual Moisture (%):	26.2
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/12/96			O_2 (dry volume %):	13.4
Meter ΔH@:	1.7527	Area (ft²):	85.90	CO_2 (dry volume %):	8.3
Meter Y_d:	0.9936			Start Time (approx.):	12:40
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	13:43
Static P:	-0.3	Thimble No:	N/A	H_2O (condensate, ml):	242.0
Leak Rate Before:	0.004 cfm @ 17"Hg	Beaker No:	N/A	H_2O (silica, g):	10.0
Leak Rate After:	0.004 cfm @ 10"Hg				

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft³)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{\text{in. } H_2O}$)	Volume (calculated) (ft³)
	0.0			344.32					
4-01	5.0	0.23	1.50	348.04	312	89	84	0.48	3.72
4-02	10.0	0.17	1.50	351.68	311	90	84	0.41	3.64
4-03	15.0	0.16	1.50	355.32	306	92	85	0.40	3.64
3-01	20.0	0.25	1.50	358.98	315	92	86	0.50	3.66
3-02	25.0	0.27	1.50	362.59	316	94	86	0.52	3.61
3-03	30.0	0.20	1.50	366.20	310	94	86	0.45	3.61
2-01	35.0	0.23	1.50	369.90	317	96	88	0.48	3.70
2-02	40.0	0.21	1.50	373.43	316	97	89	0.46	3.53
2-03	45.0	0.17	1.50	377.12	307	97	89	0.41	3.69
1-01	50.0	0.20	1.50	380.82	315	97	90	0.45	3.70
1-02	55.0	0.18	1.50	384.48	314	98	90	0.42	3.66
1-03	60.0	0.16	1.50	388.19	309	99	91	0.40	3.71
Final	60.0	0.45	1.50	43.87	312	91			

Field Data Printout

Location:	CA-3 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.80
Test Run:	3	Testing Type:	Velocity/Bwo	Actual Moisture (%):	24.5
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/12/96			O_2 (dry volume %):	12.8
Meter ΔH@:	1.7527	Area (ft^2):	85.90	CO_2 (dry volume %):	8.8
Meter Y_d:	0.9936			Start Time (approx.):	14:10
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	15:15
Static P:	-0.3	Thimble No:	N/A	H_2O (condensate, ml):	212.0
Leak Rate Before:	0.002 cfm @ 15"Hg	Beaker No:	N/A	H_2O (silica, g):	20.0
Leak Rate After:	0.002 cfm @ 14"Hg				

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)
	0.0	(in. H_2O)	(in. H_2O)	389.31	(°F)	(°F)	(°F)	($\sqrt{in.}$ H_2O)	(ft^3)
1-01	5.0	0.19	1.50	392.99	314	97	92	0.44	3.68
1-02	10.0	0.18	1.50	396.69	317	98	92	0.42	3.70
1-03	15.0	0.17	1.50	400.39	312	98	92	0.41	3.70
2-01	20.0	0.28	1.50	404.09	314	96	92	0.53	3.70
2-02	25.0	0.27	1.50	407.73	317	97	92	0.52	3.64
2-03	30.0	0.21	1.50	411.42	310	95	91	0.46	3.69
3-01	35.0	0.24	1.50	415.09	310	93	89	0.49	3.67
3-02	40.0	0.26	1.50	418.75	313	93	89	0.51	3.66
3-03	45.0	0.19	1.50	422.43	309	93	89	0.44	3.68
4-01	50.0	0.20	1.50	426.10	311	93	88	0.45	3.67
4-02	55.0	0.22	1.50	429.80	308	93	88	0.47	3.70
4-03	60.0	0.15	1.50	433.56	306	93	88	0.39	3.76
Final	60.0	0.46	1.50	44.25	312	93			

Revision 0

CAE Project No. 7837-1
Solvay Minerals, Inc.
Time is 09:56:35.16.
Date is 11-12-1996.

Calibration Error
CA-3 Calciner Stack

Time	THC ppm
9:56:35	0.7
9:56:51	1.3
9:57:05	0.7
9:57:20	0.5
9:57:36	0.5
9:57:50	0.4
9:58:06	0.8
9:58:20	0.1
9:58:36	0.3
9:58:51	0.5
9:59:05	1.1
9:59:21	1
9:59:35	0.5
9:59:51	0.4
10:00:05	0.3
10:00:21	0.8
10:00:36	0.6
10:00:50	0.4
10:01:06	113.6
10:01:20	813.9
10:01:36	839.6
10:01:50	851.2
10:02:05	850.4
10:02:21	852
10:02:35	853.6
10:02:51	854.1
10:03:05	853.7
10:03:21	854.8
10:03:35	855.3
10:03:50	854.2
10:04:06	853.8
10:04:20	852.7
10:04:36	760.1
10:04:50	706.3
10:05:06	687.3
10:05:21	708.4

Time	THC ppm
10:06:35	482.9
10:06:51	481.7
10:07:06	481.2
10:07:20	481.1
10:07:36	481.5
10:07:50	481.2
10:08:06	480.1
10:08:20	479.7
10:08:35	552.9
10:08:51	700.9
10:09:05	694.4
10:09:21	573.1
10:09:35	328.3
10:09:51	267.9
10:10:06	264.7
10:10:20	262.2
10:10:36	260.9
10:10:50	259.4
10:11:06	258.7
10:11:20	258.0
10:11:36	257.9
10:11:51	257.6
10:12:05	263.7
10:12:21	613.8

Calibration Response

Tank Value	Analyzer Response
0	0.5
852.2	854.4
470.0	480.9
252.4	257.8

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 10:17:52.51.
Date is 11-12-1996.

Reference Method Run 1
CA-3 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
10:17:54	635.3	10:57:54	578.0	11:37:54	565.4
10:18:54	642.7	10:58:53	571.4	11:38:54	561.1
10:19:53	653.8	10:59:54	570.0	11:39:54	563.1
10:20:53	657.6	11:00:54	574.6	11:40:54	557.1
10:21:54	665.0	11:01:53	576.3	11:41:54	568.7
10:22:53	657.7	11:02:54	575.8	11:42:54	570.4
10:23:53	652.8	11:03:54	558.0	11:43:54	573.1
10:24:54	653.8	11:04:53	545.4	11:44:54	568.2
10:25:53	657.7	11:05:53	538.7	11:45:54	574.9
10:26:53	652.1	11:06:54	541.5	11:46:54	581.5
10:27:54	655.6	11:07:53	546.3	11:47:54	588.5
10:28:54	653.3	11:08:53	537.8	11:48:54	587.6
10:29:53	647.7	11:09:54	538.0	11:49:54	585.9
10:30:54	646.9	11:10:53	538.4	11:50:54	590.9
10:31:54	650.1	11:11:53	525.3	11:51:54	587.8
10:32:53	653.4	11:12:54	528.6	11:52:54	570.6
10:33:54	648.1	11:13:54	525.4	11:53:54	554.0
10:34:54	650.8	11:14:53	532.4	11:54:54	554.1
10:35:53	647.5	11:15:54	545.6	11:55:54	549.2
10:36:53	653.2	11:16:54	550.8	11:56:54	539.2
10:37:54	648.6	11:17:53	531.0	11:57:54	522.4
10:38:53	645.5	11:18:54	563.0	11:58:54	563.0
10:39:53	649.2	11:19:54	561.9	11:59:54	550.5
10:40:54	648.6	11:20:53	557.6	12:00:54	545.9
10:41:53	631.1	11:21:53	551.7		
10:42:53	627.9	11:22:54	546.4	**Avg**	**586.0**
10:43:54	620.3	11:23:53	555.6		
10:44:54	608.3	11:24:53	557.5		
10:45:53	599.6	11:25:54	559.7		
10:46:54	598.8	11:26:54	548.8		
10:47:54	601.3	11:27:54	543.1		
10:48:53	598.1	11:28:54	551.3		
10:49:53	595.5	11:29:54	556.5		
10:50:54	588.3	11:30:54	552.5		
10:51:53	593.9	11:31:54	562.0		
10:52:53	590.0	11:32:54	589.0		
10:53:54	587.8	11:33:54	578.0		
10:54:53	583.7	11:34:54	567.5		
10:55:53	582.3	11:35:54	562.7		
10:56:54	579.8	11:36:54	560.7		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 12:03:37.11.
Date is 11-12-1996.

Calibration Bias 1
CA-3 Calciner Stack

Time	THC ppm
12:03:38	16.4
12:03:53	15.4
12:04:08	13.6
12:04:23	12.3
12:04:38	11.0
12:04:53	9.9
12:05:08	9.0
12:05:23	8.2
12:05:38	7.6
12:05:53	6.9
12:06:08	6.0
12:06:23	5.4
12:06:38	24.9
12:06:53	831.9
12:07:08	871.4
12:07:23	876.2
12:07:38	878.3
12:07:53	879.9
12:08:08	876.8
12:08:23	872.0
12:08:38	872.2
12:08:53	872.0
12:09:08	871.7
12:09:23	872.5
12:09:38	872.2
12:09:53	872.1
12:10:08	871.1
12:10:23	871.6
12:10:38	864.7
12:10:53	616.7
12:11:08	578.7
12:11:23	579.8
12:11:38	584.4

Calibration Response

Tank Value	Analyzer Response
0	6.8
852.2	871.8
470.0	
252.4	

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 12:13:18.78.
Date is 11-12-1996.

Reference Method Run 2
CA-3 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
12:13:20	590.3	12:49:20	543.3	13:25:20	783.2
12:14:20	598.8	12:50:20	544.9	13:26:20	789.7
12:15:20	594.6	12:51:20	546.4	13:27:20	797.7
12:16:20	569.1	12:52:20	541.5	13:28:20	798.4
12:17:20	565.2	12:53:20	545.9	13:29:20	789.7
12:18:20	565.5	12:54:20	548.7	13:30:20	787.2
12:19:20	552.8	12:55:20	562.2	13:31:20	785.2
12:20:20	571.2	12:56:20	567.3	13:32:20	786.1
12:21:20	585.8	12:57:20	570.9	13:33:20	795.8
12:22:20	589.7	12:58:20	573.2	13:34:20	805.9
12:23:20	584.3	12:59:20	570.9	13:35:20	805.4
12:24:20	571.5	13:00:20	573.1	13:36:20	795.8
12:25:20	576.1	13:01:20	583.2	13:37:20	806.1
12:26:20	575.0	13:02:20	594.2	13:38:20	816.9
12:27:20	575.1	13:03:20	598.5	13:39:20	817.7
12:28:20	576.0	13:04:20	615.1	13:40:20	818.2
12:29:20	572.8	13:05:20	616.0	13:41:20	813.9
12:30:20	574.8	13:06:20	623.6	13:42:20	826.2
12:31:20	572.4	13:07:20	629.7	13:43:20	817.7
12:32:20	571.0	13:08:20	639.0	13:44:20	824.3
12:33:20	572.1	13:09:20	639.5		
12:34:20	570.8	13:10:20	643.4	**Avg**	**644.4**
12:35:20	563.3	13:11:20	651.4		
12:36:20	567.0	13:12:20	662.9		
12:37:20	548.3	13:13:20	671.6		
12:38:20	536.1	13:14:20	676.9		
12:39:20	536.3	13:15:20	695.5		
12:40:20	526.9	13:16:20	700.0		
12:41:20	526.4	13:17:20	710.9		
12:42:20	556.5	13:18:20	723.2		
12:43:20	552.5	13:19:20	735.6		
12:44:20	542.8	13:20:20	747.0		
12:45:20	544.8	13:21:20	761.0		
12:46:20	540.8	13:22:20	772.4		
12:47:20	536.3	13:23:20	777.7		
12:48:20	535.4	13:24:20	781.7		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 13:46:08.55.
Date is 11-12-1996.

Calibration Bias 2
CA-3 Calciner Stack

Time	THC ppm
13:46:09	58.1
13:46:24	54.5
13:46:39	48.3
13:46:54	43.6
13:47:09	40.3
13:47:24	36.6
13:47:39	33.7
13:47:54	31.3
13:48:09	29.3
13:48:24	27.7
13:48:39	25.8
13:48:54	24.3
13:49:09	23.0
13:49:24	21.8
13:49:39	20.3
13:49:54	19.2
13:50:09	18.1
13:50:24	17.2
13:50:39	16.6
13:50:54	15.6
13:51:09	15.0
13:51:24	14.4
13:51:39	442.9
13:51:54	881.0
13:52:09	887.2
13:52:24	890.4
13:52:39	891.9
13:52:54	893.3
13:53:09	895.2
13:53:24	895.9
13:53:39	896.2
13:53:54	895.4
13:54:09	897.0
13:54:24	896.1
13:54:39	896.2
13:54:54	895.8
13:55:09	895.8

Calibration Response

Tank Value	Analyzer Response
0	15.7
852.2	895.9
470.0	
252.4	

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 13:57:00.74.
Date is 11-12-1996.

Reference Method Run 3
CA-3 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
13:57:02	849.1	14:33:02	626.3	15:09:02	464.5
13:58:02	852.9	14:34:02	634.9	15:10:02	446.4
13:59:02	861.9	14:35:02	637.3	15:11:02	463.9
14:00:02	862.1	14:36:02	625.8	15:12:02	480.2
14:01:02	850.5	14:37:02	626.9	15:13:02	467.3
14:02:02	845.4	14:38:02	619.7	15:14:02	464.3
14:03:02	846.7	14:39:02	628.3	15:15:02	456.4
14:04:02	856.0	14:40:02	629.2	15:16:02	458.0
14:05:02	849.5	14:41:02	619.7	15:17:02	455.3
14:06:02	846.0	14:42:02	615.5	15:18:02	449.2
14:07:02	853.9	14:43:02	600.0	15:19:02	450.3
14:08:02	850.7	14:44:02	599.3	15:20:02	452.7
14:09:02	856.5	14:45:02	599.3	15:21:02	448.1
14:10:02	857.5	14:46:02	595.3	15:22:02	456.0
14:11:02	854.1	14:47:02	587.6	15:23:02	448.0
14:12:02	845.1	14:48:02	572.7	15:24:02	436.5
14:13:02	849.8	14:49:02	576.5	15:25:02	458.6
14:14:02	839.7	14:50:02	589.4	15:26:02	456.5
14:15:02	836.3	14:51:02	574.9	15:27:02	460.3
14:16:02	821.1	14:52:02	562.9	15:28:02	454.0
14:17:02	819.1	14:53:02	552.5	15:29:02	462.0
14:18:02	809.1	14:54:02	540.7	15:30:02	468.9
14:19:02	802.9	14:55:02	536.7	15:31:02	471.1
14:20:02	782.8	14:56:02	521.3	15:32:02	475.9
14:21:02	771.1	14:57:02	513.5	15:33:02	481.5
14:22:02	755.0	14:58:02	511.1	15:34:02	500.7
14:23:02	744.3	14:59:02	512.0	15:35:02	520.0
14:24:02	725.5	15:00:02	494.5	15:36:02	532.5
14:25:02	697.0	15:01:02	499.4	15:37:02	538.1
14:26:02	680.0	15:02:02	495.9	15:38:02	549.8
14:27:02	669.4	15:03:02	504.3	15:39:02	562.5
14:28:02	654.2	15:04:02	496.3	15:40:02	586.4
14:29:02	635.7	15:05:02	492.2		
14:30:02	616.4	15:06:02	484.8	**Avg**	**614.2**
14:31:02	620.9	15:07:02	473.0		
14:32:02	621.4	15:08:02	465.1		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 15:41:06.53.
Date is 11-12-1996.

Calibration Bias 3
CA-3 Calciner Stack

Time	THC ppm
15:41:07	26.1
15:41:22	23.0
15:41:37	18.2
15:41:52	14.9
15:42:07	12.5
15:42:22	10.4
15:42:37	8.8
15:42:52	7.6
15:43:07	6.6
15:43:22	5.5
15:43:37	5.2
15:43:52	3.9
15:44:07	3.2
15:44:22	2.7
15:44:37	2.0
15:44:52	1.4
15:45:07	0.9
15:45:22	0.4
15:45:37	-0.4
15:45:52	0.5
15:46:07	-0.2
15:46:22	200.4
15:46:37	883.4
15:46:52	895.9
15:47:07	899.2
15:47:22	901.2
15:47:37	902.1
15:47:52	903.4
15:48:07	903.6
15:48:22	903.3
15:48:37	904.1
15:48:52	904.1
15:49:07	897.4
15:49:22	730.9
15:49:37	714.1
15:49:52	716.2
15:50:07	715.0
15:50:22	718.0

Calibration Response

Tank Value	Analyzer Response
0	0.3
852.2	903.8
470.0	
252.4	

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
11/12/96

GC/MS Data Reduction

Compound
1,3 Butadiene
2-Butanone (MEK)
Benzene
Ethylbenzene
Hexane
Styrene
Toluene
Xylene

CA 3 Calciner Stack - Run 1

Compound	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	Average
1,3 Butadiene	0.41	0.32	0.28	0.32	NF	NF	0.22
2-Butanone	1.40	0.54	0.95	1.25	0.79	0.58	0.92
Benzene	4.55	3.75	3.94	4.07	4.13	4.30	4.12
Ethylbenzene	0.62	0.54	0.75	0.96	0.25	0.26	0.56
Hexane	0.20	0.15	NF	0.13	NF	NF	0.08
Styrene	0.48	0.37	0.39	0.39	0.30	0.32	0.38
Toluene	1.87	1.45	1.51	1.61	1.76	1.83	1.67
Xylene	2.38	2.11	2.69	3.29	2.34	2.24	2.51

NF indicates the compound was not found. A value of zero was used for NF in the average calculation.

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
11/12/96

GC/MS Data Reduction

CA 3 Calciner Stack - Run 2

Compound	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	Average
1,3 Butadiene	0.35	0.32	NF	0.36	0.32	0.14	0.25
2-Butanone	0.88	0.95	0.95	1.25	1.61	1.38	1.17
Benzene	3.99	3.85	4.39	4.83	7.25	8.32	5.44
Ethylbenzene	0.45	0.58	0.89	1.06	0.44	0.46	0.65
Hexane	NF	NF	0.23	0.23	NF	NF	0.08
Styrene	0.44	0.40	0.42	0.57	0.58	0.79	0.53
Toluene	1.63	1.56	1.65	2.00	2.97	3.52	2.22
Xylene	2.23	2.65	2.94	3.63	3.76	4.09	3.22

CA 3 Calciner Stack - Run 3

Compound	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	12-Nov (ppmdv)	Average
1,3 Butadiene	NF	NF	0.28	0.28	0.20	0.14	0.15
2-Butanone	1.85	1.96	1.06	0.92	0.61	0.54	1.16
Benzene	7.77	7.85	4.22	3.64	2.73	2.46	4.78
Ethylbenzene	0.80	0.83	1.15	1.02	0.17	0.15	0.69
Hexane	0.61	0.36	0.17	0.17	NF	NF	0.22
Styrene	0.86	0.83	0.50	0.36	0.09	0.18	0.47
Toluene	3.34	3.33	1.87	1.57	1.21	1.13	2.08
Xylene	4.49	4.80	3.66	3.52	1.80	1.54	3.30

NF indicates the compound was not found. A value of zero was used for NF in the average calculation.

Field Data Printout

Location:	CA 1&2 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.65
Test Run:	1	Testing Type:	Velocity/Bwo	Actual Moisture (%):	11.8
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/13/96			O_2 (dry volume %):	17.8
Meter ΔH@:	1.7527	Area (ft^2):	113.10	CO_2 (dry volume %):	3.3
Meter Y_d:	0.9936			Start Time (approx.):	12:06
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	13:14
Static P:	-0.3	Thimble No:	N/A	H_2O (condensate, ml):	94.0
Leak Rate Before:	0.004 cfm @ 14"Hg	Beaker No:	N/A	H_2O (silica, g):	10.0
Leak Rate After:	0.002 cfm @ 10"Hg				

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered (ft^3)	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)
	0.0	(in. H_2O)	(in. H_2O)	434.50	(°F)	(°F)	(°F)	($\sqrt{in.}$ H_2O)	(ft^3)
3-01	4.0	0.46	1.50	437.34	232	77	70	0.68	2.84
3-02	8.0	0.50	1.50	440.24	237	79	71	0.71	2.90
3-03	12.0	0.38	1.50	443.13	240	79	71	0.62	2.89
3-04	16.0	0.38	1.50	446.07	234	80	71	0.62	2.94
4-01	20.0	0.38	1.50	448.99	223	77	72	0.62	2.92
4-02	24.0	0.37	1.50	451.92	211	77	72	0.61	2.93
4-03	28.0	0.32	1.50	454.82	207	78	73	0.57	2.90
4-04	32.0	0.33	1.50	457.71	208	78	73	0.57	2.89
1-01	36.0	0.49	1.50	460.83	256	77	72	0.70	3.12
1-02	40.0	0.70	1.50	463.80	259	79	73	0.84	2.97
1-03	44.0	0.62	1.50	466.75	261	79	73	0.79	2.95
1-04	48.0	0.46	1.50	469.63	252	80	74	0.68	2.88
2-01	52.0	0.59	1.50	472.56	243	80	73	0.77	2.93
2-02	56.0	0.61	1.50	475.49	242	79	73	0.78	2.93
2-03	60.0	0.69	1.50	478.43	251	79	73	0.83	2.94
2-04	64.0	0.60	1.50	481.33	256	78	73	0.77	2.90
Final	64.0	0.70	1.50	46.83	238	75			

Revision 0

Field Data Printout

Location: CA 1&2 Calciner Stack
Test Run: 2
Client: Solvay Minerals, Inc.
Project No: 7837-1
Test Date: 11/13/96
Meter ΔH@: 1.7527
Meter Y_d: 0.9936
Pitot C_p: 0.84
Static P: -0.4
Leak Rate Before: 0.002 cfm @ 11"Hg
Leak Rate After: 0.002 cfm @ 10"Hg

Method: 1-4
Testing Type: Velocity/Bwo
Area (ft^2): 113.10
Filter No: N/A
Thimble No: N/A
Beaker No: N/A

Bar. Press. (in. Hg): 23.65
Actual Moisture (%): 19.9
O_2 (dry volume %): 15.1
CO_2 (dry volume %): 6.1
Start Time (approx.): 14:16
Stop Time (approx.): 15:21
H_2O (condensate, ml): 180.0
H_2O (silica, g): 10.0

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)
	0.0			482.55					
4-01	4.0	0.52	1.50	485.45	274	76	73	0.72	2.90
4-02	8.0	0.55	1.50	488.34	292	77	73	0.74	2.89
4-03	12.0	0.54	1.50	491.24	297	81	74	0.73	2.90
4-04	16.0	0.41	1.50	494.17	296	81	74	0.64	2.93
3-01	20.0	0.40	1.50	497.07	263	80	74	0.63	2.90
3-02	24.0	0.42	1.50	499.95	259	81	75	0.65	2.88
3-03	28.0	0.39	1.50	502.84	257	82	76	0.62	2.89
3-04	32.0	0.32	1.50	505.81	252	82	75	0.57	2.97
2-01	36.0	0.45	1.50	508.58	269	80	75	0.67	2.77
2-02	40.0	0.46	1.50	511.45	282	81	76	0.68	2.87
2-03	44.0	0.45	1.50	514.38	284	81	76	0.67	2.93
2-04	48.0	0.20	1.50	517.31	285	81	75	0.45	2.93
1-01	52.0	0.48	1.50	520.19	299	81	75	0.69	2.88
1-02	56.0	0.20	1.50	523.07	297	81	76	0.45	2.88
1-03	60.0	0.20	1.50	525.98	299	81	75	0.45	2.91
1-04	64.0	0.10	1.50	528.91	300	81	75	0.32	2.93
Final	64.0	0.60	1.50	46.36	282	78			

Field Data Printout

Location:	CA 1&2 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.65
Test Run:	3	Testing Type:	Velocity/Bwo	Actual Moisture (%):	21.1
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/13/96			O_2 (dry volume %):	15.4
Meter ΔH@:	1.7527	Area (ft^2):	113.10	CO_2 (dry volume %):	5.8
Meter Y_d:	0.9936			Start Time (approx.):	15:52
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	17:00
Static P:	-0.4	Thimble No:	N/A	H_2O (condensate, ml):	194.0
Leak Rate Before:	0.004 cfm @ 12"Hg	Beaker No:	N/A	H_2O (silica, g):	10.0
Leak Rate After:	0.003 cfm @ 10"Hg				

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)
	0.0			530.55					
3-01	4.0	0.43	1.50	533.45	327	72	71	0.66	2.91
3-02	8.0	0.42	1.50	536.27	328	73	72	0.65	2.82
3-03	12.0	0.41	1.50	539.14	327	74	72	0.64	2.87
3-04	16.0	0.37	1.50	542.00	323	75	71	0.61	2.86
4-01	20.0	0.58	1.50	544.88	333	76	72	0.76	2.88
4-02	24.0	0.73	1.50	547.73	331	76	72	0.85	2.85
4-03	28.0	0.65	1.50	550.66	330	76	72	0.81	2.93
4-04	32.0	0.52	1.50	553.34	326	76	72	0.72	2.68
1-01	36.0	0.45	1.50	556.43	328	74	71	0.67	3.09
1-02	40.0	0.47	1.50	559.25	335	75	71	0.69	2.82
1-03	44.0	0.47	1.50	562.17	335	76	71	0.69	2.92
1-04	48.0	0.40	1.50	565.08	331	78	71	0.63	2.91
2-01	52.0	0.47	1.50	568.00	336	77	71	0.69	2.92
2-02	56.0	0.48	1.50	570.83	344	79	72	0.69	2.83
2-03	60.0	0.46	1.50	573.73	345	79	72	0.68	2.90
2-04	64.0	0.37	1.50	576.62	342	79	72	0.61	2.89
Final	64.0	0.69	1.50	46.07	333	74			

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 11:33:04.53.
Date is 11-13-1996.

Calibration Error
CA-1&2 Calciner Stack

Time	THC ppm
11:33:05	-9.3
11:33:20	-3.5
11:33:35	8.5
11:33:50	2.6
11:34:05	2.1
11:34:20	2.0
11:34:35	2.0
11:34:50	2.1
11:35:05	2.0
11:35:20	2.1
11:35:35	2.1
11:35:50	2.0
11:36:05	459.0
11:36:20	855.9
11:36:35	855.9
11:36:50	848.2
11:37:05	850.9
11:37:20	851.6
11:37:35	853.5
11:37:50	853.3
11:38:05	854.7
11:38:20	854.1
11:38:35	853.7
11:38:50	851.3
11:39:05	851.7
11:39:20	852.5
11:39:35	852.4
11:39:50	852.7
11:40:05	641.9
11:40:20	641.6
11:40:35	486.4
11:40:50	483.3
11:41:05	482.4
11:41:20	481.9
11:41:35	481.5

Time	THC ppm
11:42:05	482.5
11:42:20	482.4
11:42:35	482.6
11:42:50	482.3
11:43:05	482.9
11:43:20	481.7
11:43:35	481.1
11:43:50	154.2
11:44:05	320.5
11:44:20	258.5
11:44:35	257.9
11:44:50	257.4
11:45:05	257.1
11:45:20	256.9
11:45:35	256.6
11:45:50	256.5
11:46:05	256.2
11:46:20	255.2
11:46:35	256.1
11:46:50	99.1
11:47:05	26.0
11:47:20	23.8
11:47:35	22.7
11:47:50	22.4
11:48:05	22.2
11:48:20	21.8
11:48:35	21.8
11:48:50	21.8
11:49:05	22.7
11:49:20	27.7
11:49:35	432.5
11:49:50	382.2
11:50:05	399.4

Calibration Response

Tank Value	Analyzer Response
0	2.1
852.2	852.2
470.0	482.3
252.4	256.0

CAE Project No. 7837
Solvay Minerals Inc.
Time is 11:51:39.90.
Date is 11-13-1996.

Reference Method Run 1
CA 1&2 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
11:51:41	396.0	12:27:41	372.0	13:03:41	333.0
11:52:41	399.0	12:28:41	365.4	13:04:41	331.9
11:53:41	403.3	12:29:41	374.8	13:05:41	330.6
11:54:41	408.3	12:30:41	372.2	13:06:41	332.6
11:55:41	401.1	12:31:41	364.3	13:07:41	330.2
11:56:41	407.0	12:32:41	381.5	13:08:41	329.9
11:57:41	413.6	12:33:41	371.8	13:09:41	324.3
11:58:41	412.9	12:34:41	357.3	13:10:41	316.5
11:59:41	416.1	12:35:41	377.9	13:11:41	307.3
12:00:41	412.7	12:36:41	363.1	13:12:41	301.2
12:01:41	393.1	12:37:41	364.7	13:13:41	308.1
12:02:41	423.4	12:38:41	373.3	13:14:41	313.8
12:03:41	398.1	12:39:41	378.4	13:15:41	317.7
12:04:41	404.9	12:40:41	376.3	13:16:41	319.6
12:05:41	403.3	12:41:41	359.3	13:17:41	316.2
12:06:41	394.1	12:42:41	351.2	13:18:41	320.2
12:07:41	395.5	12:43:41	356.5	13:19:41	322.1
12:08:41	390.7	12:44:41	360.1	13:20:41	323.4
12:09:41	391.9	12:45:41	347.9	13:21:41	325.9
12:10:41	390.7	12:46:41	360.8	13:22:41	323.7
12:11:41	401.4	12:47:41	325.8	13:23:41	322.6
12:12:41	409.0	12:48:41	317.5	13:24:41	330.4
12:13:41	408.2	12:49:41	331.8	13:25:41	327.9
12:14:41	392.7	12:50:41	326.9	13:26:41	323.7
12:15:41	383.0	12:51:41	323.2	13:27:41	327.2
12:16:41	357.9	12:52:41	322.5		
12:17:41	352.8	12:53:41	327.7	**Avg**	**357.8**
12:18:41	356.6	12:54:41	326.5		
12:19:41	366.3	12:55:41	320.6		
12:20:41	367.6	12:56:41	332.5		
12:21:41	381.9	12:57:41	321.3		
12:22:41	374.0	12:58:41	329.1		
12:23:41	373.9	12:59:41	326.1		
12:24:41	370.7	13:00:41	328.5		
12:25:41	365.1	13:01:41	338.5		
12:26:41	375.1	13:02:41	327.7		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 13:28:19.86.
Date is 11-13-1996.

Calibration Bias 1
CA 1&2 Calciner Stack

Time	THC ppm
13:28:21	322.0
13:28:36	336.1
13:28:51	290.1
13:29:06	203.3
13:29:21	59.4
13:29:36	11.8
13:29:51	9.4
13:30:06	8.1
13:30:21	7.4
13:30:36	6.7
13:30:51	6.1
13:31:06	5.7
13:31:21	5.1
13:31:36	4.7
13:31:51	4.7
13:32:06	4.4
13:32:21	4.1
13:32:36	219.9
13:32:51	461.1
13:33:06	464.4
13:33:21	465.8
13:33:36	467.0
13:33:51	467.3
13:34:06	467.4
13:34:21	467.0
13:34:36	467.5

Calibration Response

Tank Value	Analyzer Response
0	4.6
852.2	
470.0	467.2
252.4	

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 13:38:33.93.
Date is 11-13-1996.

Reference Method Run 2
CA 1&2 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
13:38:35	365.2	14:14:35	451.1	14:50:35	621.0
13:39:35	387.1	14:15:35	456.2	14:51:35	630.2
13:40:35	366.0	14:16:35	454.7	14:52:35	624.7
13:41:35	343.8	14:17:35	455.6	14:53:35	634.5
13:42:35	350.6	14:18:35	428.7	14:54:35	646.5
13:43:35	351.2	14:19:35	340.9	14:55:35	642.8
13:44:35	349.4	14:20:35	303.3	14:56:35	637.4
13:45:35	343.8	14:21:35	315.5	14:57:35	646.4
13:46:35	335.3	14:22:35	325.0	14:58:35	660.1
13:47:35	349.4	14:23:35	323.6	14:59:35	657.8
13:48:35	348.6	14:24:35	327.5	15:00:35	664.8
13:49:35	348.7	14:25:35	322.6	15:01:35	666.9
13:50:35	349.4	14:26:35	320.3	15:02:35	665.3
13:51:35	348.6	14:27:35	325.0	15:03:35	678.3
13:52:35	357.3	14:28:35	328.4	15:04:35	651.5
13:53:35	346.1	14:29:35	316.8	15:05:35	659.6
13:54:35	342.9	14:30:35	318.6	15:06:35	665.2
13:55:35	400.4	14:31:35	327.7	15:07:35	654.3
13:56:35	364.2	14:32:35	363.8	15:08:35	667.8
13:57:35	353.8	14:33:35	387.0	15:09:35	670.3
13:58:35	353.6	14:34:35	400.0	15:10:35	664.9
13:59:35	356.1	14:35:35	427.4	15:11:35	667.0
14:00:35	348.1	14:36:35	465.8	15:12:35	666.8
14:01:35	354.5	14:37:35	488.8	15:13:35	658.9
14:02:35	375.9	14:38:35	487.0	15:14:35	666.4
14:03:35	372.9	14:39:35	499.5	15:15:35	678.6
14:04:35	402.6	14:40:35	512.2	15:16:35	692.4
14:05:35	421.8	14:41:35	523.1	15:17:35	691.1
14:06:35	422.9	14:42:35	538.3	15:18:35	688.4
14:07:35	414.2	14:43:35	554.2	15:19:35	685.3
14:08:35	408.0	14:44:35	565.7	15:20:35	682.3
14:09:35	410.5	14:45:35	578.3	15:21:35	673.1
14:10:35	436.2	14:46:35	587.9	15:22:35	678.7
14:11:35	444.4	14:47:35	599.4	15:23:35	694.5
14:12:35	461.6	14:48:35	604.4	15:24:35	685.2
14:13:35	457.0	14:49:35	614.1	15:25:35	705.2
				15:26:35	711.3
				Avg	**493.7**

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 15:28:46.69.
Date is 11-13-1996.

Calibration Bias 2
CA 1&2 Calciner Stack

Time	THC ppm
15:28:48	41.0
15:29:03	39.3
15:29:18	36.6
15:29:33	33.9
15:29:48	32.0
15:30:03	30.6
15:30:18	29.3
15:30:33	27.9
15:30:48	26.9
15:31:03	25.9
15:31:18	25.0
15:31:33	24.2
15:31:48	23.5
15:32:03	22.9
15:32:18	22.3
15:32:33	21.7
15:32:48	21.2
15:33:03	20.6
15:33:18	20.1
15:33:33	19.6
15:33:48	19.2
15:34:03	19.0
15:34:18	18.4
15:34:33	25.5
15:34:48	469.0
15:35:03	494.6
15:35:18	497.1
15:35:33	497.7
15:35:48	498.5
15:36:03	499.0
15:36:18	498.0
15:36:33	498.9
15:36:48	498.8
15:37:03	538.5
15:37:18	737.8
15:37:33	871.8

Time	THC ppm
15:37:48	873.6
15:38:03	875.3
15:38:18	874.9
15:38:33	875.9
15:38:48	875.9
15:39:03	875.9
15:39:18	875.8
15:39:33	874.9
15:39:48	763.2

Calibration Response

Tank Value	Analyzer Response
0	18.9
852.2	
470.0	497.8
252.4	

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 15:41:02.69.
Date is 11-13-1996.

Reference Method Run 3
CA 1&2 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
15:41:04	634.0	16:17:04	554.7	16:53:04	532.7
15:42:04	626.5	16:18:04	539.9	16:54:04	527.2
15:43:04	630.6	16:19:04	547.8	16:55:04	532.3
15:44:04	625.3	16:20:04	535.0	16:56:04	526.9
15:45:04	614.0	16:21:04	541.3	16:57:04	525.9
15:46:04	593.0	16:22:04	557.8	16:58:04	521.0
15:47:04	580.9	16:23:04	548.3	16:59:04	521.9
15:48:04	576.7	16:24:04	551.3	17:00:04	513.7
15:49:04	561.7	16:25:04	542.7	17:01:04	513.5
15:50:04	558.0	16:26:04	540.9	17:02:04	511.4
15:51:04	559.4	16:27:04	548.7	17:03:04	508.5
15:52:04	553.5	16:28:04	530.4	17:04:04	515.4
15:53:04	549.6	16:29:04	538.4	17:05:04	507.6
15:54:04	543.4	16:30:04	526.9	17:06:04	516.5
15:55:04	547.7	16:31:04	524.1	17:07:04	520.9
15:56:04	550.6	16:32:04	534.0	17:08:04	514.4
15:57:04	545.9	16:33:04	540.4	17:09:04	525.1
15:58:04	554.0	16:34:04	539.0	17:10:04	521.1
15:59:04	552.1	16:35:04	527.4	17:11:04	513.9
16:00:04	554.1	16:36:04	533.9	17:12:04	526.3
16:01:04	548.2	16:37:04	545.1	17:13:04	511.8
16:02:04	546.7	16:38:04	538.0	17:14:04	505.6
16:03:04	550.8	16:39:04	532.2	17:15:04	520.1
16:04:04	545.8	16:40:04	543.4	17:16:04	512.8
16:05:04	546.8	16:41:04	534.9	17:17:04	512.1
16:06:04	554.5	16:42:04	529.0	17:18:04	509.1
16:07:04	560.7	16:43:04	526.6	17:19:04	504.5
16:08:04	543.7	16:44:04	532.6	17:20:04	510.2
16:09:04	566.5	16:45:04	539.3	17:21:04	492.6
16:10:04	562.1	16:46:04	535.1	17:22:04	486.7
16:11:04	566.5	16:47:04	534.8	17:23:04	490.6
16:12:04	554.0	16:48:04	537.8	17:24:04	481.8
16:13:04	544.5	16:49:04	532.7	17:25:04	497.1
16:14:04	551.8	16:50:04	523.7	17:26:04	497.2
16:15:04	559.7	16:51:04	523.1	17:27:04	494.9
16:16:04	550.9	16:52:04	528.8		
				Avg	**538.6**

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 17:28:32.81.
Date is 11-13-1996.

Calibration Bias 3
CA 1&2 Calciner Stack

Time	THC ppm
17:28:34	36.6
17:28:49	35.5
17:29:04	33.3
17:29:19	31.7
17:29:34	30.4
17:29:49	29.2
17:30:04	28.2
17:30:19	27.2
17:30:34	26.5
17:30:49	23.1
17:31:04	23.4
17:31:19	24.2
17:31:34	23.6
17:31:49	23.2
17:32:04	22.6
17:32:19	22.2
17:32:34	21.7
17:32:49	21.4
17:33:04	20.9
17:33:19	20.6
17:33:34	20.1
17:33:49	86.8
17:34:04	861.7
17:34:19	883.4
17:34:34	887.6
17:34:49	890.5
17:35:04	891.9
17:35:19	892.8
17:35:34	893.8
17:35:49	894.7
17:36:04	895.4
17:36:19	895.8
17:36:34	896.3
17:36:49	896.0
17:37:04	894.9
17:37:19	894.5

Time	THC ppm
17:37:34	605.2
17:37:49	594.0
17:38:04	512.0
17:38:19	510.3
17:38:34	509.2
17:38:49	499.2
17:39:04	497.0
17:39:19	496.9
17:39:34	496.8
17:39:49	496.5
17:40:04	496.4
17:40:19	496.4
17:40:34	496.0
17:40:49	496.1
17:41:04	495.7
17:41:19	495.8
17:41:34	495.7
17:41:49	496.0
17:42:04	496.0
17:42:19	495.8
17:42:34	495.2
17:42:49	494.4

Calibration Response

Tank Value	Analyzer Response
0	20.5
852.2	
470.0	495.7
252.4	

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
11/13/96

GC/MS Data Reduction

Compound
1,3 Butadiene
2-Butanone (MEK)
Benzene
Ethylbenzene
Hexane
Styrene
Toluene
Xylene

CA 1&2 Calciner Stack - Run 1

Compound	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	Average
1,3 Butadiene	0.18	0.12	0.07	0.07	0.08	0.06	0.10
2-Butanone	0.12	NF	0.26	0.13	NF	NF	0.09
Benzene	1.17	1.05	0.96	0.84	1.20	1.18	1.07
Ethylbenzene	0.34	0.45	0.33	0.13	0.09	0.08	0.24
Hexane	0.04	0.06	0.06	NF	NF	NF	0.03
Styrene	0.08	0.07	0.07	0.06	0.02	0.18	0.08
Toluene	0.44	0.40	0.37	0.33	0.54	0.59	0.45
Xylene	0.92	1.07	1.39	1.42	1.13	1.40	1.22

NF indicates the compound was not found. A value of zero was used for NF in the average calculation.

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
11/13/96

GC/MS Data Reduction

CA 1&2 Calciner Stack - Run 2

Compound	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	Average
1,3 Butadiene	0.12	NF	NF	NF	NF	NF	0.02
2-Butanone	0.10	0.08	0.48	0.64	0.72	0.72	0.46
Benzene	1.00	1.05	1.76	2.57	4.39	4.98	2.63
Ethylbenzene	0.35	0.43	0.41	0.61	0.29	0.31	0.40
Hexane	NF	NF	0.17	0.21	NF	NF	0.06
Styrene	0.13	0.08	0.11	0.22	0.52	0.72	0.30
Toluene	0.41	0.41	0.70	1.06	1.85	2.10	1.09
Xylene	0.83	0.99	1.96	2.64	2.32	2.31	1.84

CA 1&2 Calciner Stack - Run 3

Compound	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	13-Nov (ppmdv)	Average
1,3 Butadiene	NF	NF	NF	NF	NF	NF	NF
2-Butanone	0.68	0.22	0.73	0.72	0.60	0.53	0.58
Benzene	2.80	2.81	2.66	2.60	2.86	2.48	2.70
Ethylbenzene	0.67	0.67	0.55	0.56	0.68	0.18	0.55
Hexane	NF	NF	0.26	0.22	NF	NF	0.08
Styrene	0.31	0.26	0.24	0.23	0.19	0.33	0.26
Toluene	1.29	1.21	1.22	1.05	1.22	1.18	1.20
Xylene	2.20	2.28	2.22	2.31	1.87	1.62	2.08

NF indicates the compound was not found. A value of zero was used for NF in the average calculation.

Field Data Printout

Location:	CA 1&2 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.25
Test Run:	4	Testing Type:	Velocity/Bwo	Actual Moisture (%):	18.9
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/14/96			O_2 (dry volume %):	15.7
Meter ΔH@:	1.7527	Area (ft^2):	113.10	CO_2 (dry volume %):	5.7
Meter Y_d:	0.9936			Start Time (approx.):	09:15
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	10:21
Static P:	-0.3	Thimble No:	N/A	H_2O (condensate, ml):	171.0
Leak Rate Before:	0.003 cfm @ 15"Hg	Beaker No:	N/A	H_2O (silica, g):	9.0
Leak Rate After:	0.002 cfm @ 10"Hg				

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)
	0.0	(in. H_2O)	(in. H_2O)	577.84	(°F)	(°F)	(°F)	($\sqrt{in.\ H_2O}$)	(ft^3)
1-01	4.0	0.40	1.50	580.73	324	51	48	0.63	2.89
1-02	8.0	0.41	1.50	583.53	324	52	48	0.64	2.80
1-03	12.0	0.40	1.50	586.33	324	54	49	0.63	2.80
1-04	16.0	0.32	1.50	589.17	320	56	49	0.57	2.84
4-01	20.0	0.40	1.50	592.02	324	56	49	0.63	2.85
4-02	24.0	0.40	1.50	594.87	324	58	50	0.63	2.85
4-03	28.0	0.40	1.50	597.72	323	58	50	0.63	2.85
4-04	32.0	0.31	1.50	600.64	319	59	51	0.56	2.92
3-01	36.0	0.39	1.50	603.47	323	58	51	0.62	2.83
3-02	40.0	0.40	1.50	606.32	323	59	52	0.63	2.85
3-03	44.0	0.39	1.50	609.18	323	59	52	0.62	2.86
3-04	48.0	0.33	1.50	612.04	320	60	53	0.57	2.86
2-01	52.0	0.37	1.50	614.92	322	59	52	0.61	2.88
2-02	56.0	0.39	1.50	617.80	323	59	52	0.62	2.88
2-03	60.0	0.39	1.50	620.61	322	59	53	0.62	2.81
2-04	64.0	0.33	1.50	623.40	320	60	53	0.57	2.79
Final	64.0	0.61	1.50	45.56	322	54			

Field Data Printout

Location: CA 1&2 Calciner Stack
Test Run: 5
Client: Solvay Minerals, Inc.
Project No: 7837-1
Test Date: 11/14/96
Meter ΔH@: 1.7527
Meter Y_d: 0.9936
Pitot C_p: 0.84
Static P: -0.3
Leak Rate Before: 0.002 cfm @ 10"Hg
Leak Rate After: 0.002 cfm @ 8"Hg

Method: 1-4
Testing Type: Velocity/Bwo
Area (ft^2): 113.10
Filter No: N/A
Thimble No: N/A
Beaker No: N/A

Bar. Press. (in. Hg): 23.25
Actual Moisture (%): 19.9
O_2 (dry volume %): 15.7
CO_2 (dry volume %): 5.7
Start Time (approx.): 10:53
Stop Time (approx.): 11:58
H_2O (condensate, ml): 181.0
H_2O (silica, g): 10.0

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)
	0.0			624.00					
3-01	4.0	0.41	1.50	626.86	322	52	50	0.64	2.86
3-02	8.0	0.41	1.50	629.69	322	53	50	0.64	2.83
3-03	12.0	0.41	1.50	632.56	321	54	50	0.64	2.87
3-04	16.0	0.32	1.50	635.45	317	55	50	0.57	2.89
4-01	20.0	0.40	1.50	638.27	322	55	50	0.63	2.82
4-02	24.0	0.42	1.50	641.08	323	55	50	0.65	2.81
4-03	28.0	0.41	1.50	643.91	323	55	50	0.64	2.83
4-04	32.0	0.34	1.50	646.76	320	56	50	0.58	2.85
1-01	36.0	0.39	1.50	649.61	323	55	50	0.62	2.85
1-02	40.0	0.41	1.50	652.44	323	55	50	0.64	2.83
1-03	44.0	0.42	1.50	655.25	324	56	50	0.65	2.81
1-04	48.0	0.35	1.50	658.13	320	56	50	0.59	2.88
2-01	52.0	0.42	1.50	660.92	321	55	50	0.65	2.79
2-02	56.0	0.43	1.50	663.74	322	55	50	0.66	2.82
2-03	60.0	0.42	1.50	666.57	323	55	50	0.65	2.83
2-04	64.0	0.35	1.50	669.37	320	55	50	0.59	2.80
Final	64.0	0.63	1.50	45.37	322	52			

Field Data Printout

Location:	CA 1&2 Calciner Stack	Method:	1-4	Bar. Press. (in. Hg):	23.25
Test Run:	6	Testing Type:	Velocity/Bwo	Actual Moisture (%):	19.2
Client:	Solvay Minerals, Inc.				
Project No:	7837-1				
Test Date:	11/14/96			O_2 (dry volume %):	16.0
Meter ΔH@:	1.7527	Area (ft^2):	113.10	CO_2 (dry volume %):	5.4
Meter Y_d:	0.9936			Start Time (approx.):	12:30
Pitot C_p:	0.84	Filter No:	N/A	Stop Time (approx.):	13:37
Static P:	-0.3	Thimble No:	N/A	H_2O (condensate, ml):	171.0
Leak Rate Before:	0.002 cfm @ 10"Hg	Beaker No:	N/A	H_2O (silica, g):	9.0
Leak Rate After:	0.002 cfm @ 10"Hg				

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.\ H_2O}$)	Volume (calculated) (ft^3)
	0.0			670.25					
1-01	4.0	0.40	1.50	673.07	322	52	50	0.63	2.82
1-02	8.0	0.42	1.50	675.85	324	53	50	0.65	2.78
1-03	12.0	0.40	1.50	678.69	323	55	50	0.63	2.84
1-04	16.0	0.32	1.50	681.53	317	55	50	0.57	2.84
4-01	20.0	0.39	1.50	684.34	321	55	50	0.62	2.81
4-02	24.0	0.41	1.50	687.17	323	55	51	0.64	2.83
4-03	28.0	0.40	1.50	689.99	323	57	51	0.63	2.82
4-04	32.0	0.33	1.50	692.83	319	57	51	0.57	2.84
3-01	36.0	0.39	1.50	695.69	323	56	51	0.62	2.86
3-02	40.0	0.39	1.50	698.52	324	58	51	0.62	2.83
3-03	44.0	0.38	1.50	701.34	323	58	52	0.62	2.82
3-04	48.0	0.33	1.50	704.24	319	58	52	0.57	2.90
2-01	52.0	0.37	1.50	707.05	323	57	53	0.61	2.81
2-02	56.0	0.39	1.50	709.86	324	58	53	0.62	2.81
2-03	60.0	0.38	1.50	712.77	324	59	53	0.62	2.91
2-04	64.0	0.32	1.50	715.00	317	59	53	0.57	2.23
Final	64.0	0.6128	1.50	44.75	322	54			

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 09:05:13.95.
Date is 11-14-1996.

Calibration Error
CA 1&2 Calciner Stack

Time	THC ppm
9:05:15	6.1
9:05:30	5.8
9:05:45	4.8
9:06:00	1.9
9:06:15	1.0
9:06:30	0.8
9:06:44	0.7
9:07:00	0.7
9:07:14	0.7
9:07:30	0.6
9:07:44	0.4
9:08:00	0.1
9:08:15	353.4
9:08:29	804.4
9:08:45	844.3
9:08:59	853.1
9:09:15	853.6
9:09:29	852.6
9:09:44	851.8
9:10:00	850.3
9:10:14	849.8
9:10:30	849.3
9:10:44	847.9
9:11:00	848.7
9:11:15	850.0
9:11:29	712.2
9:11:45	562.6
9:11:59	482.4
9:12:15	475.4
9:12:29	479.5
9:12:45	479.8
9:13:00	479.4
9:13:15	478.9
9:13:30	477.9
9:13:45	477.4
9:14:00	476.8

Time	THC ppm
9:14:15	422.8
9:14:30	256.3
9:14:45	255.0
9:15:00	254.1
9:15:15	253.5
9:15:30	252.9
9:15:45	252.3
9:16:00	252.4
9:16:15	269.2

Calibration Response

Tank Value	Analyzer Response
0	0.6
852.2	848.6
470.0	477.4
252.4	252.5

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 09:17:42.03.
Date is 11-14-1996.

Reference Method Run 4
CA 1&2 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
9:17:43	306.2	9:53:43	312.9	10:29:43	307.0
9:18:42	306.5	9:54:43	310.4	10:30:43	302.3
9:19:42	307.0	9:55:43	308.1	10:31:43	297.6
9:20:43	297.6	9:56:43	306.5	10:32:43	296.0
9:21:42	300.4	9:57:43	305.2	10:33:43	295.6
9:22:42	298.2	9:58:43	305.2	10:34:43	296.5
9:23:43	300.1	9:59:43	304.7		
9:24:43	305.3	10:00:43	299.0	**Average**	**308.8**
9:25:42	310.4	10:01:43	299.8		
9:26:43	310.3	10:02:43	305.3		
9:27:43	310.4	10:03:43	300.5		
9:28:42	311.8	10:04:43	299.9		
9:29:43	315.0	10:05:43	305.7		
9:30:43	317.0	10:06:43	302.0		
9:31:43	318.4	10:07:43	297.3		
9:32:43	319.1	10:08:43	298.9		
9:33:43	323.6	10:09:43	303.9		
9:34:43	322.0	10:10:43	312.1		
9:35:43	322.2	10:11:43	317.2		
9:36:43	321.9	10:12:43	307.4		
9:37:43	316.7	10:13:43	312.3		
9:38:43	318.7	10:14:43	307.9		
9:39:43	317.2	10:15:43	306.7		
9:40:43	316.3	10:16:43	302.9		
9:41:43	316.0	10:17:43	307.1		
9:42:43	314.9	10:18:43	310.4		
9:43:43	319.2	10:19:43	308.1		
9:44:43	314.7	10:20:43	305.8		
9:45:43	315.6	10:21:43	308.2		
9:46:43	316.6	10:22:43	309.2		
9:47:43	314.8	10:23:43	309.3		
9:48:43	314.6	10:24:43	308.3		
9:49:43	311.7	10:25:43	307.3		
9:50:43	310.3	10:26:43	305.5		
9:51:43	310.2	10:27:43	308.6		
9:52:43	308.3	10:28:43	310.2		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 10:38:50.85.
Date is 11-14-1996.

Calibration Bias 4
CA 1&2 Calciner Stack

Time	THC ppm
10:38:51	7.3
10:39:07	7.0
10:39:21	6.9
10:39:36	6.4
10:39:52	6.1
10:40:06	5.8
10:40:22	5.7
10:40:36	5.4
10:40:52	5.2
10:41:07	5.0
10:41:21	227.1
10:41:37	468.6
10:41:51	472.6
10:42:07	474.1
10:42:21	474.9
10:42:37	474.7
10:42:52	475.0
10:43:06	473.7
10:43:22	473.6
10:43:36	470.0
10:43:52	335.8
10:44:06	310.6

Calibration Response

Tank Value	Analyzer Response
0	5.4
852.2	
470.0	474.5
252.4	

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 10:45:14.50.
Date is 11-14-1996.

Reference Method Run 5
CA 1&2 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
10:45:15	314.9	11:21:15	299.3	11:57:15	326.7
10:46:14	318.8	11:22:15	297.5	11:58:15	324.9
10:47:14	318.0	11:23:15	300.2	11:59:15	320.8
10:48:15	295.7	11:24:15	303.0	12:00:15	321.9
10:49:15	292.5	11:25:15	301.6	12:01:15	322.8
10:50:14	292.5	11:26:15	301.3	12:02:15	323.9
10:51:15	298.3	11:27:15	302.3	12:03:15	321.8
10:52:15	300.0	11:28:15	303.1	12:04:15	323.0
10:53:14	299.3	11:29:15	304.1	12:05:15	322.2
10:54:15	294.2	11:30:15	302.7	12:06:15	319.3
10:55:15	289.0	11:31:15	302.9	12:07:15	315.9
10:56:14	296.8	11:32:15	302.5	12:08:15	315.2
10:57:14	296.6	11:33:15	303.8	12:09:15	314.9
10:58:15	296.3	11:34:15	306.3		
10:59:15	297.7	11:35:15	310.4	**Average**	**307.5**
11:00:15	297.8	11:36:15	312.9		
11:01:15	297.4	11:37:15	315.0		
11:02:15	298.3	11:38:15	314.2		
11:03:15	293.9	11:39:15	310.1		
11:04:15	295.6	11:40:15	311.1		
11:05:15	294.0	11:41:15	312.4		
11:06:15	292.1	11:42:15	312.5		
11:07:15	293.1	11:43:15	308.9		
11:08:15	294.6	11:44:15	316.2		
11:09:15	299.5	11:45:15	316.5		
11:10:15	297.6	11:46:15	319.5		
11:11:15	298.0	11:47:15	318.9		
11:12:15	294.3	11:48:15	318.3		
11:13:15	303.7	11:49:15	320.9		
11:14:15	299.6	11:50:15	323.1		
11:15:15	293.8	11:51:15	327.8		
11:16:15	297.0	11:52:15	324.2		
11:17:15	302.1	11:53:15	324.3		
11:18:15	300.1	11:54:15	317.7		
11:19:15	303.7	11:55:15	322.1		
11:20:15	299.1	11:56:15	327.4		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 12:10:58.66.
Date is 11-14-1996.

Calibration Bias 5
CA 1&2 Calciner Stack

Time	THC ppm
12:11:00	18.1
12:11:15	16.6
12:11:30	14.1
12:11:45	13.0
12:12:00	11.9
12:12:15	11.4
12:12:30	10.3
12:12:45	9.3
12:13:00	8.6
12:13:15	8.0
12:13:30	7.6
12:13:45	7.3
12:14:00	7.3
12:14:15	6.5
12:14:30	6.2
12:14:45	5.9
12:15:00	14.7
12:15:15	444.9
12:15:30	467.5
12:15:45	468.6
12:16:00	469.4
12:16:15	469.8
12:16:30	470.3
12:16:45	470.1
12:17:00	470.1
12:17:15	469.5
12:17:30	468.9

Calibration Response

Tank Value	Analyzer Response
0	6.7
852.2	
470.0	469.9
252.4	

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 12:19:17.11.
Date is 11-14-1996.

Reference Method Run 6
CA 1&2 Calciner Stack

Time	THC ppm	Time	THC ppm	Time	THC ppm
12:19:18	320.8	12:55:18	297.0	13:31:18	228.4
12:20:18	328.0	12:56:18	304.4	13:32:18	229.7
12:21:18	328.9	12:57:18	303.4	13:33:18	233.9
12:22:18	313.1	12:58:18	302.5	13:34:18	238.8
12:23:18	302.8	12:59:18	301.7	13:35:18	233.9
12:24:18	309.6	13:00:18	295.7	13:36:18	242.0
12:25:18	307.8	13:01:18	282.1	13:37:18	245.8
12:26:18	303.5	13:02:18	280.7	13:38:18	245.8
12:27:18	309.5	13:03:18	273.7	13:39:18	249.9
12:28:18	309.2	13:04:18	273.7	13:40:18	251.4
12:29:18	309.9	13:05:18	275.8		
12:30:18	312.9	13:06:18	270.3	**Average**	**279.8**
12:31:18	307.7	13:07:18	264.8		
12:32:18	309.9	13:08:18	270.3		
12:33:18	311.7	13:09:18	266.9		
12:34:18	308.9	13:10:18	254.6		
12:35:18	304.9	13:11:18	252.8		
12:36:18	303.4	13:12:18	248.4		
12:37:18	308.9	13:13:18	244.2		
12:38:18	304.7	13:14:18	241.0		
12:39:18	311.0	13:15:18	243.9		
12:40:18	308.9	13:16:18	239.4		
12:41:18	306.6	13:17:18	244.7		
12:42:18	304.3	13:18:18	248.2		
12:43:18	305.4	13:19:18	250.6		
12:44:18	306.0	13:20:18	252.9		
12:45:18	304.7	13:21:18	251.6		
12:46:18	305.6	13:22:18	249.4		
12:47:18	312.1	13:23:18	247.7		
12:48:18	315.1	13:24:18	251.4		
12:49:18	310.6	13:25:18	249.0		
12:50:18	307.7	13:26:18	242.2		
12:51:18	307.6	13:27:18	240.6		
12:52:18	304.4	13:28:18	237.9		
12:53:18	300.3	13:29:18	233.4		
12:54:18	298.6	13:30:18	231.7		

CAE Project No. 7837-1
Solvay Minerals Inc.
Time is 13:40:51.36.
Date is 11-14-1996.

Calibration Bias 6
CA 1&2 Calciner Stack

Time	THC ppm
13:40:52	16.4
13:41:07	14.9
13:41:22	12.6
13:41:37	11.1
13:41:52	10.0
13:42:07	9.1
13:42:22	8.3
13:42:37	7.7
13:42:52	7.2
13:43:07	6.7
13:43:22	6.2
13:43:37	6.1
13:43:52	6.0
13:44:07	5.6
13:44:22	421.0
13:44:37	479.8
13:44:52	482.3
13:45:07	483.3
13:45:22	483.9
13:45:37	484.0
13:45:52	482.8
13:46:07	481.9
13:46:22	483.5
13:46:37	481.5

Calibration Response

Tank Value	Analyzer Response
0	6.1
852.2	
470.0	482.7
252.4	

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
11/14/96

GC/MS Data Reduction

Compound
1,3 Butadiene
2-Butanone (MEK)
Benzene
Ethylbenzene
Hexane
Styrene
Toluene
Xylene

CA 1&2 Calciner Stack - Run 4

Compound	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	Average
1,3 Butadiene	0.12	0.12	0.12	NF	0.10	0.10	0.09
2-Butanone	0.41	0.42	0.39	0.38	0.40	0.41	0.40
Benzene	1.28	1.38	1.37	1.32	1.28	1.33	1.33
Ethylbenzene	0.10	0.09	0.09	0.09	0.09	0.10	0.09
Hexane	0.10	0.06	0.08	0.10	0.08	0.08	0.08
Styrene	0.12	0.12	0.12	0.12	0.12	0.11	0.12
Toluene	0.60	0.62	0.63	0.62	0.63	0.63	0.62
Xylene	0.78	0.87	0.76	0.78	0.83	0.83	0.81

NF indicates the compound was not found. A value of zero was used for NF in the average calculation.

SOLVAY MINERALS, INC.
CAE Project No. 7837-1
11/14/96

GC/MS Data Reduction

CA 1&2 Calciner Stack - Run 5

Compound	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	Average
1,3 Butadiene	NF	0.11	0.12	0.14	0.13	0.12	0.10
2-Butanone	0.41	0.27	0.39	0.41	0.46	0.48	0.40
Benzene	1.34	1.25	1.30	1.48	1.60	1.52	1.42
Ethylbenzene	0.09	0.09	0.10	0.10	0.11	0.11	0.10
Hexane	0.07	0.05	0.09	0.10	0.03	0.05	0.07
Styrene	0.11	0.11	0.12	0.12	0.15	0.14	0.13
Toluene	0.61	0.59	0.61	0.67	0.70	0.69	0.65
Xylene	0.78	0.73	0.72	0.78	0.87	0.91	0.80

CA 1&2 Calciner Stack - Run 6

Compound	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	14-Nov (ppmdv)	Average
1,3 Butadiene	0.14	0.12	CD	0.10	0.07	0.10	0.11
2-Butanone	0.39	0.41	CD	0.36	0.35	0.29	0.36
Benzene	1.49	1.40	CD	1.04	1.09	1.10	1.22
Ethylbenzene	0.11	0.10	CD	0.08	0.07	0.07	0.09
Hexane	0.10	0.05	CD	0.05	0.05	0.08	0.07
Styrene	0.13	0.12	CD	0.07	0.07	0.06	0.09
Toluene	0.67	0.66	CD	0.55	0.53	0.53	0.59
Xylene	0.86	0.88	CD	0.80	0.75	0.69	0.80

NF indicates the compound was not found. A value of zero was used for NF in the average calculation.

CD indicates corrupt data and is not included in the average calculation.

F

OPERATING DATA

F

Source: CA -3 AQD #48
Date: 11/12/96

Time	Rate (TPH)		
8:00	160		
9:00	160		
10:00	160	Start:	10:17
11:00	160		
12:00	160		
13:00	160		
14:00	160		
15:00	160		
16:00	160	Stop:	15:40
17:00	160		

Source: CA -1&2 AQD #17
Date: 11/13/96

Time	Rate (TPH)			
	CA-1	CA-2		
8:00	135	DOWN		
9:00	135	DOWN		
10:00	135	DOWN		
11:00	135	DOWN	Start:	11:51
12:00	135	DOWN		
13:00	135	DOWN		
14:00	135	DOWN		
15:00	135	DOWN		
16:00	135	DOWN	Stop:	17:27
17:00	135	DOWN		
18:00	135	DOWN		
19:00	135	DOWN		

Source: CA -1&2 AQD #17
Date: 11/14/96

Time	Rate (TPH)			
	CA-1	CA-2		
8:00	81	71		
9:00	81	71	Start:	9:17
10:00	81	71		
11:00	81	71		
12:00	81	71		
13:00	81	71	Stop:	13:40
14:00	81	71		
15:00	81	71		

EXPANSION CALCINER PRECIPITATOR LOGSHEET
EP-5

DATE: 11-12-91

OPERATOR SHIFT 6: Tom OPERATOR SHIFT 7:

	CONTROL RANGE	EP-5 PRCP MID SHIFT	EP-5 PRCP MID SHIFT
Calciner Operating	Yes or No	yes	
Section 1 Primary Current	Amps AC	150	
Section 1 Field Voltage	Kilovolts DC	36	
Section 1 Digital	0 - 100%	41	
Section 2 Primary Current	Amps AC	320	
Section 2 Field Voltage	Kilovolts DC	40	
Section 2 Digital	0 - 100%	100	
Section 3 Primary Current	Amps AC	300	
Section 3 Field Voltage	Kilovolts DC	40	
Section 3 Digital	0 - 100%	91	
Section 4 Primary Current	Amps AC	270	
Section 4 Field Voltage	Kilovolts DC	34	
Section 4 Digital	0 - 100%	87	
Section 5 Primary Current	Amps AC	310	
Section 5 Field Voltage	Kilovolts DC	40	
Section 5 Digital	0 - 100%	100	
Section 6 Primary Current	Amps AC	230	
Section 6 Field Voltage	Kilovolts DC	42	
Section 6 Digital	0 - 100%	71	
Dust Screws Operating	Yes - No	yes	

WORK AREA EXAMINATION 1x/SHIFT: 6-7-8

SHIFT #6	SHIFT #7
TIME: 0600	TIME:
INITIALS: TW	INITIALS:

COMMENTS:

SOLVAY2016_6_001835

CALCINE PRECIPITATOR LOGSHEET
EP-1 AND EP-2

DATE: 11-13-96

OPERATOR SHIFT 6: Stan OPERATOR SHIFT 7: Jack

	CONTROL POINT	A PRECIP MID SHIFT	B PRECIP MID SHIFT	A PRECIP MID SHIFT	B PRECIP MID SHIFT
Calciner Operating	Yes / No	yes		Y	Y
Section 1	Amp	046		052	004
Section 1	KV	27.9		25.2	22.5
Section 1 Control Mode	Auto/Man	A		A	A
Section 2	Amp	185		187	182
Section 2	KV	37.7		36.1	36.5
Section 2 Control Mode	Auto/Man	A		A	A
Section 3	Amp	187		187	Unknown
Section 3	KV	35.1		35.6	
Section 3 Control Mode	Auto/Man	A	*	A	A
Section 4	Amp	182		180	184
Section 4	KV	38.4		39.4	36.2
Section 4 Control Mode	Auto/Man	A		A	A
Section 5	Amp	177		172	185
Section 5	KV	38.7		39.1	37.0
Section 5 Control Mode	Auto/Man	A		A	A
Section 6	Amp	174		174	187
Section 6	KV	39.8		40.3	31.6
Section 6 Control Mode	Auto/Man	A		A	A
Cyclone Dust Hoppers	Emp/Full	E		E	E
Dust Screws Operating	Yes / No	yes		Y	Y

WORK AREA EXAMINATION 1x/SHIFT:

SHIFT #6	SHIFT #7
TIME: 06 00	TIME: 4 PM
INITIALS: TV	INITIALS: [illegible]

COMMENTS:

* CA-2 Down For Maintenance

SOLVAY2016_6_001836

CALCINER PRECIPITATOR LOGSHEET
EP-1 AND EP-2

DATE: 11-14-9

OPERATOR SHIFT 6: Sean OPERATOR SHIFT 7: Jack

	CONTROL POINT	A PRECIP MID SHIFT	B PREC.P MID SHIFT	A PRECIP MID SHIFT	B PRECI MID SHI
Calciner Operating	Yes / No	Yes	Yes	Y	Y
Section 1	Amp	048	007	047	005
Section 1	KV	27.1	18.7	26.4	22
Section 1 Control Mode	Auto/Man	A	A	A	A
Section 2	Amp	187	187	187	188
Section 2	KV	39.7	38.2	38.8	38.7
Section 2 Control Mode	Auto/Man	A	A	A	A
Section 3	Amp	185	Down	185	?
Section 3	KV	37.6	Down	37.9	?
Section 3 Control Mode	Auto/Man	A	A	A	A
Section 4	Amp	174	182	179	191
Section 4	KV	40.8	39.0	40.7	38.5
Section 4 Control Mode	Auto/Man	A	A	A	A
Section 5	Amp	164	185	162	195
Section 5	KV	39.9	39.0	39.7	38.4
Section 5 Control Mode	Auto/Man	A	A	A	A
Section 6	Amp	119	184	118	105
Section 6	KV	40.9	32.1	40.7	32.6
Section 6 Control Mode	Auto/Man	A	A	A	A
Cyclone Dust Hoppers	Emp/Full	M-t	M-t	E	E
Dust Screws Operating	Yes / No	Yes	Y	Y	Y

WORK AREA EXAMINATION 1x/SHIFT:

SHIFT #6	SHIFT #7
TIME: 5pm	TIME: 9:40
INITIALS:	INITIALS:

COMMENTS: