Clean Air Engineering

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20 Miles West of Green River
Green River, Wyoming 82935

REPORT ON DIAGNOSTIC TESTING

Performed for:

SOLVAY MINERALS, INC.
EP 1&2 CALCINER STACK
EP-5 CALCINER STACK
GREEN RIVER, WYOMING

Client Reference No: C 02216
CAE Project No: 7473-2
Revision 0: December 1, 1995

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

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Project Overview

PROJECT OVERVIEW

Solvay Minerals, Inc. (Solvay) contracted Clean Air Engineering to perform emissions testing at their facility located west of Green River, Wyoming. The facility processes trona into soda ash, which is used in a variety of manufacturing processes. Testing was conducted on April 24 through 28, 1995.

The purpose of testing was twofold. First, particulate emissions testing was performed at the EP 1&2 Calciner Stack to determine the electrostatic precipitator (ESP) performance under sub-optimal operating conditions. Three (3) one (1) hour runs, using EPA Methods 1-5, were performed to measure particulate emissions.

In addition, EP-5 Calciner Stack emissions were tested at different calciner flame conditions for the purpose of flame optimization. A one (1) hour run was performed at each of three (3) flame conditions (short, medium and long). Nitrogen oxides (NOx), carbon monoxide (CO), methane (CH_4), total hydrocarbons as propane (C_3H_8), and specific volatile organic compounds (VOCs) were measured using EPA Methods 1-4, 7E, 10, 10B, 18 and 25A.

Three (3) injections were performed for each Method 18 test run. When an injection was reported below detection limit (BDL), the value of zero was used to calculate the average concentration for that run.

Standards were not available for field calibration of acrylonitrile and trichloroethene. Duplication of chromatographic conditions used in the field was attempted at CAE's laboratory in Palatine, Illinois. Exact duplication was not possible due to atmospheric differences between the laboratory and the field.

At similar conditions in the laboratory, acrylonitrile standards were observed to interfere with toluene standards. Trichloroethene standards were observed to co-elute with benzene standards. Quantification of acrylonitrile and trichloroethene concentrations from field data is therefore not attainable. As a result, data for these compounds for this project is unavailable.

Coordinating the field testing were:

Dolly Potter - Solvay Minerals, Inc.
Steve Ferguson - Clean Air Engineering

Source identification information is shown in Table 1-1 and 1-2.

SOLVAY2016_6_000433

PROJECT OVERVIEW

Table 1-1:
EP 1&2 Calciner Profile

Unit Identification Number	**AQD No. 17, EP-1 2**
Process	Calciner
Fuel	Subbituminous Coal
Heat Content	10084 Btu/lb
Sulfur Content	0.47%
Ash Content	6.89%
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 Equiptment	2-Buell ESP

Table 1-2:
EP-5 Calciner Profile

Unit Identification Number	**AQD No. 48, EP-5**
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 5.5
Diameters to Downstream Disturbance	Approximately 9.0
Primary Control Equiptment	Flakt ESP

Chemical abstract service(CAS) numbers for the volatile organic compound analytes are listed in Table 1-3.

Table 1-3:
Volatile Organic Compound (CAS) Numbers

Compound Name	**CAS No.**	**Molecular Weight**
Benzene	71-43-2	78.11
1,3 Butadiene	106-99-0	54.09
Ethylbenzene	100-41-4	106.17
Hexane	110-54-3	86.18
1,1,1-Trichloroethane	71-55-6	133.42
2-Butanone	78-93-3	72.10
Methylene chloride	75-09-2	84.94
Styrene	100-42-5	104.14
Toluene	108-88-3	92.14
Xylene	1330-20-7	106.16

PROJECT OVERVIEW

Summaries of the test results are shown in Table 1-4 and Table 1-5.

Table 1-4:
Summary of Test Results for EP 1&2 Calciner Stack

Source Constituent	Sampling Method	Average Concentration (gr/dscf)	Average Emission (lb/hr)
EP 1 & 2 Calciner Stack	M5/202		
Total Inorganic Particulate		0.0166	33.9
Back 1/2 Organic Particulate		0.0103	20.9

Table 1-5:
Summary of Test Results for EP-5 Calciner Stack

Source Constituent	Sampling Method	Average Concentration Short Flame (ppmdv)	Average Concentration Med. Flame (ppmdv)	Average Concentration Long Flame (ppmdv)
EP-5 Calciner Stack				
Nitrogen oxides	EPA M 7E	44.1	42.7	37.7
Carbon monoxide	EPA M 10	617.2	1499.8	497.0
Volatile Organic Compounds	EPA M 18			
2-Butanone		0.71	BDL	0.97
Benzene		3.46	1.65	2.81
1,3 Butadiene		16.12	5.71	11.41
Ethyl Benzene		0.40	BDL	5.87
Hexane		1.95	0.84	1.42
Methylene Chloride		2.35	1.75	3.41
Styrene		0.49	0.31	0.48
Toluene		4.22	2.35	4.14
1,1,1-Trichloroethane		3.11	1.39	3.42
Xylene		4.01	1.67	3.17
Methane		203	249	168
Total Hydrocarbons (as propane)	EPA M 25A	320.5	262.0	204.9

BDL indicates value was below the detection limit. Detection limits are shown in Appendix F.

The test conditions and results of analysis are presented in Table 2-1 through Table 2-3 on pages 2-1 through 2-3.

Results

SOLVAY2016_6_000436

RESULTS

Table 2-1:
EP 1&2 Calciner Stack - Particulate

Run No.		1	2	3	Average
Date (1995)		April 25	April 25	April 25	
Start Time (approx.)		11:45	14:19	16:57	
Stop Time (approx.)		13:27	15:54	18:30	
Process Conditions					
	Feed Rate (tons of trona/hr)[1]	267	267	267	**267**
Gas Conditions					
T_s	Temperature (°F)	426	429	427	**428**
B_{wo}	Moisture (volume %)	18.05	17.93	18.09	**18.02**
O_2	Oxygen (dry volume %)	14.3	14.2	14.1	**14.2**
CO_2	Carbon dioxide (dry volume %)	8.0	8.2	8.2	**8.1**
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	612,500	619,400	621,100	**617,700**
Q_{std}	Standard conditions (dscfm)	235,400	237,600	238,300	**237,100**
Front Half Particulate					
C	Concentration (gr/dscf)	0.0075	0.0137	0.0136	**0.0116**
E	Emission rate (lb/hr)	15.1	27.9	27.8	**23.6**
E	Emission rate (lb/ton trona)	0.0567	0.1046	0.1040	**0.0884**
Back Half Organic Particulate					
C	Concentration (gr/dscf)	0.0092	0.0084	0.0132	**0.0103**
E	Emission Rate (lb/hr)	18.5	17.1	27.0	**20.9**
E	Emission rate (lb/ton trona)	0.0694	0.0641	0.1010	**0.0782**
Back Half Inorganic Particulate					
C	Concentration (gr/dscf)	0.0020	0.0059	0.0072	**0.0050**
E	Emission Rate (lb/hr)	4.05	12.09	14.7	**10.3**
E	Emission rate (lb/ton trona)	0.0152	0.0453	0.0549	**0.0385**
Total Inorganic Particulate					
C	Concentration (gr/dscf)	0.0095	0.0197	0.0208	**0.0166**
E	Emission Rate (lb/hr)	19.2	40.0	42.4	**33.9**
E	Emission rate (lb/ton trona)	0.0718	0.1499	0.1589	**0.1269**

[1] Feed rate provided by Solvay Minerals, Inc.

RESULTS

Table 2-2:
EP-5 Calciner Stack - Nitrogen Oxides, Carbon Monoxide, Methane and Total Hydrocarbons

Run No.	1 (Short Flame)	2 (Med. Flame)	3 (Long Flame)	Average
Date (1995)	April 28	April 28	April 28	
Start Time (approx.)	13:11	15:30	16:59	
Stop Time (approx.)	13:56	16:15	17:44	
Gas Conditions[1]				
T_s Stack temperature (°F)	301	306	299	**302**
B_{wo} Moisture in sample (% by volume)	36.92	38.22	36.00	**37.05**
O_2 Oxygen (dry volume %)	10.4	11.7	10.9	**11.0**
CO_2 Carbon dioxide (dry volume%)	12.6	11.2	12.1	**12.0**
Process Conditions[2]				
Feed rate (ton of trona /hr)	166	166	166	**166**
Flow Conditions				
Q_a Volumetric flow rate, actual (acfm)	144,400	148,800	144,500	**145,900**
Q_{std} Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820	**50,250**
Continuous Emissions Monitoring				
Nitrogen Oxides				
C Concentration (ppmdv)	44.1	42.7	37.7	**41.5**
E Emission rate (lb/hr)	15.8	15.3	13.7	**14.9**
E Emission rate (lb/ton of trona)	0.0950	0.0922	0.0827	**0.0900**
Carbon Monoxide				
C Concentration (ppmdv)	617.2	1499.8	497.0	**871.3**
E Emission rate (lb/hr)	134.4	327.2	110.2	**190.6**
E Emission rate (lb/ton of trona)	0.809	1.971	0.664	**1.15**
Total Hydrocarbons (as propane)				
C Concentration (ppmdv)	320.5	262.0	204.9	**262.4**
E Emission rate (lb/hr)	109.8	90.0	71.5	**90.4**
E Emission rate (lb/ton of trona)	0.662	0.542	0.431	**0.545**
Methane				
C Concentration (ppmdv)	203	249	168	**207**
E Emission rate (lb/hr)	25.3	31.1	21.3	**25.9**
E Emission rate (lb/ton of trona)	0.152	0.187	0.128	**0.156**
Total Non-Methane Hydrocarbons (as propane)				
E Emission rate (lb/hr)	84.5	58.9	50.2	**64.5**

[1] Gas conditions are taken from simultaneous velocity-moisture testing.
[2] Process conditions provided by Solvay Minerals, Inc.

RESULTS

Table 2-3:
EP-5 Calciner - Stack Volatile Organic Compounds

Run No.		1 (Short Flame)	2 (Med. Flame)	3 (Long Flame)	Average
Date (1995)		April 28	April 28	April 28	
Start Time (approx.)		13:12	15:32	16:58	
Stop Time (approx.)		13:56	16:15	17:42	
Process Conditions[1]					
	Feed rate(ton of trona/hr)	166	166	166	**166**
Gas Conditions[2]					
B_{wo}	Moisture (% by volume)	36.92	38.22	36.00	**37.05**
Q_{std}	Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820	**50,250**
1,1,1-Trichloroethane					
C	Concentration (ppmdv)	3.11	1.39	3.42	**2.64**
E	Emission rate (lb/hr)	3.22	1.45	3.61	**2.76**
E	Emission rate(lb/ton of trona)	1.94E-02	8.72E-03	2.18E-02	**1.66E-02**
1,3 Butadiene					
C	Concentration (ppmdv)	16.12	5.71	11.41	**11.08**
E	Emission rate (lb/hr)	6.78	2.41	4.88	**4.69**
E	Emission rate(lb/ton of trona)	4.08E-02	1.45E-02	2.94E-02	**2.82E-02**
2-Butanone					
C	Concentration (ppmdv)	0.71	BDL	0.97	**0.56**
E	Emission rate (lb/hr)	0.40	BDL	0.55	**0.32**
E	Emission rate(lb/ton of trona)	2.41E-03	BDL	3.33E-03	**1.91E-03**
Benzene					
C	Concentration (ppmdv)	3.46	1.65	2.81	**2.64**
E	Emission rate (lb/hr)	2.10	1.00	1.74	**1.61**
E	Emission rate(lb/ton of trona)	1.26E-02	6.05E-03	1.05E-02	**9.72E-03**
Ethyl Benzene					
C	Concentration (ppmdv)	0.40	BDL	5.87	**2.09**
E	Emission rate (lb/hr)	0.33	BDL	4.94	**1.75**
E	Emission rate(lb/ton of trona)	1.97E-03	BDL	2.97E-02	**1.06E-02**
Hexane					
C	Concentration (ppmdv)	1.95	0.84	1.42	**1.40**
E	Emission rate (lb/hr)	1.31	0.56	0.97	**0.95**
E	Emission rate(lb/ton of trona)	7.87E-03	3.40E-03	5.84E-03	**5.70E-03**
Methylene Chloride					
C	Concentration (ppmdv)	2.35	1.75	3.41	**2.50**
E	Emission rate (lb/hr)	1.55	1.16	2.29	**1.67**
E	Emission rate(lb/ton of trona)	9.33E-03	6.97E-03	1.38E-02	**1.00E-02**
Styrene					
C	Concentration (ppmdv)	0.49	0.31	0.48	**0.43**
E	Emission rate (lb/hr)	0.40	0.25	0.40	**0.35**
E	Emission rate(lb/ton of trona)	2.40E-03	1.50E-03	2.40E-03	**2.10E-03**
Toluene					
C	Concentration (ppmdv)	4.22	2.35	4.14	**3.57**
E	Emission rate (lb/hr)	3.02	1.68	3.02	**2.57**
E	Emission rate(lb/ton of trona)	1.82E-02	1.01E-02	1.82E-02	**1.55E-02**
Xylene					
C	Concentration (ppmdv)	4.01	1.67	3.17	**2.95**
E	Emission rate (lb/hr)	3.31	1.38	2.66	**2.45**
E	Emission rate(lb/ton of trona)	1.99E-02	8.31E-03	1.61E-02	**1.48E-02**

BDL indicates value was below the detection limit. A value of zero was usec for BDL in the average calculation.
[1] Process conditions provided by Solvay Minerals, Inc.
[2] Gas conditions are taken from simultaneous velocity-moisture test.

Description of Installation

SOLVAY2016_6_000440

DESCRIPTION OF INSTALLATION

Solvay Minerals, Inc., located near Green River, Wyoming, is a mining, refining and chemical manufacturing facility 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 mined trona is transferred via shuttle cars and conveyor belts into an underground storage bin. The trona is hoisted from the storage bin to the surface. Once on the surface, the trona is crushed and fed to one of three soda ash calciners or to the trona products packaging area.

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 processes 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 solution is then treated to remove organic materials and fine insolubles. This series of processing steps yields a high-purity saturated solution of sodium carbonate. The solution 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 high quality soda ash ready for storage and shipment.

The plant is equipped with bag houses, scrubbers and electrostatic precipitators to control emissions. The coal-fired calciners (EP-1& 2) are equipped with two separate model BA1.1 x 50I, 4334-4.T electrostatic precipitators.

The gas-fired calciner (EP5) is controlled with an ABB Flakt Model FAAGX x 37.5 - 120-110-520-CL-026 electrostatic precipitator and the gas-fired dryer (EP6) is equipped with an ABB Flakt Model FAA 4 x 30H-87-100-AL electrostatic precipitator.

Methodology

METHODOLOGY

The sampling followed procedures as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3, 4, 5, 7E, 10, 18, 25A and 202. The following table summarizes the methods and their respective sources.

Table 4-1:
Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A1	
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 5	"Determination of Particulate Emissions from Stationary Sources"
Method 7E	"Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 10	"Determination of Carbon Monoxide Emissions from Stationary Sources"
Method 18	"Measurement of Gaseous Organic Compound Emissions by Gas Chromatography"
Method 25A	"Determination of Total Gaseous Organic Concentrations using a Flame Ionization Analyzer (FIA)"
Method 202	"Determination of Condensible Particulate Emissions from Stationary Sources"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR).

These sampling, recovery and analytical procedures are summarized on pages 4-2 through 4-13.

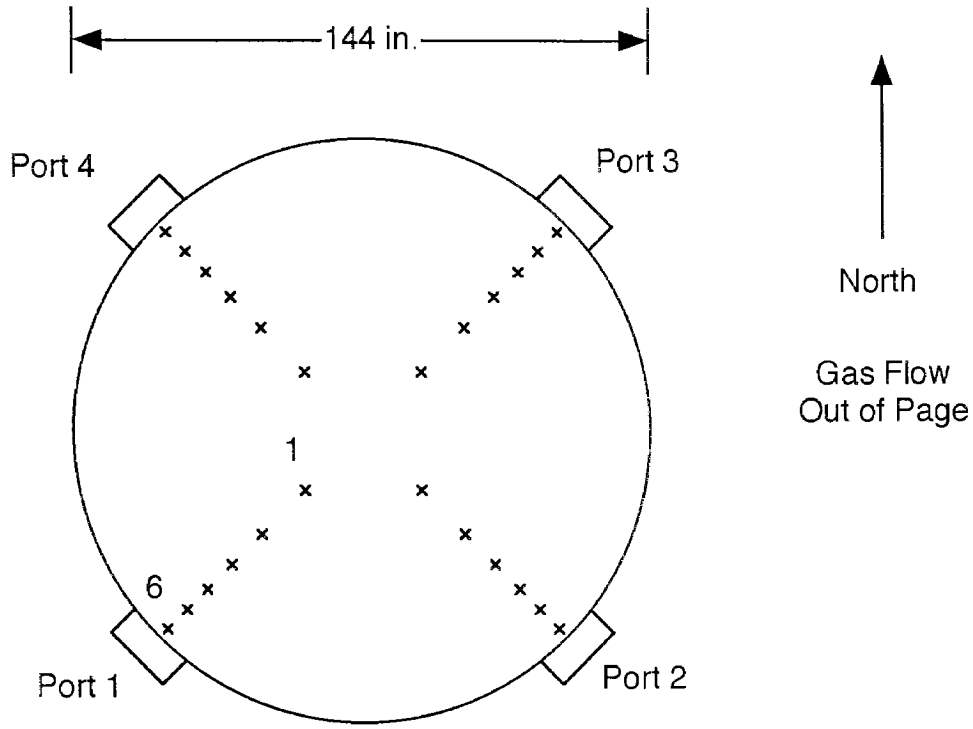
All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site. A post calibration was performed on each meter box at the conclusion of testing to verify that calibration was maintained throughout the test program. Calibration sheets can be found in Appendix Section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

METHODOLOGY

SAMPLING POINT DETERMINATION

Sampling point locations were determined according to EPA Method 1.

Figures 4-1 and 4-2 illustrate the sampling points and orientation of sampling ports for both of the sources tested in the program.



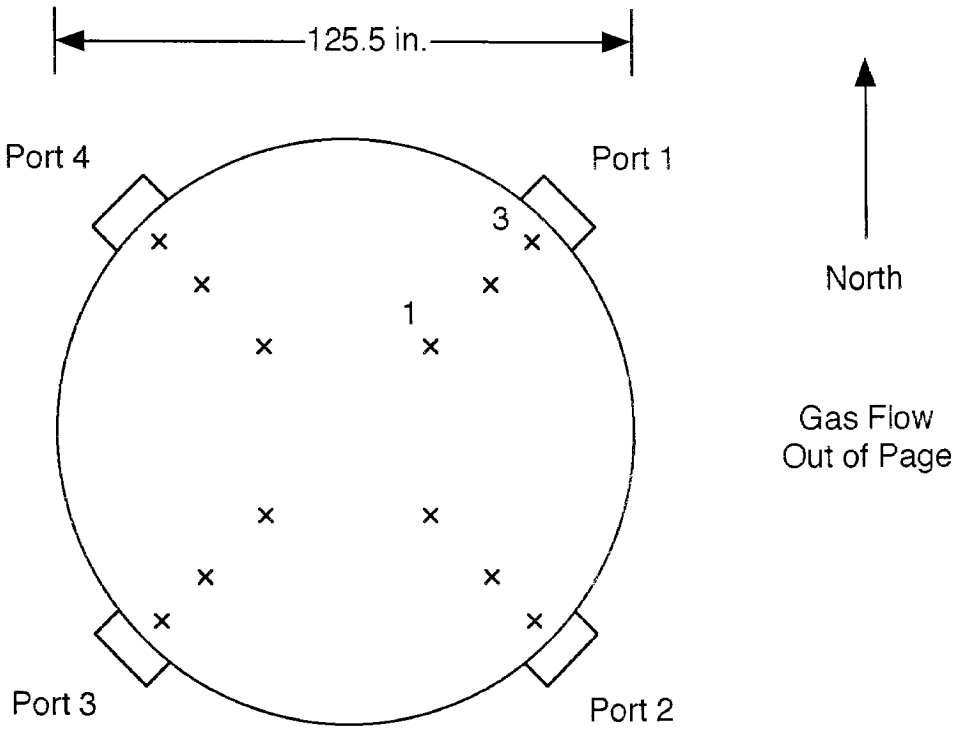
Sampling Point	Port to Point Distance (in.)
1	51.3
2	36.0
3	25.5
4	17.0
5	9.6
6	3.0

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

Figure 4-1: EP 1 & 2 Calciner Stack Sampling Point Determination (EPA Method 1)

METHODOLOGY

SAMPLING POINT DETERMINATION (CONTINUED)



Sampling 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 4-2: EP-5 Calciner Stack Sampling Point Determination (EPA Method 1)

SOLVAY2015_6_000445

METHODOLOGY

VELOCITY AND VOLUMETRIC FLOW RATE - EPA METHOD 2

EPA Method 2 was used to determine the gas velocity and flow rate at the EP-5 and the EP 1&2 Calciner Stacks. Figure 4-3 shows the major components of the 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.

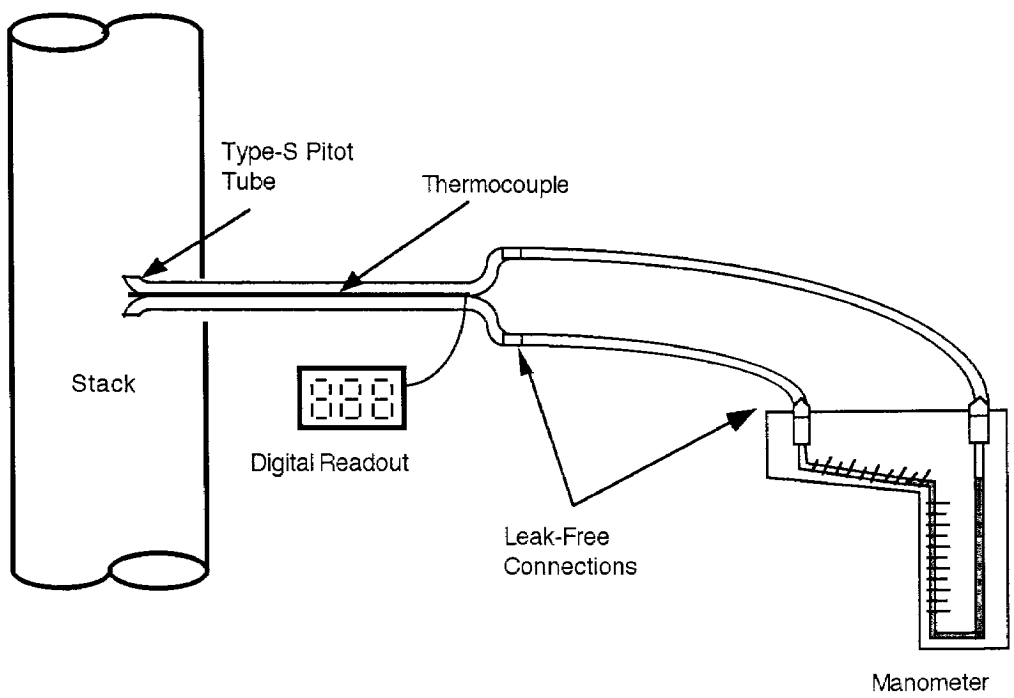


Figure 4-3: Velocity Sampling Apparatus (EPA Method 2)

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 and analyzed for O_2 and CO_2 concentrations using an Orsat gas analyzer.

METHODOLOGY

MOISTURE CONTENT - EPA METHOD 4

The flue gas moisture content at the EP-5 and the EP 1&2 Calciner Stacks was determined in accordance with EPA Method 4. Figure 4-4 shows the major components of the EPA Method 4 sampling apparatus. The gas moisture was determined by quantitatively condensing the water in a chilled knock-out jar train. 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 calculations.

The sample gas entered a condenser system for drying of the gas. The condenser system consisted of four leak-free glass knock-out jars and rubber leak-free connectors. The first two knock-out jars each contained 100 milliliters of distilled water. The third knock-out jar was empty, and the fourth contained 300 grams of silica gel. All four of the knock-out jars were placed in an ice bath for the duration of the test.

The metering system included a vacuum gauge, a leak-free pump, thermometers accurate to within ±5.0°F and a dry gas meter accurate to within 2%.

Before and after each test, the sample apparatus was leak checked. A leakage rate of less than the 0.02 cfm was considered acceptable.

METHODOLOGY

MOISTURE CONTENT (CONTINUED)

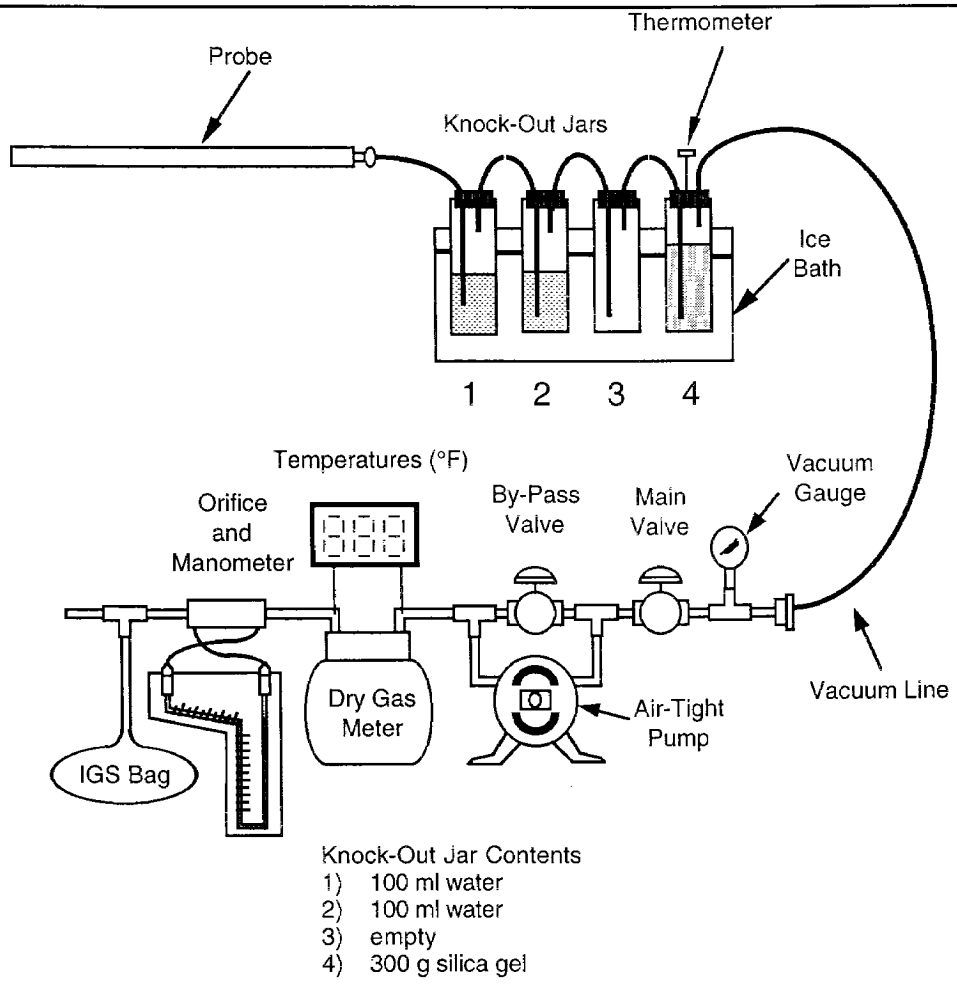


Figure 4-4: Moisture Sampling Apparatus (EPA Method 4)

SOLVAY2015_6_000448

METHODOLOGY

TOTAL PARTICULATE AND BACK-HALF CONDENSIBLES COMBINED EPA METHODS 5 AND 202

EPA Method 5 was used in conjunction with EPA Method 202 to measure total particulate and back-half condensible particulate emissions at the EP 1&2 Calciner Stack. EPA Method 5 measures particulate collected in the nozzle, probe and filter. EPA Method 202 measures the condensible particulate matter which collects in the impinger assembly.

Figure 4-5 illustrates the EPA Method 5/202 sampling apparatus that was used. The sampling train consisted of a temperature-controlled glass- lined probe equipped with a pitot tube and thermocouple (for measuring stack gas flow rate). The probe was fitted with a sharp-edged glass sampling nozzle which also conformed to method specifications. The exit of the probe connected directly to an 85-mm glass filter holder which contained a high efficiency glass fiber filter for particulate collection.

The exit of the filter was connected directly to a series of four impingers. The first three impingers each contained 100 milliliters of distilled water. The fourth contained approximately 300 grams of silica gel. The impingers were maintained at a temperature below 68°F for the duration of each test. In accordance with EPA Method 202 requirements, all glassware was cleaned prior to testing with soap and water, rinsed with water, acetone and finally methylene chloride.

Procedures for selecting sampling locations and for the operation of the apparatus were derived from EPA Method 5/202 and associated EPA Methods 1 through 4. The sampling apparatus was leak-checked before and after each test run. The pre-test leak checks were performed with the entire apparatus assembled. Sampling was performed isokineticly at each sampling point for the duration of the test.

At the conclusion of the test run, the nozzle and probe were rinsed and brushed with distilled water, which was collected into a glass sample container. The glass fiber filter and associated particulate catch were recovered into the original filter container and sealed.

The impinger liquid was recovered quantitatively into a glass sample container. The volume of liquid collected in each of the impingers was quantified for EPA Method 4 moisture calculations. The impingers were rinsed with distilled water, and the rinses were added to the storage container. The impingers were then rinsed with methylene chloride, which was collected into a separate glass container. All containers were labeled and sealed for shipment to the laboratory.

METHODOLOGY

TOTAL PARTICULATE AND BACK-HALF CONDENSIBLES (CONTINUED)

The particulate analyses were performed by the Clean Air Engineering laboratory located in Palatine, Illinois. Particulate samples collected on the glass fiber filters were analyzed gravimetrically to a constant weight. The nozzle wash along with the filter holder and probe wash were transferred to tared beakers, evaporated to dryness, and weighed to constant weights.

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

METHODOLOGY

TOTAL PARTICULATE AND BACK-HALF CONDENSIBLES (CONTINUED)

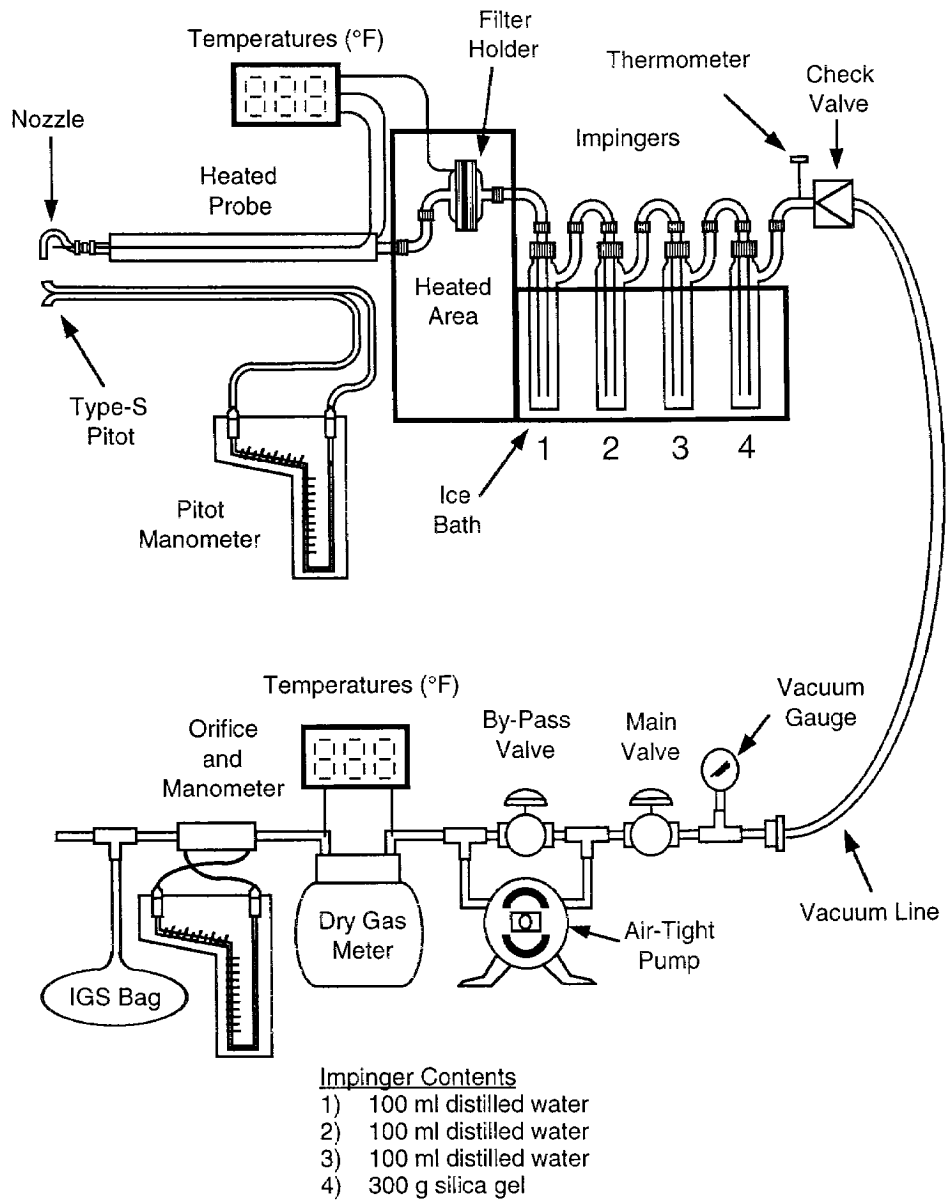


Figure 4-5: Particulate Sampling Apparatus (EPA Method 5/202)

SOLVAY2016_5_000451

METHODOLOGY

VOLATILE EMISSIONS TESTING - EPA METHOD 18

The analytical method used for on-site gas chromatography for air is detailed in the U.S. EPA Method 18: "Measurement of gaseous organic compound emissions by gas chromatography."

A Hewlett Packard benchtop gas chromatograph (GC) equipped with an FID (flame ionization detector) and a TCD (thermal conductivity detector), was calibrated with a standard mixture containing the compounds of interest. An initial calibration consisting of five points was performed immediately after mobilization to the site. A known concentration of each compound was injected into the GC via a gas sampling valve. A continuous flow of gas was pushed through the valve at a constant rate and a one milliliter sample loop was filled with calibration gas. In addition, an MTI 200 GC coupled with a TCD was used for methane measurements.

At the test location a heated sample line was connected to the source and fed to the on-site GC. Data from the chromatograms was reduced by first identifying peaks. Peaks from the sample gas are matched with retention times of the peaks from the known standards. Areas are calculated using a computing integrator. The area of the each peak is mathematically compared to the concentration for the standard most similar in area or the average response factor. Results were calculated in ppm of each analyte.

METHODOLOGY

CONTINUOUS EMISSIONS MONITORING - EPA METHODS 7E, 10 AND 25A

Monitoring of nitrogen oxides (NOx), carbon monoxide (CO) and total hydrocarbons (THC) emissions at the EP-5 Calciner Stack was performed using a combination of EPA Methods 7E, 10 and 25A.

A gas sample was continuously extracted from the stack and delivered to a series of gas analyzers which measured the pollutant concentrations in the gas. The analyzers were calibrated on-site using certified mixtures of calibration gases.

Figure 4-6 contains a general schematic of the continuous emissions monitoring (CEM) system. The system utilized a heated stainless steel probe for gas withdrawal. The probe tip was equipped with a sintered stainless steel filter for particulate removal. The end of the probe was connected to a heated Teflon sample line which delivered the sample gases from the stack to the CEM system. 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.

Table 4-2 lists the analyzers used to perform the continuous emissions monitoring.

Table 4-2
Gas Analyzers

GAS	METHOD	REFERENCE ANALYZER MANUFACTURER	PRINCIPLE OF OPERATION
NOx	EPA 7E	TECO 10A	Chemiluminescense
CO	EPA 10	TECO 48	Gas Filter Correlation NDIR
THC	EPA 25A	J.U.M. Engineering VE-7	Flame Ionization Detection (FID)

Determination of NOx and CO Concentrations
EPA Methods 7E and 10

Before entering the analyzer, the gas sample was split into two streams. One stream passed directly into a refrigerated condenser which cooled the gas to approximately 35°F to remove the stack gas moisture. After passing through the condenser, the dry gas entered a Teflon-head diaphragm pump and a flow control panel which delivered the gas in parallel to the NOx and CO analyzers. The analyzers measured the gas concentrations on a dry volumetric basis.

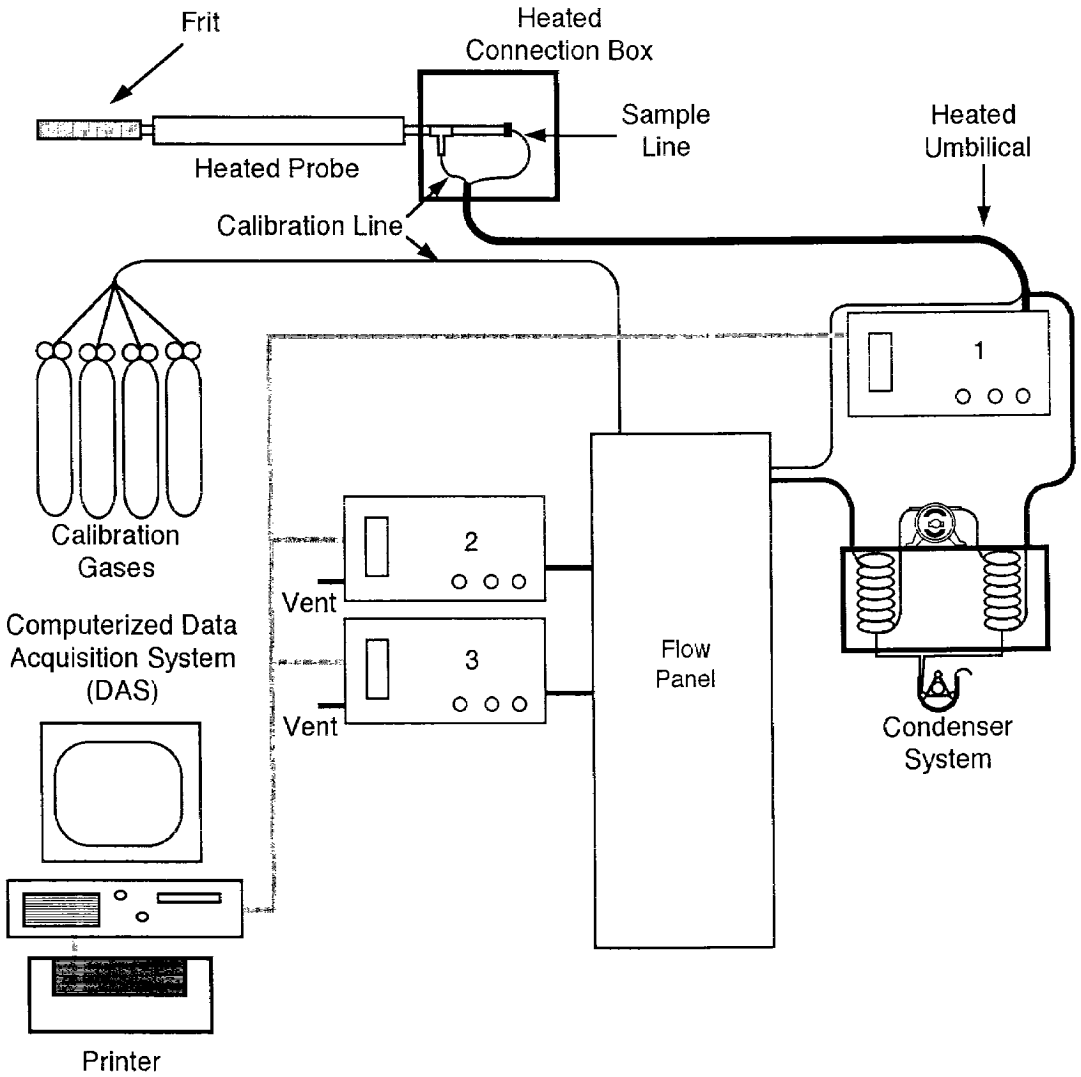
Determination of THC Concentrations
EPA Method 25A

The other gas stream remained heated and was transported through a Teflon line directly into the THC analyzer, which measured the gas on a wet volumetric basis. The THC analyzer contained a separate heated pump for gas delivery.

SOLVAY2016_3_000453

METHODOLOGY

CONTINUOUS EMISSIONS MONITORING (CONTINUED)



No	Gas	Monitor	Range Used	Calibration Gas Concentrations
1)	THC	J.U.M. Engineering VE-7	0-100 0-1000	24.78, 55.43, 84.81 250.1, 558.2, 847.1
2)	CO	TECO 48	0-500 0-5000	150.2, 281.9 1508, 3972
3)	NOx	TECO 10A	0-500	232, 442.7

Figure 4-6: CEM Apparatus (EPA Methods 7E, 10 and 25A)

SOLVAY2016_6_000454

METHODOLOGY

CONTINUOUS EMISSIONS MONITORING (CONTINUED)

Each of the analyzers was calibrated according to the respective reference method procedures. Before testing, each analyzer was checked for calibration error by introducing a zero, mid-level and high-level certified calibration gas directly into the analyzer. All of the reference method criteria for calibration error were demonstrated for each analyzer before testing could proceed.

EPA Protocol No. 1 certified calibration mixtures were used to calibrate the analyzers. The THC analyzer was calibrated with propane. All calibration gases were blended with nitrogen.

Before and after each of the three test runs, the zero gas and one up-scale gas for each analyzer was introduced into the sampling line at the exit of the heated probe to check for sampling system bias and calibration drift. The demonstration of reference method criteria for bias (pre- and post-test) and calibration drift was required for a valid test run. The results of the pre-test and post-test bias checks were used to correct the average flue gas concentration measured during each test run for analyzer drift during that period.

Appendix

APPENDIX

SAMPLE CALCULATIONS ..... A
PARAMETERS ..... B
CALIBRATION DATA C
WEIGHT SHEETS ..... D
FIELD DATA ..... E
FIELD DATA PRINTOUTS ..... F
CHAIN OF CUSTODY ..... G

A

SAMPLE CALCULATIONS

A

SAMPLE CALCULATIONS
EP 5 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)

$$V_{wstd} = (0.04707)(V_{lc})$$
$$= (0.04707)(238.3)$$
$$= 11.22 \text{ wscf}$$

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)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$
$$= \frac{(17.64)(24.20)\left(23.66 + \frac{1.80}{13.6}\right)(0.9966)}{(460 + 68)}$$
$$= 19.16 \text{ dscf}$$

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)

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

$$= 23.66 + \left(\frac{-0.2}{13.6}\right)$$

$$= 23.65 \text{ in. Hg}$$

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]

$$P_v = P_s$$

$$= 23.65 \text{ in. Hg}$$

Where:

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

5. Moisture content (%)

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

$$= \frac{11.22}{19.16 + 11.22}$$

$$= 0.3692$$

$$\times 100\% = 36.92\ \%$$

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 (%)

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

$$= \frac{(23.65)}{(23.65)}$$

$$= 1.0$$

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

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)

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

$$= 44.0\frac{(12.6)}{(100)} + 32.0\frac{(10.4)}{(100)} + 28.0\frac{(77.0)}{(100)}$$

$$= 30.43\ \frac{\text{lb}}{\text{lb}\cdot\text{mole}}$$

Where:

Md	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)
$M_{CO}+N_2$	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)

$$M_s = (M_d)(1 - B_{wo}) + (M_{H_2O})(B_{wo})$$
$$= (30.43)(1 - 0.3692) + (18.0)(0.3692)$$
$$= 25.84 \frac{\text{lb}}{\text{lb} \cdot \text{mole}}$$

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)

$$V_s = (K_p)(C_P)\left(\sqrt{\Delta P}\right)\left(\sqrt{\frac{(\overline{T}_s + 460)}{(M_s)(P_s)}}\right)$$
$$= (85.49)(0.84)(0.350)\left(\sqrt{\frac{(301 + 460)}{(25.84)(23.65)}}\right)$$
$$= 28.0 \frac{\text{ft}}{\text{sec}}$$

Where:

C_p	velocity pressure coefficient (dimensionless)
K_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)

$$Q_a = (60)(A_s)(V_s)$$
$$= (60)(85.93)(28.0)$$
$$= 144{,}400 \text{ acfm}$$

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)

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

$$= \frac{(144{,}400)(23.65)(17.64)(1-0.3692)}{(301+460)}$$

$$= 49{,}910 \text{ dscfm}$$

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. Percent isokinetic (%)[1]

$$I = \frac{(0.09450)(\overline{T_s}+460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1-B_{wo})}$$

$$= \frac{(0.09450)(426+460)(55.81)}{(23.56)(90.3)\left(\frac{(0.255)^2(\pi)}{(144)(4)}\right)(60)(1-0.1805)}$$

$$= 99.0\ \%$$

Where:

D_n	diameter of nozzle (in)
B_{wo}	proportion of water vapor in the gas stream by volume
I	percent of isokinetic sampling (%)
P_s	absolute sample gas pressure (in. Hg)
T_s	average sample gas temperature (°F)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
V_s	sample gas velocity (ft/sec)
Θ	total sampling time (min)
0.09450	constant
460	°F to °R conversion constant

[1] These calculations were taken from EP-1&2 run 1.

SAMPLE CALCULATIONS (CONTINUED)

13. Particulate concentration (gr/dscf)

$$C_{gr/dscf} = \frac{(15.43)(m_n)}{V_{mstd}} = \frac{(15.43)(0.0530)}{(43.82)} = 0.0187 \frac{gr}{dscf}$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
m_n	total amount of particulate matter collected, corrected for applicable reagent blank (g)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
15.43	conversion factor (gr/g)

14. Particulate emission (lb/hr)

$$E_{lb/hr} = \frac{(C_{gr/dscf})(Q_{std})(60)}{7,000} = \frac{(0.0187)(235,400)(60)}{(7,000)} = 37.7 \frac{lb}{hr}$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
$E_{lb/hr}$	emission rate (lb/hr)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
60	conversion factor (min/hr)
7,000	conversion factor (gr/lb)

SAMPLE CALCULATIONS (CONTINUED)

15. Continuous emissions monitoring for total hydrocarbons as propane (drift corrected in ppmdv)[1]

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

$$= \left((215.3) - \left(\frac{0.2 + 5.8}{2}\right)\right) \frac{(558.2)}{\left(\left(\frac{555.6 + 622.9}{2}\right) - \left(\frac{0.2 + 5.8}{2}\right)\right)}$$

$$= 202.1 \text{ ppmdv}$$

Where:

C_{gas}	concentration corrected for drift (ppmdv)
C_{avg}	measured concentration in the gas stream (ppmdv)
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)

16. Continuous emissions monitoring for total hydrocarbons as propane (moisture corrected to ppmdv)[1]

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

$$= \frac{(215)}{(1 - 0.3692)}$$

$$= 320 \text{ppmdv}$$

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)

[1] Calculations for nitrogen oxides and carbon monoxide are performed in a similar manner.

SAMPLE CALCULATIONS (CONTINUED)

17. Continuous emissions monitoring for total hydrocarbons as propane (lb/hr)[1]

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

$$= \frac{(320)(44.10)(49,910)(60)}{(385.3)(10^6)}$$

$$= 110 \frac{lb}{hr}$$

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)

18. Continuous emissions monitoring for total hydrocarbons (lb/ton of trona)[2]

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

$$= \frac{(110)}{(166)}$$

$$= 0.662 \frac{lb}{ton\ of\ trona}$$

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 nitrogen oxides, carbon monoxide and volatile organic compounds are performed in a similar manner, using their respective molecular weights.

[2] Calculations for nitrogen oxides, carbon monoxide and volatile organic compounds are performed in a similar manner.

B

PARAMETERS

B

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 1&2 Calciner Stack

PARTICULATE PARAMETERS

Run No.		1	2	3
Date (1995)		April 25	April 25	April 25
Start Time (approx.)		11:45	14:19	16:57
Stop Time (approx.)		13:27	15:54	18:30
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9966	0.9966	0.9966
C_p	Pitot tube coefficient	0.84	0.84	0.84
P_g	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_b	Barometric pressure (in. Hg)	23.58	23.58	23.58
D_n	Nozzle diameter (in.)	0.255	0.185	0.185
O_2	Oxygen (dry volume %)	14.3	14.2	14.1
CO_2	Carbon dioxide (dry volume %)	8.0	8.2	8.2
V_{lc}	Liquid collected (ml)	205.0	155.5	157.7
V_m	Volume metered, meter conditions (ft^3)	55.81	42.54	42.40
T_m	Dry gas meter temperature (°F)	72	67	64
T_s	Stack temperature (°F)	426	429	427
ΔH	Meter box orifice pressure drop (in. H_2O)	2.43	0.66	0.66
Θ	Total sampling time (min)	60	84	84
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	9.65	7.32	7.42
V_{mstd}	Volume metered, standard (ft^3)	43.82	33.51	33.61
P_s	Sample gas pressure, absolute (in. Hg)	23.56	23.56	23.56
P_v	Vapor pressure, actual (in. Hg)	23.56	23.56	23.56
B_{wo}	Moisture in sample (% by volume)	18.05	17.93	18.09
B_{ws}	Saturated moisture (% by volume)	100.00	100.00	100.00
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	1.079	1.090	1.094
M_d	MW of sample gas, dry (lb/lb-mole)	29.85	29.88	29.88
M_s	MW of sample gas, wet (lb/lb-mole)	27.71	27.75	27.73
V_s	Velocity of sample (ft/sec)	90.3	91.3	91.5
%I	Isokinetic sampling (%)	99.0	101.8	101.8
Q_a	Volumetric flow rate, actual (acfm)	612,500	619,400	621,100
Q_{std}	Volumetric flow rate, standard (dscfm)	235,400	237,600	238,300

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 1&2 Calciner Stack

PARTICULATE PARAMETERS (continued)

Run No.		1	2	3
Date (1995)		April 25	April 25	April 25
Start Time (approx.)		11:45	14:19	16:57
Stop Time (approx.)		13:27	15:54	18:30
Front Half Particulate Results				
m_n	Matter collected (g)	0.0213	0.0298	0.0296
C	Concentration (gr/dscf)	0.0075	0.0137	0.0136
E	Emission rate (lb/hr)	15.1	27.9	27.8
E	Emission rate (lb/ton of trona)[1]	0.0567	0.105	0.104
Back Half Organic Particulate Results				
m_n	Matter collected (g)	0.0261	0.0183	0.0288
C	Concentration (gr/dscf)	0.0092	0.0084	0.0132
E	Emission rate (lb/hr)	18.5	17.1	27.0
E	Emission rate (lb/ton of trona)[1]	0.0694	0.0641	0.101
Back Half Inorganic Particulate Results				
m_n	Matter collected (g)	0.0057	0.0129	0.0156
C	Concentration (gr/dscf)	0.0020	0.0059	0.0072
E	Emission rate (lb/hr)	4.05	12.1	14.7
E	Emission rate (lb/ton of trona)[1]	0.0152	0.0453	0.0549
Back Half Total Particulate Results				
m_n	Matter collected (g)	0.0318	0.0312	0.0444
C	Concentration (gr/dscf)	0.0112	0.0143	0.0204
E	Emission rate (lb/hr)	22.6	29.2	41.6
E	Emission rate (lb/ton of trona)[1]	0.0845	0.109	0.156
Total Inorganic Particulate Results				
m_n	Matter collected (g)	0.0270	0.0427	0.0452
C	Concentration (gr/dscf)	0.0095	0.0197	0.0208
E	Emission rate (lb/hr)	19.2	40.0	42.4
E	Emission rate (lb/ton of trona)[1]	0.0718	0.1499	0.1589
Total Particulate Results				
m_n	Matter collected (g)	0.0530	0.0610	0.0740
C	Concentration (gr/dscf)	0.0187	0.0281	0.0340
E	Emission rate (lb/hr)	37.7	57.2	69.4
E	Emission rate (lb/ton of trona)[1]	0.141	0.214	0.260

[1] Calculation performed using a feed rate of 267 tons of trona/hr.

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack

VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (1995)		April 28	April 28	April 28
Start Time (approx.)		13:13	15:32	16:59
Stop Time (approx.)		13:58	16:02	17:29
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9966	0.9966	0.9966
C_p	Pitot tube coefficient	0.84	0.84	0.84
P_g	Static pressure (in. H_2O)	-0.2	-0.2	-0.2
A_s	Sample location area (ft^2)	85.90	85.90	85.90
P_b	Barometric pressure (in. Hg)	23.66	23.66	23.66
O_2	Oxygen (dry volume %)	10.4	11.7	10.9
CO_2	Carbon dioxide (dry volume %)	12.6	11.2	12.1
V_{lc}	Liquid collected (ml)	238.3	250.3	221.5
V_m	Volume metered, meter conditions (ft^3)	24.20	24.04	23.17
T_m	Dry gas meter temperature (°F)	68	68	63
T_s	Stack temperature (°F)	301	306	299
ΔH	Meter box orifice pressure drop (in. H_2O)	1.80	1.80	1.80
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	11.22	11.78	10.43
V_{mstd}	Volume metered, standard (ft^3)	19.16	19.04	18.54
P_s	Sample gas pressure, absolute (in. Hg)	23.65	23.65	23.65
P_v	Vapor pressure, actual (in. Hg)	23.65	23.65	23.65
B_{wo}	Moisture in sample (% by volume)	36.92	38.22	36.00
B_{ws}	Saturated moisture (% by volume)	100.00	100.00	100.00
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.350	0.357	0.351
M_d	MW of sample gas, dry (lb/lb-mole)	30.43	30.26	30.37
M_s	MW of sample gas, wet (lb/lb-mole)	25.84	25.57	25.92
V_s	Velocity of sample (ft/sec)	28.0	28.9	28.0
Q_a	Volumetric flow rate, actual (acfm)	144,400	148,800	144,500
Q_{std}	Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack

CEM PARAMETERS

Run No.		1	2	3
Date (1995)		April 28	April 28	April 28
Start Time (approx.)		13:11	15:30	16:59
Stop Time (approx.)		13:56	16:15	17:44
Gas Conditions[1]				
O_2	Oxygen (dry volume %)	10.4	11.7	10.9
CO_2	Carbon Dioxide (dry volume %)	12.6	11.2	12.1
B_{wo}	Moisture in sample (% by volume)	36.92	38.22	36.00
Q_{std}	Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820
Process Conditions[2]				
	Feed Rate (tons/hr of trona)	166	166	166
NITROGEN OXIDES				
Data Acquisition				
C	Effluent gas concentration (ppmdv)	44.0	42.6	37.4
Calibration Gases				
C_{oi}	Calibration bias check, initial zero gas	0.9	1.1	0.5
C_{mi}	Calibration bias check, initial upscale gas	428.6	435.4	432.4
C_{of}	Calibration bias check, final zero gas	1.1	0.5	0.7
C_{mf}	Calibration bias check, final upscale gas	435.4	432.4	433.1
C_{ma}	Actual concentration of upscale gas	442.70	442.70	442.70
Calculated Results				
C_{gas}	Concentration drift corrected (ppmdv)	44.1	42.7	37.7
E	Emission rate (lb/hr)	15.8	15.3	13.7
E	Emission rate (lb/ton of trona)	0.0950	0.0922	0.0827
CARBON MONOXIDE				
Data Acquisition				
C	Effluent gas concentration (ppmdv)	598.2	1455.6	483.4
Calibration Gases				
C_{oi}	Calibration bias check, initial zero gas	1.2	1.2	1.2
C_{mi}	Calibration bias check, initial upscale gas	1461.1	1459.0	1468.1
C_{of}	Calibration bias check, final zero gas	1.2	1.2	1.2
C_{mf}	Calibration bias check, final upscale gas	1459.0	1468.1	1460.0
C_{ma}	Actual concentration of upscale gas	1508.000	1508.000	1508.000
Calculated Results				
C_{gas}	Concentration drift corrected (ppmdv)	617.2	1499.8	497.0
E	Emission rate (lb/hr)	134.4	327.2	110.2
E	Emission rate (lb/ton of trona)	0.809	1.97	0.664

[1] Gas conditions taken from simultaneous velocity-moisture testing.
[2] Feed rate provided by Solvay Minerals, Inc.

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack

CEM PARAMETERS

Run No.		1	2	3
Date (1995)		April 28	April 28	April 28
Start Time (approx.)		13:11	15:30	16:59
Stop Time (approx.)		13:56	16:15	17:44
Gas Conditions[1]				
O_2	Oxygen (dry volume %)	10.4	11.7	10.9
CO_2	Carbon Dioxide (dry volume %)	12.6	11.2	12.1
B_{wo}	Moisture in sample (% by volume)	36.92	38.22	36.00
Q_{std}	Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820
Process Conditions[2]				
	Feed Rate (tons/hr of trona)	166	166	166
TOTAL HYDROCARBONS				
Data Acquisition				
C	Effluent gas concentration (ppmwv)	215.3	182.1	146.1
Calibration Gases				
C_{oi}	Calibration bias check, initial zero gas	0.2	5.8	0.1
C_{mi}	Calibration bias check, initial upscale gas	555.6	622.9	618.9
C_{of}	Calibration bias check, final zero gas	5.8	0.1	0.6
C_{mf}	Calibration bias check, final upscale gas	622.9	618.9	622.5
C_{ma}	Actual concentration of upscale gas	558.2	558.2	558.2
Calculated Results				
C_{gas}	Concentration drift corrected (ppmwv)	202.1	161.8	131.1
C_{gas}	Concentration moisture corrected (ppmdv)	320.5	262.0	204.9
E	Emission rate (lb/hr)	109.8	90.0	71.5
E	Emission rate (lb/ton of trona)	0.662	0.542	0.431
METHANE				
Calculated Results				
C_{gas}	Concentration moisture corrected (ppmdv)	203	249	168
E	Emission rate (lb/hr)	25.3	31.1	21.3
E	Emission rate (lb/tons of trona)	0.152	0.187	0.128
TOTAL NON-METHANE HYDROCARBONS(as propane)				
Calculated Results				
E	Emission rate (lb/hr)	84.5	58.9	50.2

[1] Gas conditions taken from simultaneous velocity-moisture testing.
[2] Feed rate provided by Solvay Minerals, Inc.

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack

VOLATILE ORGANICS PARAMETERS

Run No.		1	2	3	Average
Date (1995)		April 28	April 28	April 28	
Start Time (approx.)		13:12	15:32	16:58	
Stop Time (approx.)		13:56	16:15	17:42	
Process Conditions[1]					
	Feed rate(ton of trona/hr)	166	166	166	**166**
Gas Conditions[2]					
B_{wo}	Moisture (% by volume)	36.92	38.22	36.00	**37.05**
Q_{std}	Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820	**50,250**
1,1,1-Trichloroethane					
C	Concentration (ppmwv)	1.96	0.86	2.19	**1.67**
C	Concentration (ppmdv)	3.11	1.39	3.42	**2.64**
E	Emission rate(lb/hr)	3.22	1.45	3.61	**2.76**
E	Emission rate(lb/ton of trona)	1.94E-02	8.72E-03	2.18E-02	**1.66E-02**
1,3 Butadiene					
C	Concentration (ppmwv)	10.17	3.53	7.30	**7.00**
C	Concentration (ppmdv)	16.12	5.71	11.41	**11.08**
E	Emission rate(lb/hr)	6.78	2.41	4.88	**4.69**
E	Emission rate(lb/ton of trona)	4.08E-02	1.45E-02	2.94E-02	**2.82E-02**
2-Butanone					
C	Concentration (ppmwv)	0.45	BDL	0.62	**0.36**
C	Concentration (ppmdv)	0.71	BDL	0.97	**0.56**
E	Emission rate(lb/hr)	0.40	BDL	0.55	**0.32**
E	Emission rate(lb/ton of trona)	2.41E-03	BDL	3.33E-03	**1.91E-03**
Benzene					
C	Concentration (ppmwv)	2.18	1.02	1.80	**1.67**
C	Concentration (ppmdv)	3.46	1.65	2.81	**2.64**
E	Emission rate(lb/hr)	2.10	1.00	1.74	**1.61**
E	Emission rate(lb/ton of trona)	1.26E-02	6.05E-03	1.05E-02	**9.72E-03**
Ethyl Benzene					
C	Concentration (ppmwv)	0.25	BDL	3.76	**1.34**
C	Concentration (ppmdv)	0.40	BDL	5.87	**2.09**
E	Emission rate(lb/hr)	0.33	BDL	4.94	**1.75**
E	Emission rate(lb/ton of trona)	1.97E-03	BDL	2.97E-02	**1.06E-02**
Hexane					
C	Concentration (ppmwv)	1.23	0.52	0.91	**0.89**
C	Concentration (ppmdv)	1.95	0.84	1.42	**1.40**
E	Emission rate(lb/hr)	1.31	0.56	0.97	**0.95**
E	Emission rate(lb/ton of trona)	7.87E-03	3.40E-03	5.84E-03	**5.70E-03**

BDL indicates value was below the detection limit. A value of zero was used for BDL in the average calculation.
[1] Process conditions provided by Solvay Minerals, Inc.
[2] Gas conditions are taken from simultaneous velocity-moisture test.

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack

VOLATILE ORGANICS PARAMETERS

Run No.		1	2	3	Average
Date (1995)		April 28	April 28	April 28	
Start Time (approx.)		13:12	15:32	16:58	
Stop Time (approx.)		13:56	16:15	17:42	
Process Conditions[1]					
	Feed rate(ton of trona/hr)	166	166	166	**166**
Gas Conditions[2]					
B_{wo}	Moisture (% by volume)	36.92	38.22	36.00	**37.05**
Q_{std}	Volumetric flow rate, standard (dscfm)	49,910	50,020	50,820	**50,250**
Methylene Chloride					
C	Concentration (ppmwv)	1.48	1.08	2.18	**1.58**
C	Concentration (ppmdv)	2.35	1.75	3.41	**2.50**
E	Emission rate(lb/hr)	1.55	1.16	2.29	**1.67**
E	Emission rate(lb/ton of trona)	9.33E-03	6.97E-03	1.38E-02	**1.00E-02**
Styrene					
C	Concentration (ppmwv)	0.31	0.19	0.31	**0.27**
C	Concentration (ppmdv)	0.49	0.31	0.48	**0.43**
E	Emission rate(lb/hr)	0.40	0.25	0.40	**0.35**
E	Emission rate(lb/ton of trona)	2.40E-03	1.50E-03	2.40E-03	**2.10E-03**
Toluene					
C	Concentration (ppmwv)	2.66	1.45	2.65	**2.25**
C	Concentration (ppmdv)	4.22	2.35	4.14	**3.57**
E	Emission rate(lb/hr)	3.02	1.68	3.02	**2.57**
E	Emission rate(lb/ton of trona)	1.82E-02	1.01E-02	1.82E-02	**1.55E-02**
Xylene					
C	Concentration (ppmwv)	2.53	1.03	2.03	**1.86**
C	Concentration (ppmdv)	4.01	1.67	3.17	**2.95**
E	Emission rate(lb/hr)	3.31	1.38	2.66	**2.45**
E	Emission rate(lb/ton of trona)	1.99E-02	8.31E-03	1.61E-02	**1.48E-02**

BDL indicates value was below the detection limit. A value of zero was used for BDL in the average calculation.
[1] Process conditions provided by Solvay Minerals, Inc.
[2] Gas conditions are taken from simultaneous velocity-moisture test.

CALIBRATION DATA

C

[redacted] Meter Box Full Test Calibration [redacted]

Date: 11.20.94 Operator: M. KUBERA

Meter Box No.: D-7	Meter Box ΔH@: 1.8228	Meter Box Yd: 0.9966	Barometric Pressure: 28.93

				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} Net	Initial	Final	V_d Net	In	Out	T_{ds} Ave.	In	T_o Out	T_d Ave.	Θ Time	Y_d	ΔH@
0.38	0.5	-1.8	1.0000	0	5.12	5.12	365.837	371.185	5.348	68	68	68	87	83	85	12.75	0.9824	1.7553
0.38	0.5	-1.8	1.0000	0	5.00	5.00	371.185	376.415	5.23	68	68	68	89	84	87	12.44	0.9846	1.7489
0.93	3.0	-3.9	1.0000	0	15.50	15.50	390.00	405.718	15.718	68	68	68	99	86	93	16.03	1.0148	1.8065
0.93	3.0	-3.9	1.0000	0	18.6	18.6	408.975	427.95	18.975	68	68	68	101	89	95	19.26	1.0124	1.8011
0.63	1.5	-2.5	1.0000	0	10.40	10.40	431.00	441.918	10.918	68	68	68	102	90	96	15.71	0.9928	1.9135
0.64	1.5	-2.5	1.0000	0	10.00	10.00	441.918	452.418	10.50	68	68	68	102	90	96	15.10	0.9927	1.9115
																Average	0.9966	1.8228

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

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

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

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

Calibrations

Vacuum Gauge		Thermometers		
Standard (in. Hg)	Vacuum Gauge	Standard (°F)	Inlet	Outlet
5.3	5			
10.6	10			
15.5	15			
20.4	20			
23.5	23.5			

CS 001 Full Test-English
CNVS/TRG.R2-2/7/94

Clean Air Engineering

SOLVAY2016_6_000479

POST-TEST DGM CALIBRATION CHECK
BY CRITICAL ORIFICE

Client/Owner: Solvay Minerals, Inc
CAE Project No: 7473
Post-Test Cal. Date: 4/28/95

Meterbox I.D. No: D-7
Full-Test Cal. Date: 11/20/94
Post Test Calibration by: Ron Luikaart

Average Field Test Data
Sample Rate: 1.75 ΔH
Highest Vacuum: 6 "Hg

(+) Leak check ok?	Yes	(-) Leak check ok?	Yes	Orifice I. D. no:	B2	Orifice K':	0.6501	Orifice rated cfm:	0.84

Trial No:	Elapsed Time Min.	Meterbox Gas Volume Initial cu. ft.	Final cu. ft.	Vm cu. ft.	ΔH "H2O	Vacuum "Hg	Pb "Hg	Temperatures Ti °F	To °F	Tavg °F	Tamb °F	Post Test Yc	Full Test Yd	Error %
1	5.00	266.80	270.93	4.13	1.75	14	23.66	64	62	63	63	1.0148	0.9966	-1.8
2	5.00	270.93	275.08	4.15	1.75	14	23.66	61	60	61	56	1.0129	0.9966	-1.6
3	5.00	275.08	279.21	4.13	1.75	14	23.66	62	61	62	60	1.0160	0.9966	-1.9
			Average cfm =	4.14									Average % Error =	-1.8

Calculations

Vmstd = 17.64 * Vm * ((Pb +(ΔH/13.6)) / (Tm + 460))
Vcr std = K' * Pb * min / √(Tamb + 460)
Yc = Vcr std / Vmstd
% Error = 100 * (Yd - Yc) / Yd

Where:

Vm = Gas Volume Metered, cu. ft.
ΔH = Meterbox Orifice Setting, in. H2O
Pb = Barometric Pressure, in. Hg
Tm = Meterbox Temp. (avg. of Ti & To), °F
Ti = Meterbox Inlet Temp., °F
To = Meterbox Outlet Temp., °F
Tamb = Ambient Temp. °F
Yc = DGM Calibration Coeffcient based on orifice data
Yd = DGM Calibration Coeffcient from Full Test Calibration
K' = Orifice Coeffcient

**Acceptance Criteria: The average percent error must not be greater than 5%. See 40CFR60, Method 5, sections 5.3.2 & 5.3.3.*

SOLVAY2016_6_000480

Meter Box Critical Orifice
Post Test Data Sheet

CAE Project No. 7473

Location SOLVAY MINERALS

Date 4/28/95

Meter # ~~61~~ - D7
RML 65

Meter Yd .9966

Meter ΔH@ 1.8228

Full Test Cal. Date _____

Critical Orifice Cal. Date _____

Pbar 23.66

K' 0.6501

Orifice Used B2

Volume	Elapsed Time	Tmi	Tmo	Tamb	ΔH	Vacuum
266.80	.....	62	61	.....	.....	.....
270.93	5	64	62	63	1.75	14
275.08	10	61	60	56	1.75	14
279.21	15	62	61	60	1.75	14
12.41	15	61.6		60	1.75	14

Calibrated by RON M. LUIKAART

Clean Air Engineering

CS 005 Critical Orifice
EXCL/D61.R1-2/9/94

Critical Orifice Calibration Data Sheet

Meter 61 - 10

Meter Yd 0.9964

Meter ΔH@ 0.995

Full Test Cal. Date - - 1/20/94

Critical Orfice Cal. Date 7/5/94

Pbar 29.26

Orifice Calibrated B-2

Run #	Volume	Elapsed Time	Tmi	Tmo	Tamb	ΔH	Vacuum
Initial	287.06		79	78			
1	291.33	5.0	79	78	71	2.4	18
2	295.65	10.0	81	78	69	2.4	18
3	299.96	15.0	81	79	69	2.4	18

Run #	K'	Difference from Avg.
1	0.6467	-0.52%
2	0.6528	0.42%
3	0.6508	0.11%
avg	0.6501	

SAMPLE PROBE CALIBRATION DATA

Probe Type & I.D. number: 6' S-TYPE PITOT 12-8-94-4

D. Chiarone 1-5-95

Thermocouple Calibration

Reference Type: _____ Reference I.D. No: _____ Pyrometer I.D. No: _____ Degrees: F / C

Point No.	Target Temp.	Reference Temp	Indicated Temp	Temp Difference	% Difference
1	ice-32F				
2	ambient-70F				
3	hot oil-150F				
4	boiling H2O-212F				
5	hot oil-320F				

Specification

%Difference ≤ 1.5

Does assembly meet specifications? YES / NO → *If "NO" thermocouple must be replaced.*

Geometric Pitot Calibration — diagrams on reverse

Is pitot assembly in good repair? YES / NO If "NO" explain: _____

[1] "S" Pitot

Measurement				Specification
α1=	1	α2=	1	<10°
β1=	1	β2=	1	<5°
γ=	1	θ=	1	
Pa=	.349	Pb=	.349	Pa + Pb = A
A=	.698	D1=	.250	

Calculations

z = A sin = .0121 <0.125"

w = A sin = .0121 <0.03125"

[ ] Standard Pitot

Measurement		Specification
Tube O.D.	"	(D)
Static Hole I.D.	"	(D X 0.1)
Length,		
Tip to Static	"	(6 X D Minimum)
Static to Bend	"	(8 X D Minimum)

Does assembly meet specifications? YES / NO

If "YES" "S" pitot Cp=0.84; Std pitot Cp=0.99

Does assembly meet specifications? YES / NO → *If "NO" wind tunnel calibration is required.*

Wind Tunnel Pitot Calibration

Reference Pitot I.D. No: _____ Reference Pitot Cp: _____

SIDE A:

Trial No.	Reference ΔP	Probe ΔP	Probe Cp	Cp Deviation
1				
2				
3				

Average Probe Cp= _____

Side A "S" = _____

SIDE B:

Trial No.	Reference ΔP	Probe ΔP	Probe Cp	Cp Deviation
1				
2				
3				

Average Probe Cp= _____

Side B "S" = _____

Where,

Probe Cp=√(Reference ΔP / Probe ΔP)

Cp Deviation=Probe Cp - Average Probe Cp

"S" =√((Σ (Reference Cp - Cp Deviation))/2)

Specification

Avg Cp Side A - Avg Cp Side B < 0.01

and

"S" Side A and "S" Side B ≤ 0.02

Does assembly meet specifications? YES / NO → *If "YES" Cp=Average of A and B Side Cp values. If "NO" pitot must be replaced.*

PROBE Cp = 0.84 Calibrated by: D. Chiarone Date: 1-5-95

SOLVAY2016_6_000483

CLEAN AIR ENGINEERING IL. 003 01/12/95 14:49

Pyrometer Calibration Sheet

Pyrometer No.: D-7

Office: Palatine

Calibrated by: HHC

Client:

Date: 11-20-94

Job or Ref No.:

Temperature Scale Used: ☑ Fahrenheit ☐ Celsius

Full Test ☑ Post Test ☐

Calibration Reference Settings for Fahrenheit Scale	Pyrometer Reading	Calibration Reference Settings for Celsius Scale
50 °F	50	25 °C
100 °F	100	50 °C
150 °F	150	75 °C
200 °F	201	100 °C
250 °F	252	125 °C
300 °F	301	150 °C
350 °F	351	175 °C
400 °F	400	200 °C
450 °F	450	225 °C
500 °F	500	250 °C
550 °F	550	275 °C
600 °F	600	300 °C

Calibration Reference Information

Reference Used: Digimite/Other

Serial No.: T-123216

Calibrated By: OMEGA ENGINEERING

Date Calibrated: 4-29-94

Calibration Report No.: 237920

SOLVAY2016_6_000484

Nozzle Calibration Sheet

Client: SOLVAY

Calibrated by: SF

Date: 4/25/95

Job or Ref No: 7473

Unit: EP 1,2 &

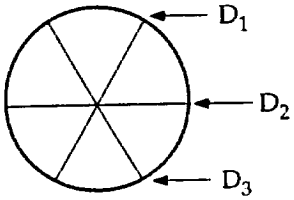
Runs: 1-3

Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	ΔD_{ave} (inches)
.25	0.255	0.255	0.254	0.001	0.255
	0.185	0.185	0.184	0.001	0.185

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters
$\Delta D \leq 0.004$ inches*

ΔD_{avg} = average of D_1, D_2, D_3



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

CS 006 Nozzle
CNVS/TRG.R1-2/7/94

Clean Air Engineering

Reference Method
Sampling System

Client: SOLVAY MINERALS
Plant: GREEN RIVER, WY
Unit: EP-1,2 & EP-5
Location: STACK
Run #'s: 1-3

Job #: 7473
Operator: S. FERGUSON
Date: 4-26-95
Data Acquisition: Chart / Computer
File Names: RUN-→ BIAS00→

Instrumentation Data for Reference Method:

#	Constituent	Manufacturer	Serial/Asset#	Range Used	Oper. Principle	Units Reported
1	THC	J.U.M.		0-1000/100	FID	PPM
2	CO	TECO	3223	0-5000/500	GFC	PPM
3						
4						
5						
6						

Reference Method System Performance Checks:

System Leak Check Passed: ✓
Calibration Error Check Passed: ✓
System Response Time: 100 MIN

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?
	ZERO AIR	NITROGEN	ALM048925	YES / NO
2	CO	150.2	ALM047561	(YES) / NO
3	CO	281.9	ALM020132	(YES) / NO
4	CO	1508	ALM09903	(YES) / NO
5	CO	3972	ALM034231	(YES) / NO
6	PROPANE	250.1	ALM047573	(YES) / NO
7	PROPANE	558.2	ALM[illegible]	(YES) / NO
8	PROPANE	847.1	ALM023336	(YES) / NO
9	PROPANE	24.78	ALM042121	(YES) / NO
10	PROPANE	55.43	ALM042200	(YES) / NO
11	PROPANE	84.81	ALM023879	(YES) / NO
12				YES / NO
13				YES / NO
14				YES / NO

Comments:

Schematic of Reference Method System:

SOLVAY2016_6_000486

OCT 11 1994

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 : 12153-71500
Scott Project # : 571378

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 : ALM020132
Cylinder Pressure + : 1900 psig

Certificate Date : 10/4/94
Previous Certificate Date : None

Expiration Date : 10/4/97

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	281.9 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 1681	4/21/96	ALM-024826	966.0 ppm Carbon Monoxide in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO : Beckman/864/102528	9/22/94	Non-Dispersive Infrared

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

Components: Carbon Monoxide

First Triad Analysis

Date: 9/27/94	Response Units: mv	
Z1=0.00	R1=100.00	T1=33.20
R2=100.00	Z2=0.00	T2=33.20
Z3=0.00	T3=33.20	R3=100.00
Avg. Conc. of Cust. Cyl. 281.9 ppm		

Second Triad Analysis

Date: 10/4/94	Response Units: mv	
Z1=0.00	R1=100.00	T1=33.20
R2=100.00	Z2=0.00	T2=33.20
Z3=0.00	T3=33.20	R3=100.00
Avg. Conc. of Cust. Cyl. 281.9 ppm		

Calibration Curve

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

r=1.00000	NTRM 1681
Constants:	A=-0.162760000
B=7.918200000	C=0.017444000
D=0.000000000	E=0.000000000

Special Notes

Customer

Analyst

SOLVAY2016_6_000487

MISF/P-1

Scott Specialty Gases, Inc

AUG 15 19

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 : 11785-71500
Scott Project # : 569024

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 : ALM047561 **Certificate Date :** 8/6/94 **Expiration Date :** 8/6/97
Cylinder Pressure + : 1900 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	150.2 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
NTRM 1681	4/21/96	ALM-024826	966.0 ppm Carbon Monoxide in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO : Beckman/864/102528	7/28/94	Non-Dispersive Infrared

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

Components: Carbon Monoxide

First Triad Analysis

Date: 7/30/94	Response Units: mv	
Z1=0.00	R1=100.00	T1=18.30
R2=100.00	Z2=0.00	T2=18.30
Z3=0.00	T3=18.30	R3=100.00
Avg. Conc. of Cust. Cyl. 150.6 ppm		

Second Triad Analysis

Date: 8/6/94	Response Units: mv	
Z1=0.00	R1=100.00	T1=18.20
R2=100.00	Z2=0.00	T2=18.20
Z3=0.00	T3=18.20	R3=100.00
Avg. Conc. of Cust. Cyl. 149.7 ppm		

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4	
r=1.00000	NTRM 1681
Constants:	A=-0.162760000
B=7.918200000	C=0.017444000
D=0.000000000	E=0.000000000

Special Notes

Analyst

SOLVAY2016_6_000488

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 : 11072-71500
Scott Project # : 564384

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 : ALM042121
Cylinder Pressure + : 1900 psig
Certificate Date : 4/12/94
Previous Certificate Date : None
Expiration Date : 4/12/97

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	24.78 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
SRM 2643A	3/28/98	SX-20290	99.12 ppm Propane in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Propane : Beckman/400/1002059	4/24/94	Flame Ionization Detector

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

Components
Propane

First Triad Analysis

Date: 4/12/94 Response Units: mv

Z1=0.00	R1=99.10	T1=24.80
R2=99.10	Z2=0.00	T2=24.80
Z3=0.00	T3=24.80	R3=99.10

Avg. Conc. of Cust. Cyl. 24.78 ppm

Second Triad Analysis

Calibration Curve

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

r=1.00000	SRM 2643A
Constants:	A=-0.034421000
B=1.000500000	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

Analyst Rhonda Lundy

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 : 12153-71500
Scott Project # : 571394

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 : ALM048200
Cylinder Pressure + : 1900 psig
Certificate Date : 9/27/94
Previous Certificate Date : None
Expiration Date : 9/27/97

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	55.43 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
SRM 2643A	3/28/98	SX-20290	99.12 ppm Propane in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Propane : Beckman/400/1002059	9/22/94	Flame Ionization Detector

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

Components
Propane

First Triad Analysis

Date: 9/27/94	Response Units: ppm	
Z1=0.00	R1=99.10	T1=55.25
R2=99.10	Z2=0.00	T2=55.65
Z3=0.00	T3=55.40	R3=99.10
Avg. Conc. of Cust. Cyl. 55.43 ppm		

Second Triad Analysis

Calibration Curve

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

r=1.00000	SRM 2643A
Constants:	A=-0.034421000
B=1.000500000	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

Cylinder

Analyst

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 : 11475-71500
Scott Project # : 567212

ANALYTICAL INFORMATION

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

Cylinder Number : ALM023879
Cylinder Pressure + : 1900 psig
Certificate Date : 6/16/94
Previous Certificate Date : None
Expiration Date : 6/16/97

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	84.81 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
SRM 2643A	3/28/98	SX-20290	99.12 ppm Propane in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Propane : Beckman/400/1002059	5/25/94	Flame Ionization Detector

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

Components
Propane

First Triad Analysis

Date: 6/16/94 Response Units: mv

Z1=0.00	R1=99.10	T1=84.80
R2=99.10	Z2=0.00	T2=84.80
Z3=0.00	T3=84.80	R3=99.10

Avg. Conc. of Cust. Cyl. 84.81 ppm

Second Triad Analysis

Calibration Curve

Concentration=A+Bz+Cz^2+Dz^3+Ez^4

r=1.00000	SRM 2643A
Constants:	A=-0.034421000
B=1.000500000	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

SOLVAY2016_6_000491

Analyst Don Eichler, Jr

Scott Specialty Gases, Inc.

500 WEAVER PARK ROAD, LONGMONT, CO 80501 (303) 442-4700, (303) 651-3094 FAX (303) 772-7673

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer	Assay Laboratory		
Clean Air Engineering	Scott Specialty Gases, Inc.	Purchase Order	6410-65
6850 North Broadway	500 Weaver Park Road	Scott Project #	0814860
Suite D	Longmont, CO 80501	CGA Fitting	660
Denver CO 80221		QC Number	21129403
		File Number	14860-01

ANALYTICAL INFORMATION

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

Cylinder Number ALM-011782 Certification Date 07/12/94 Expiration Date 07/12/96

Cylinder Pressure 2000 psig Previous Certification Dates None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
(Nitric Oxide)	229 ppm	±1% NIST Directly Traceable
(Nitrogen Oxides)	232 ppm	Reference Value Only
(Nitrogen)	Balance	

* Analytical uncertainty is inclusive of usual known error scources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 1685	11/19/94	ALM-024159	244.7ppm NO / N2
GMIS	06/13/96	ALM-006147	100.8ppm NO / N2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Monitor Labs 8840-857	06/13/94	Chemiluminescence

ANALYZER READINGS

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

Components (Nitric Oxide)

First Triad Analysis

Date: 07/05/94 Response Units: mv

Z1 = 0.0000 R1 = 0.3975 T1 = 0.9160

R2 = 0.3975 Z2 = 0.0000 T2 = 0.9160

Z3 = 0.0000 T3 = 0.9160 R3 = 0.3975

Avg. Conc. of Cust. Cyl. = 228.9 ppm

Second Triad Analysis

Date: 07/12/94 Response Units: mv

Z1 = 0.0000 R1 = 0.3981 T2 = 0.9160

R2 = 0.3981 Z2 = 0.0000 T2 = 0.9160

Z3 = 0.0000 T3 = 0.9160 R3 = 0.3981

Avg. Conc. of Cust. Cyl. = 228.9 ppm

Calibration Curve

Concentration = A+Bx+Cx²+Dx³+Ex⁴

r = 0.999951 NTRM 1685

Constants: A = 6.975256

B = 236.1011 C = 6.919329

D = 0 E = 0

Special Notes Do not use when cylinder pressure is below 150 psig.

Analyst: Susan J. Brandon

SOLVAY2016_6_000492

Scott Specialty Gases, Inc.

500 WEAVER PARK ROAD, LONGMONT, CO 80501 (303) 442-4700, (303) 651-3094 FAX (303) 772-7673

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
Clean Air Engineering
6850 North Broadway
Suite D
Denver CO 80221

Assay Laboratory
Scott Specialty Gases, Inc.
500 Weaver Park Road
Longmont, CO 80501

Purchase Order 6345-65
Scott Project # 0811663
CGA Fitting 660
QC Number 24019303
File Number 11663-01

ANALYTICAL INFORMATION

Certified to exceed the minimum specification of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number AAL-13802 **Certification Date** 10/01/93 **Expiration Date** 10/01/95
Cylinder Pressure 2000 psig **Previous Certification Dates** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Nitric Oxide	438.4 ppm	±1% NIST Directly Traceable
Nitrogen Oxides	442.7 ppm	Reference Value Only
Nitrogen	Balance	

* Analytical uncertainty is inclusive of usual known error scources which at least include reference standard error & precision of the measurement process.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 1687	07/30/93	ALM-016020	965.5ppm NO / N2
GMIS	NONE	ALM-004240	479.9ppm NO / N2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Monitor Labs 8840-857	07/09/93	Chemiluminescence

ANALYZER READINGS

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

Components: Nitric Oxide

First Triad Analysis
Date: 09/24/93 Response Units: mv
Z1 = 0.0000 R1 = 0.4795 T1 = 0.4364
R2 = 0.4795 Z2 = 0.0000 T2 = 0.4364
Z3 = 0.0000 T3 = 0.4364 R3 = 0.4795
Avg. Conc. of Cust. Cyl. = 436.8 ppm

Second Triad Analysis
Date: 10/01/93 Response Units: mv
Z1 = 0.0000 R1 = 0.4762 T2 = 0.4360
R2 = 0.4762 Z2 = 0.0000 T2 = 0.4360
Z3 = 0.0000 T3 = 0.4360 R3 = 0.4762
Avg. Conc. of Cust. Cyl. = 440.0 ppm

Calibration Curve
Concentration = A+Bx+Cx²+Dx³+Ex⁴
r = 0.999937 NTRM 1687
Constants: A = -0.48618
B = 1000.5040 C = 0
D = 0 E = 0

Special Notes

David Chapman
Analyst: David Chapman

SOLVAY2016_6_000493

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 : 11785-71500
Scott Project # : 569024

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 : ALM047573
Cylinder Pressure + : 1900 psig
Certificate Date : 8/8/94
Previous Certificate Date : None
Expiration Date : 8/8/97

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	250.1 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
Beckman/400/1002059	8/4/94	Flame Ionization Detection

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

Components
Propane

First Triad Analysis

Date: 8/8/94 Response Units: mv

Z1=0.00	R1=97.30	T1=25.00
R2=97.30	Z2=0.00	T2=25.00
Z3=0.00	T3=25.00	R3=97.30

Avg. Conc. of Cust. Cyl. 250.1 ppm

Second Triad Analysis

Calibration Curve

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

r=1.00000	NTRM 2646
Constants:	A=0.049241000
B=10.022000000	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

Analyst

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 : 11785-71500
Scott Project # : 569024

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 : ALM047541 **Certificate Date :** 8/8/94 **Expiration Date :** 8 8/97
Cylinder Pressure + : 1900 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	558.2 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
Beckman/400/1002059	8/4/94	Flame Ionization Detection

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

Components
Propane

First Triad Analysis

Date 8/8/94	Response Units: mv	
Z1=0.00	R1=97.30	T1=55.80
R2=97.30	Z2=0.00	T2=55.80
Z3=0.00	T3=55.80	R3=97.30
Avg Conc of Cust Cyl 558.2 ppm		

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4	
r=1.00000	NTRM 2646
Constants:	A=0.045241000
B=10.002000000	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

SOLVAY2016-6-000495

Analyst

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
CAE INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE, IL. 60067

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

Purchase Order 9294-71500
Scott Project # 555450

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure # G1, Section Number 3.0.4

Cylinder Number ALM-023336
Cylinder Pressure 1900 psig

Certification Date 9-9-93
Previous Certification Dates None

General Exp. Date 9-9-96
Acid Rain Exp. Date 9-9-96

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	847.1 ppm	±1% NIST Directly Traceable

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM 2646	12-31-93	AAL-18432	973.2 ppm Propane in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Prop: Beckman/400/1002059	9-9-93	Flame Ionization Detector

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: 9-9-93 Response Units: mv Z1=0.00 R1=96.40 T1=83.90 R2=96.40 Z2=0.00 T2=83.90 Z3=0.00 T3=83.90 R3=96.40 Avg. Conc. of Cust. Cyl. 847.1 ppm		Concentration = $A+Bx+Cx^2+Dx^3+Ex^4$ r=0.99999 CRM 2646 Constants: A=0.7421058 B=10.10758 C=0 D=0 E=0
			Concentration = $A+Bx+Cx^2+Dx^3+Ex^4$
			Concentration = $A+Bx+Cx^2+Dx^3+Ex^4$

SOLVAY2016_6_000496

Special Notes
If this product is used for Acid Rain Rule Compliance, the *Acid Rain Expiration Date* noted above applies per 40 CFR Part 75, Appendix H. Otherwise, the *General Expiration Date* applies.

Don Eichler

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 : 12153-71500
Scott Project # : 571378

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 : ALM009903 **Certificate Date :** 10/4/94 **Expiration Date :** 10/4/97
Cylinder Pressure + : 1900 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	1508 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 2637	6/18/95	ALM-019952	2440 ppm Carbon Monoxide in Nitrogen

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO : Beckman/864/102528	9/22/94	Non-Dispersive Infrared

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

Components: Carbon Monoxide

First Triad Analysis

Date 9/27/94	Response Units: mv	
Z1=0.00	R1=120.00	T1=85.50
R2=120.00	Z2=0.00	T2=85.60
Z3=0.00	T3=85.50	R3=120.00
Avg. Conc. of Cust. Cyl. 1506 ppm		

Second Triad Analysis

Date: 10/4/94	Response Units: mv	
Z1=0.00	R1=120.00	T1=85.50
R2=120.00	Z2=0.00	T2=85.50
Z3=0.00	T3=85.80	R3=120.00
Avg. Conc. of Cust. Cyl. 1511 ppm		

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4	
r=1.00000	NTRM 2637
Constants:	A=0.077551000
B=13.552000000	C=0.024090000
D=0.000270110	E=0.000000000

Special Notes

Customer

Analyst

SOLVAY2016_6_000497

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET
TROY MI 46083
Phone: 313-589-2950 Fax: 313-589-2134

CERTIFICATE OF ANALYSIS

A E INSTRUMENT RENTAL
46 WOODWORK LANE
ALATINE IL 60067

PROJECT #: 05-55453-004
PO#: 9294-71500
ITEM #: 05021453 2AL
DATE: 9/07/93

CYLINDER #: ALM034231 ANALYTICAL ACCURACY: +/-1%

BLEND TYPE : ACUBLEND MASTER GAS

MPONENT	REQUESTED GAS CONC MOLES		ANALYSIS (MOLES)	
RBON MONOXIDE	4,000.	PPM	3,972.	PPM
TROGEN		BAL		BAL

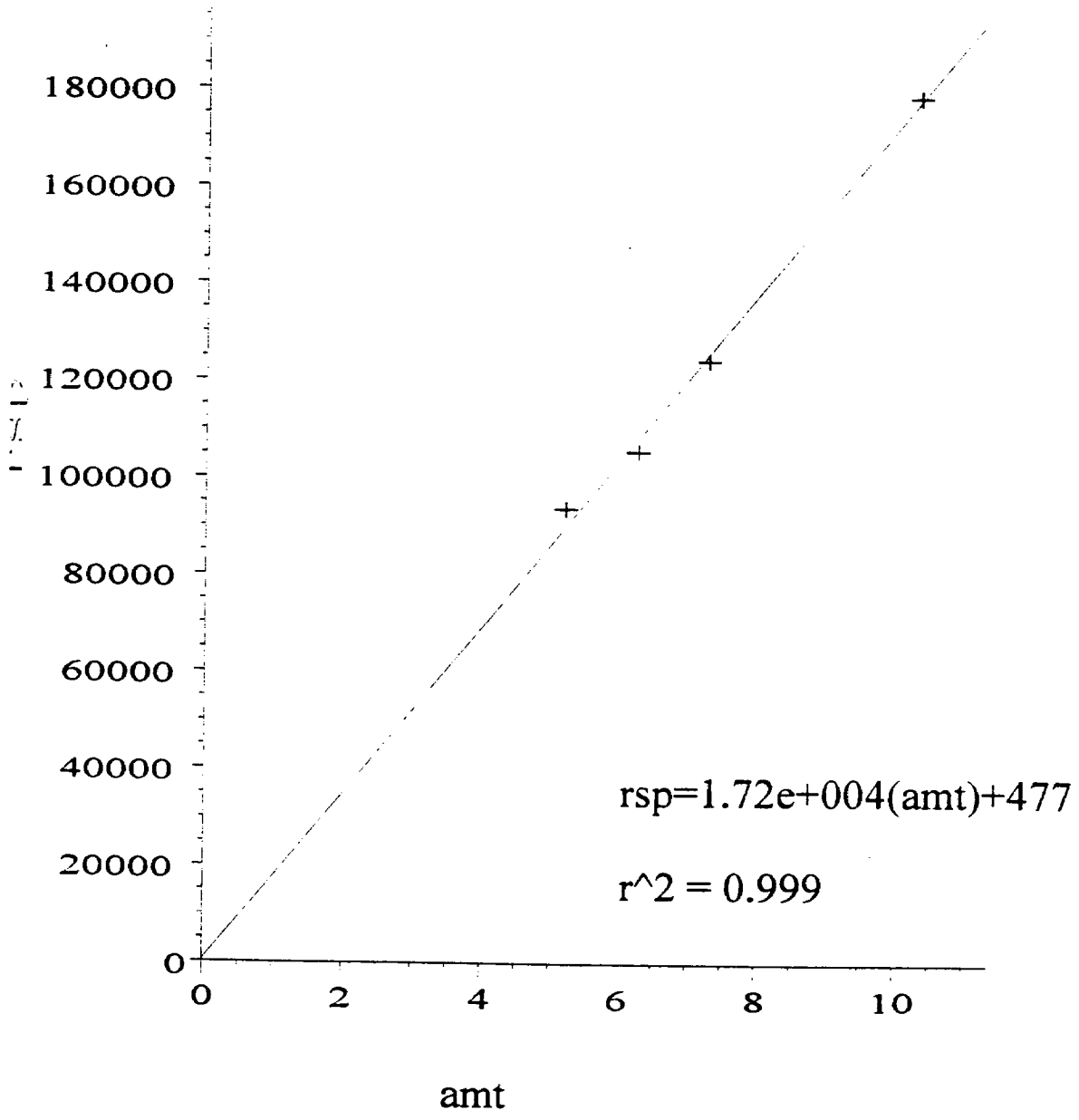
ACUBLEND MASTER GAS
ALM034232 ALM034236

METHOD: AME

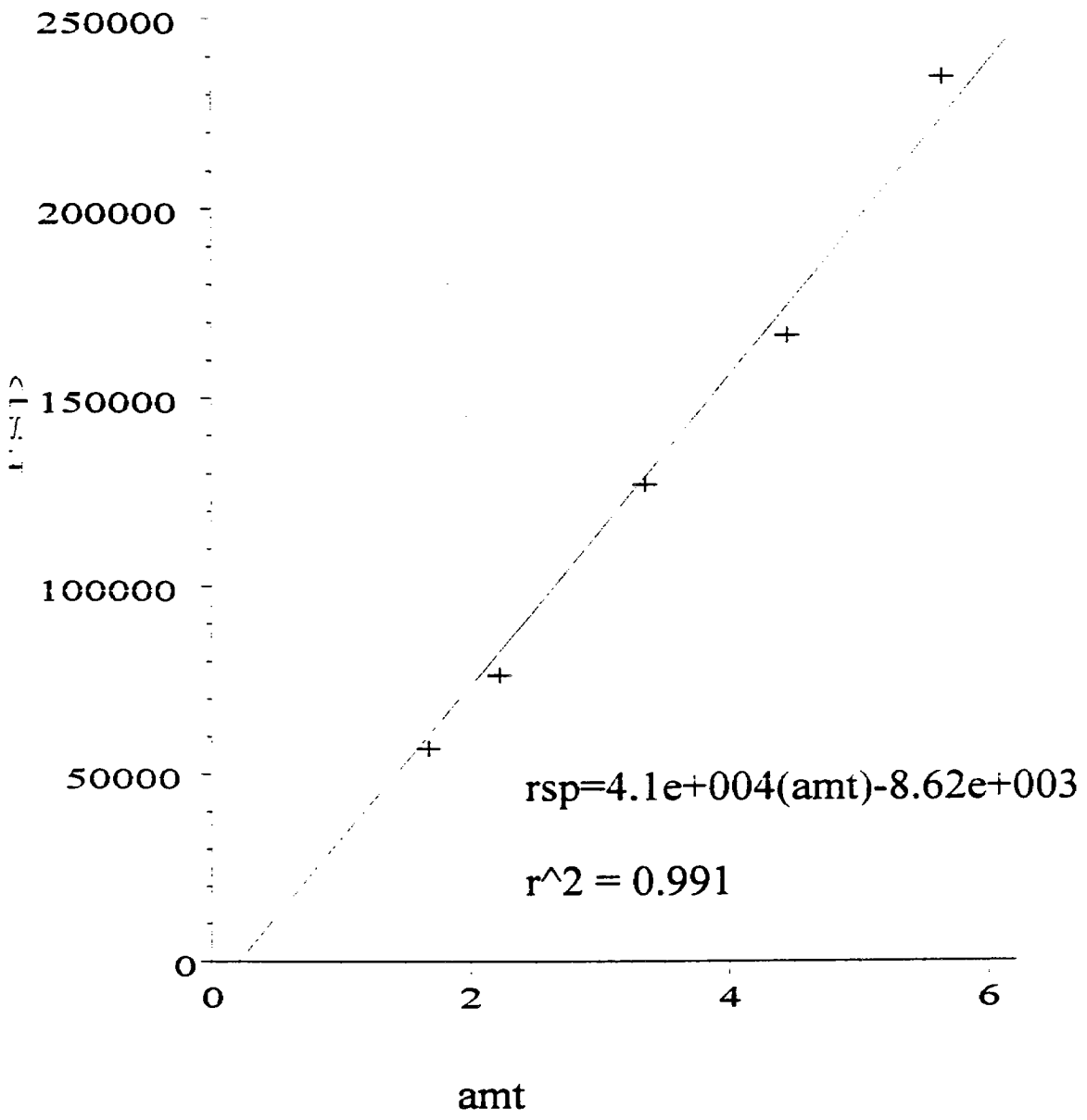
ANALYST: [signature]

SOLVAY2016_6_000498

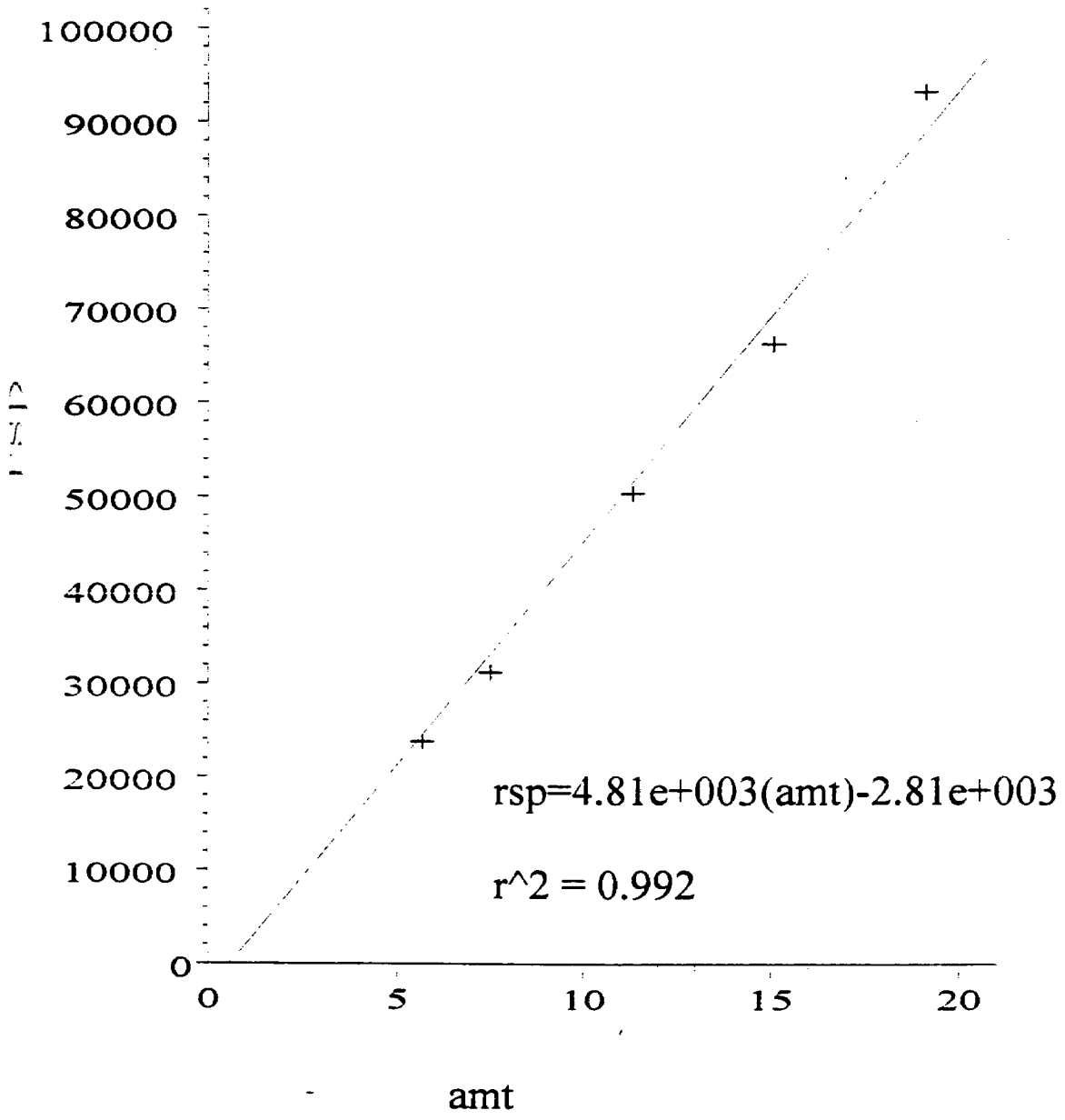
Butadiene


180000
160000
140000
120000
100000
80000
60000
40000
20000
0
0
2
4
6
8
10
amt
rsp=1.72e+004(amt)+477
r^2 = 0.999

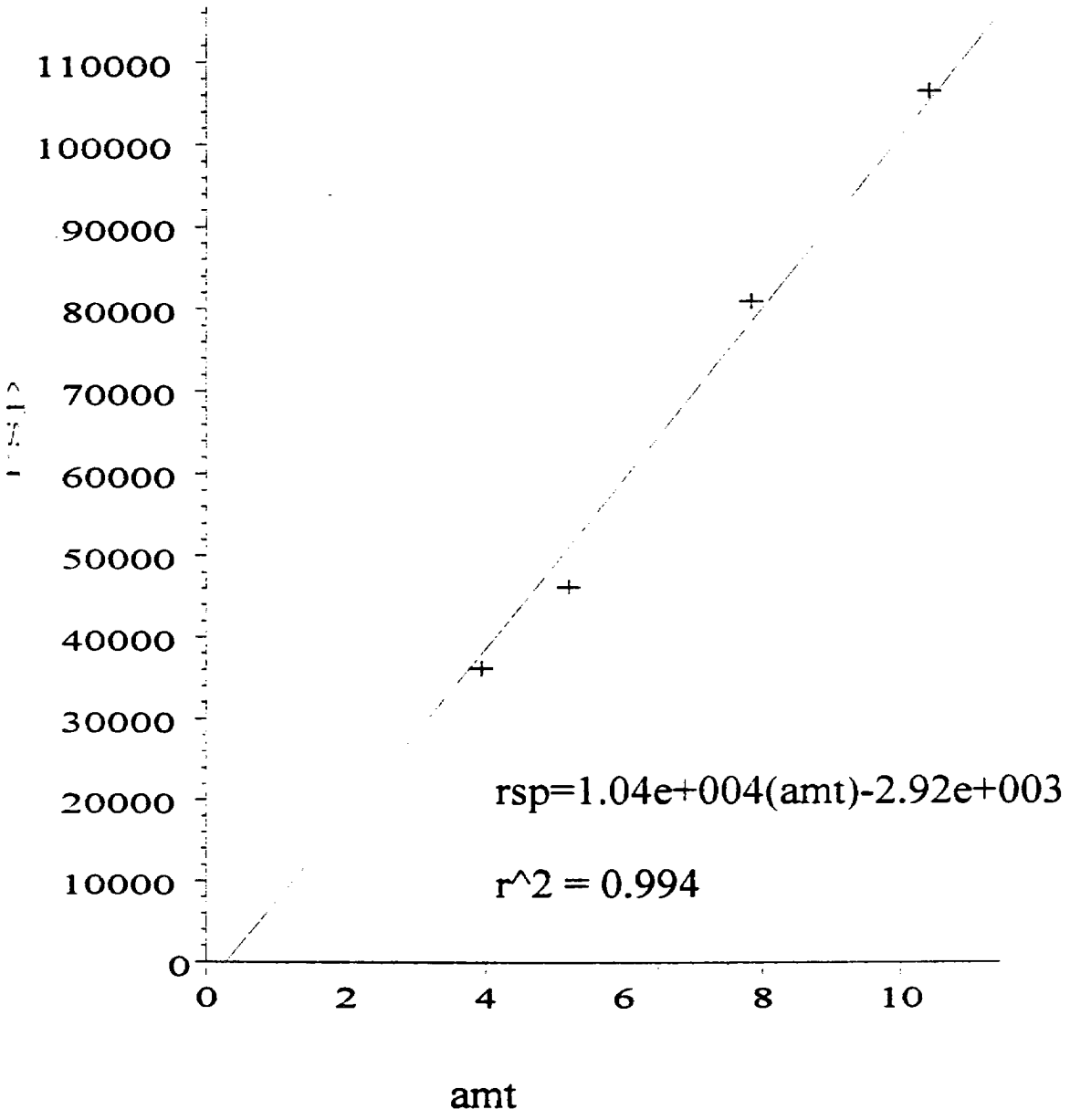
Hexane


250000
200000
150000
100000
50000
0
0
2
4
6
amt
rsp=4.1e+004(amt)-8.62e+003
r^2 = 0.991

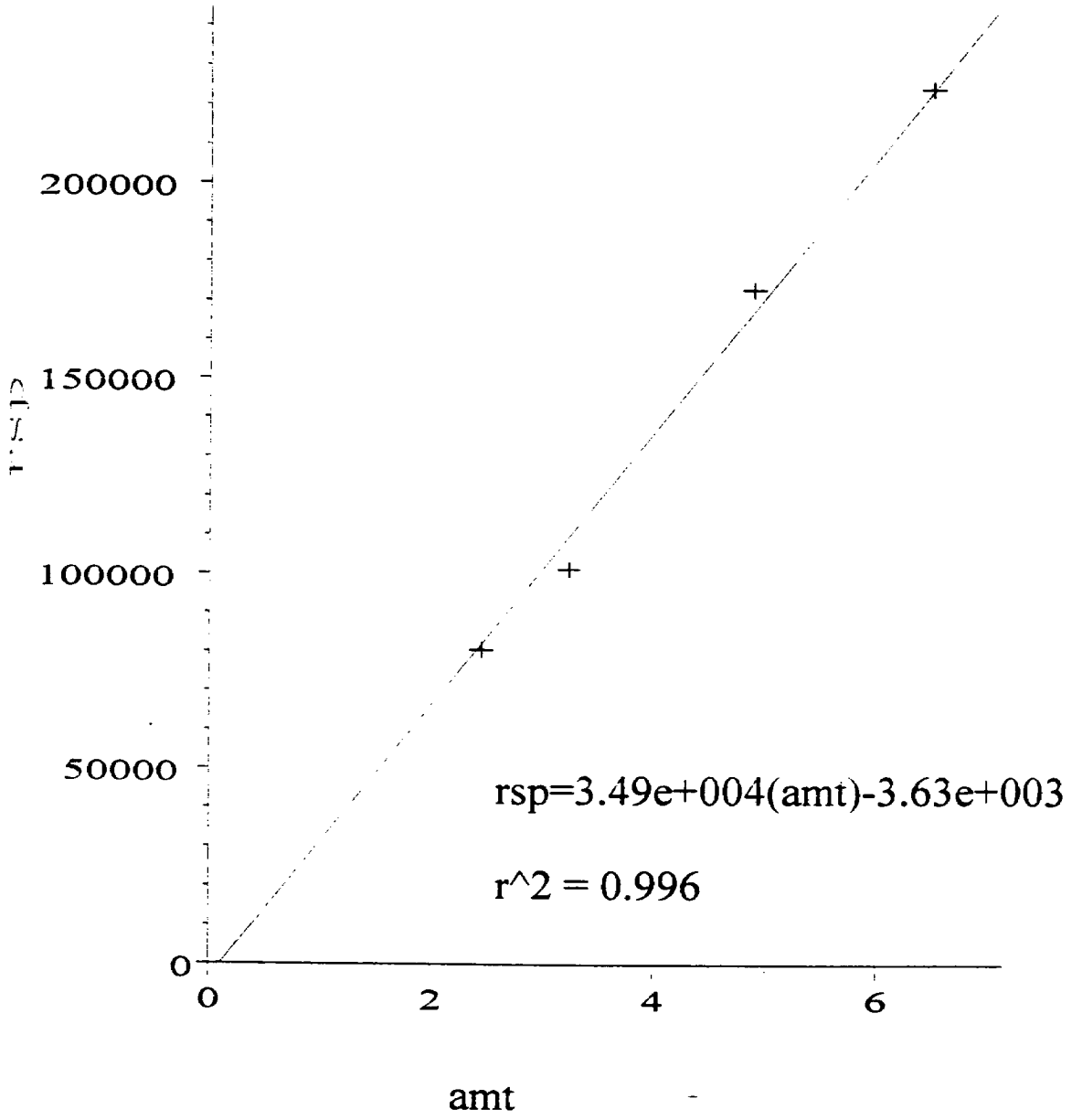
Methylene Chloride



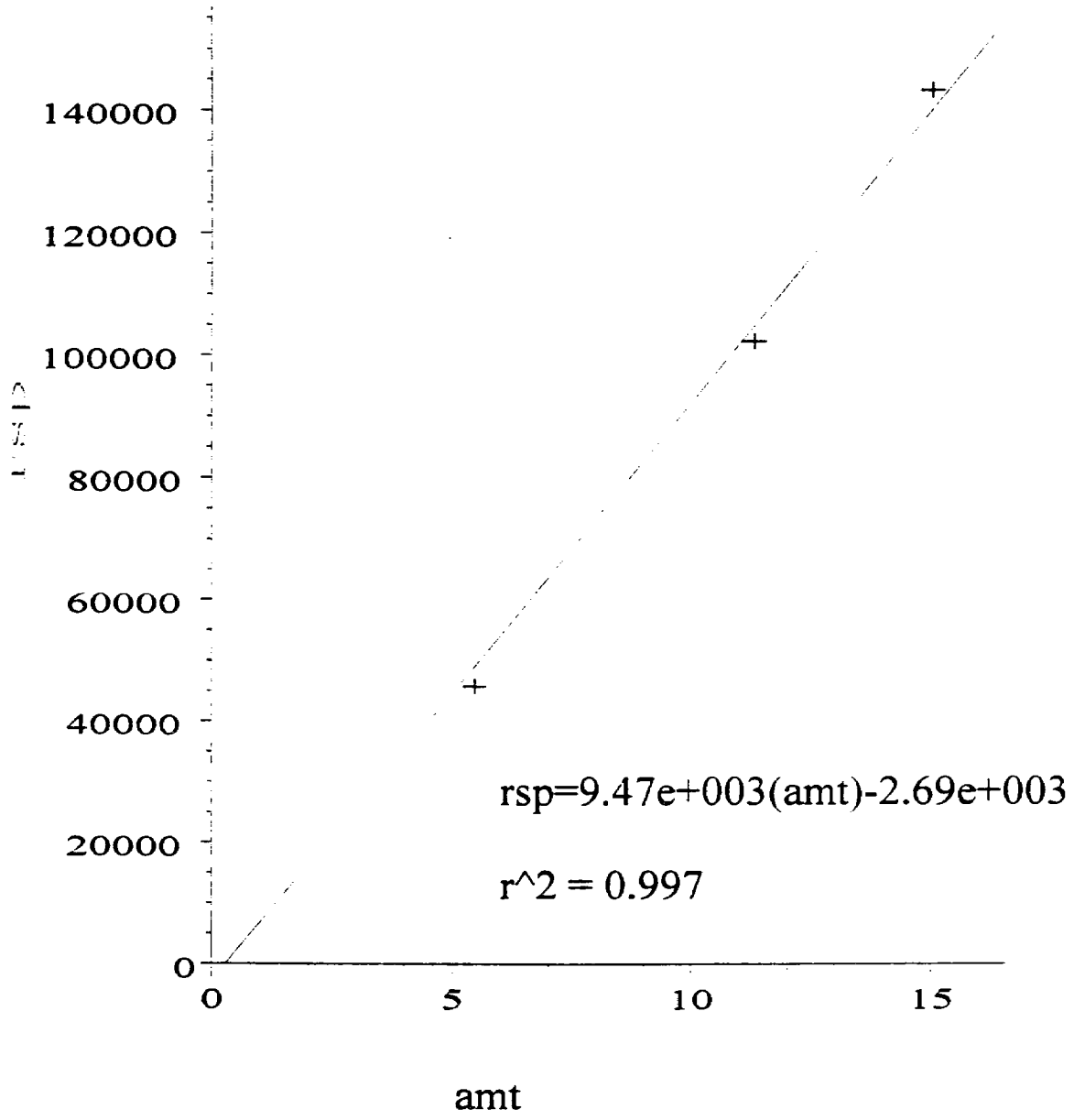
TCE


110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
0
2
4
6
8
10
amt
rsp=1.04e+004(amt)-2.92e+003
r^2 = 0.994

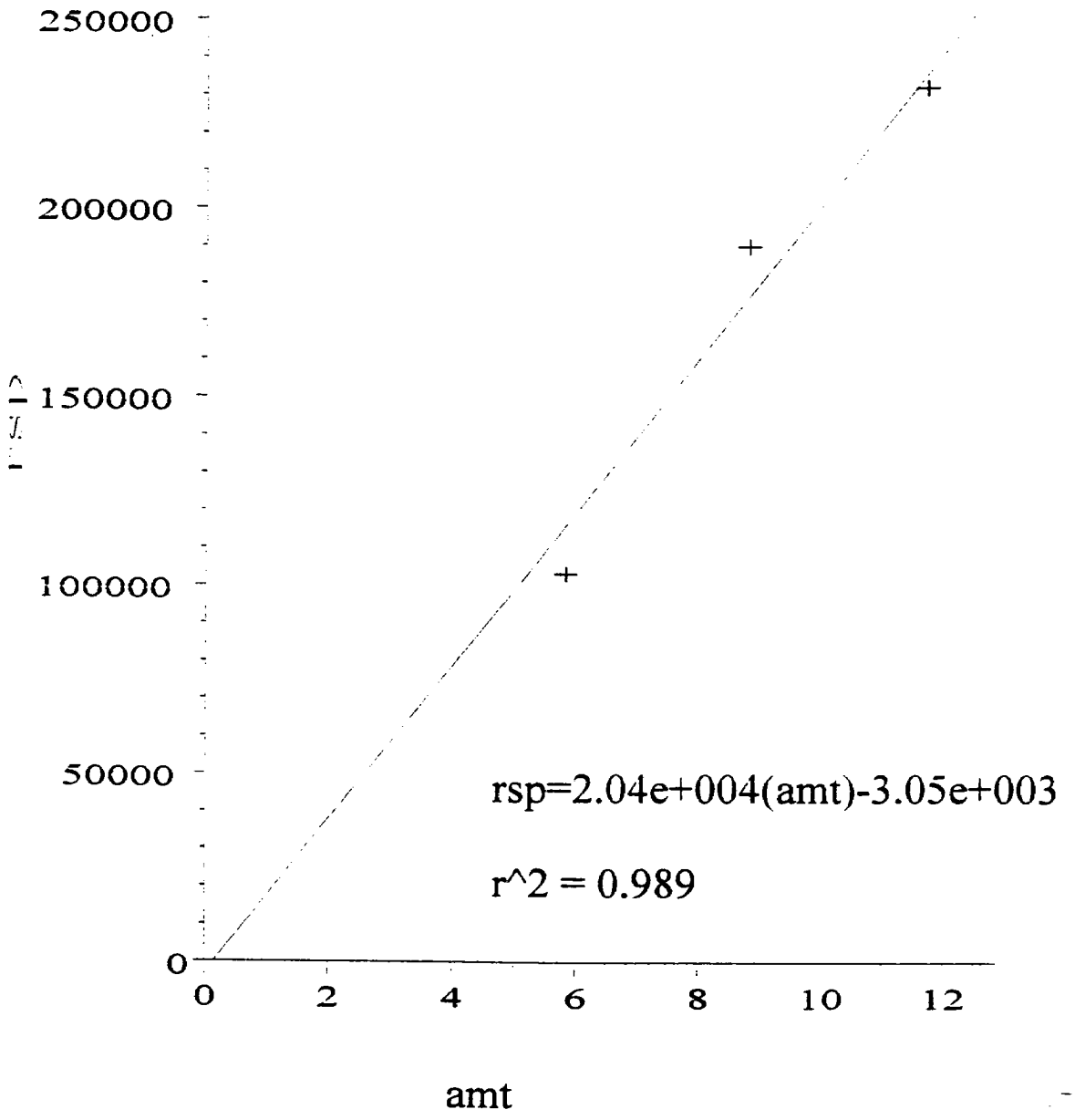
Benzene


200000
150000
100000
50000
0
0
2
4
6
amt
rsp=3.49e+004(amt)-3.63e+003
r^2 = 0.996

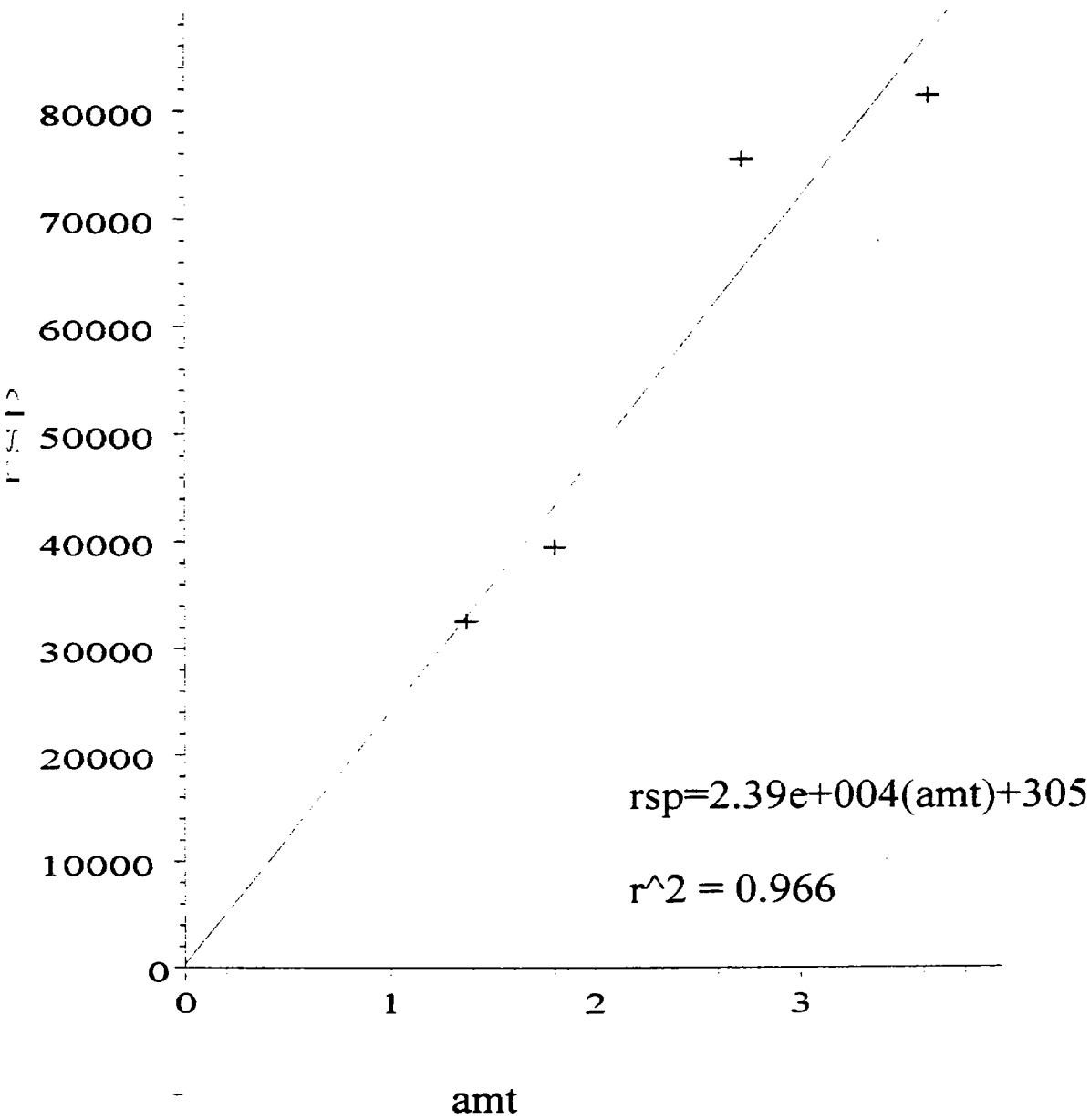
MEK


140000
120000
100000
80000
60000
40000
20000
0
0
5
10
15
amt
rsp=9.47e+003(amt)-2.69e+003
r^2 = 0.997

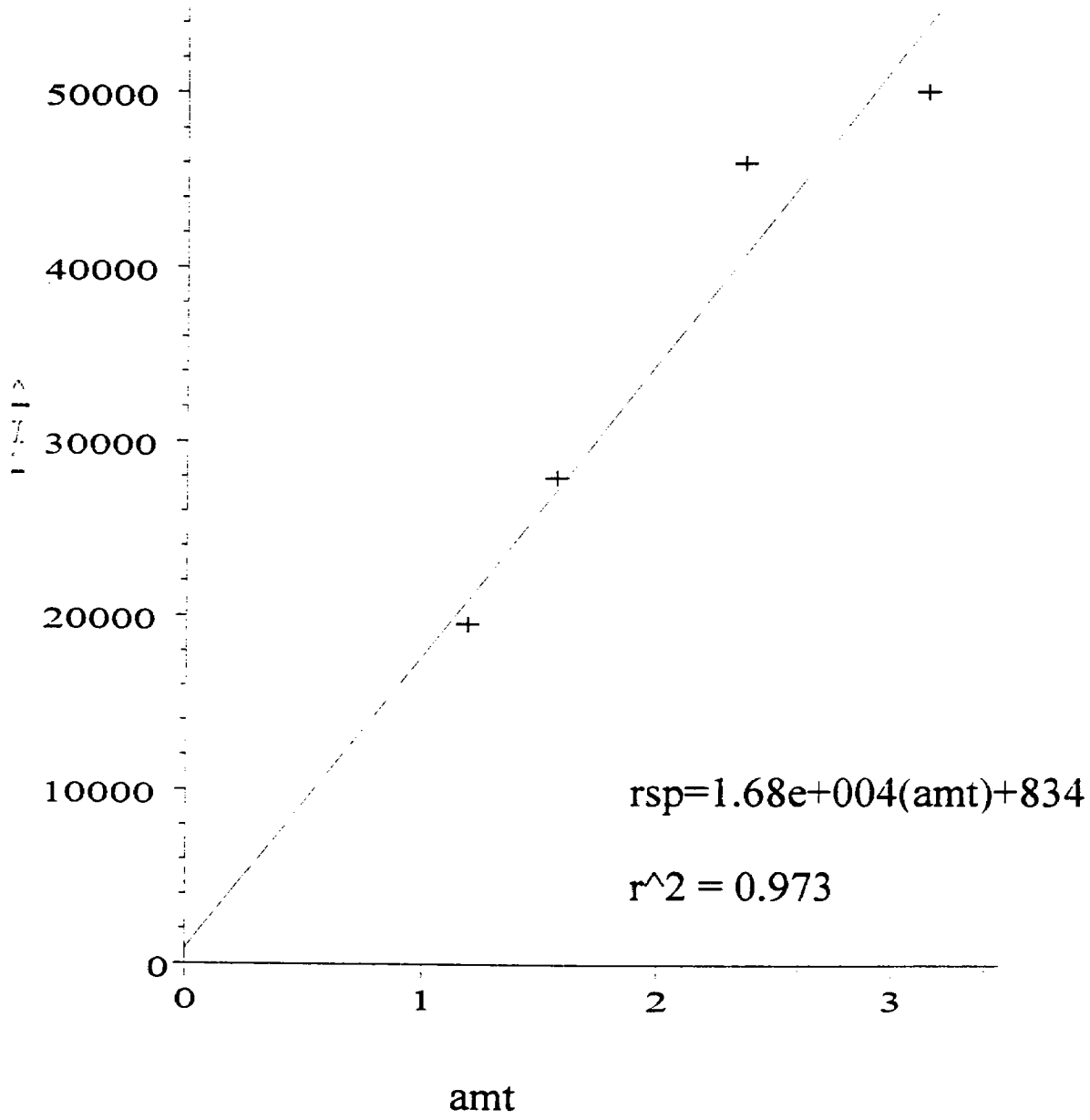
Toluene


250000
200000
150000
100000
50000
0
0
2
4
6
8
10
12
amt
rsp=2.04e+004(amt)-3.05e+003
r^2 = 0.989

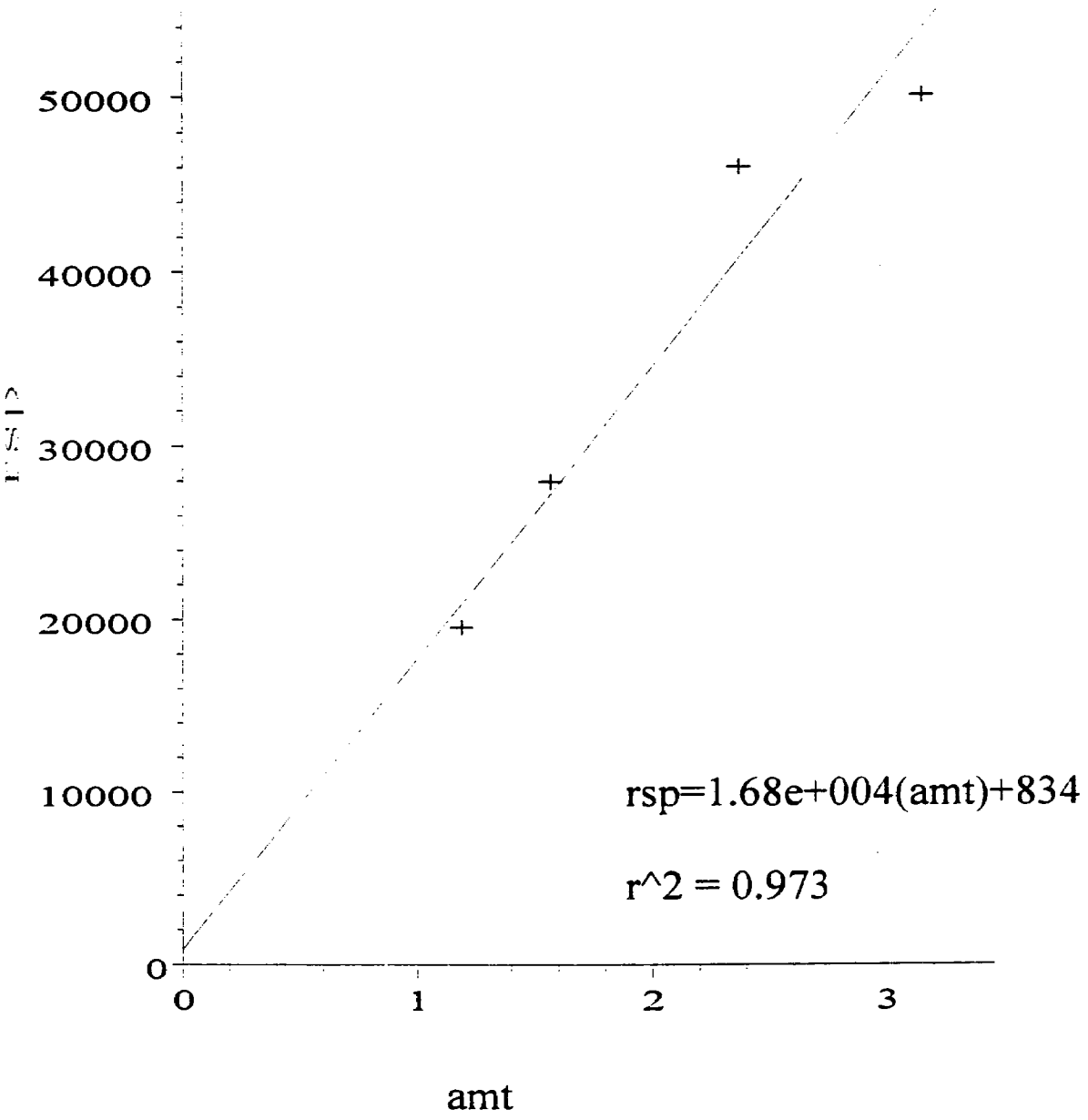
Ethyl Benzene



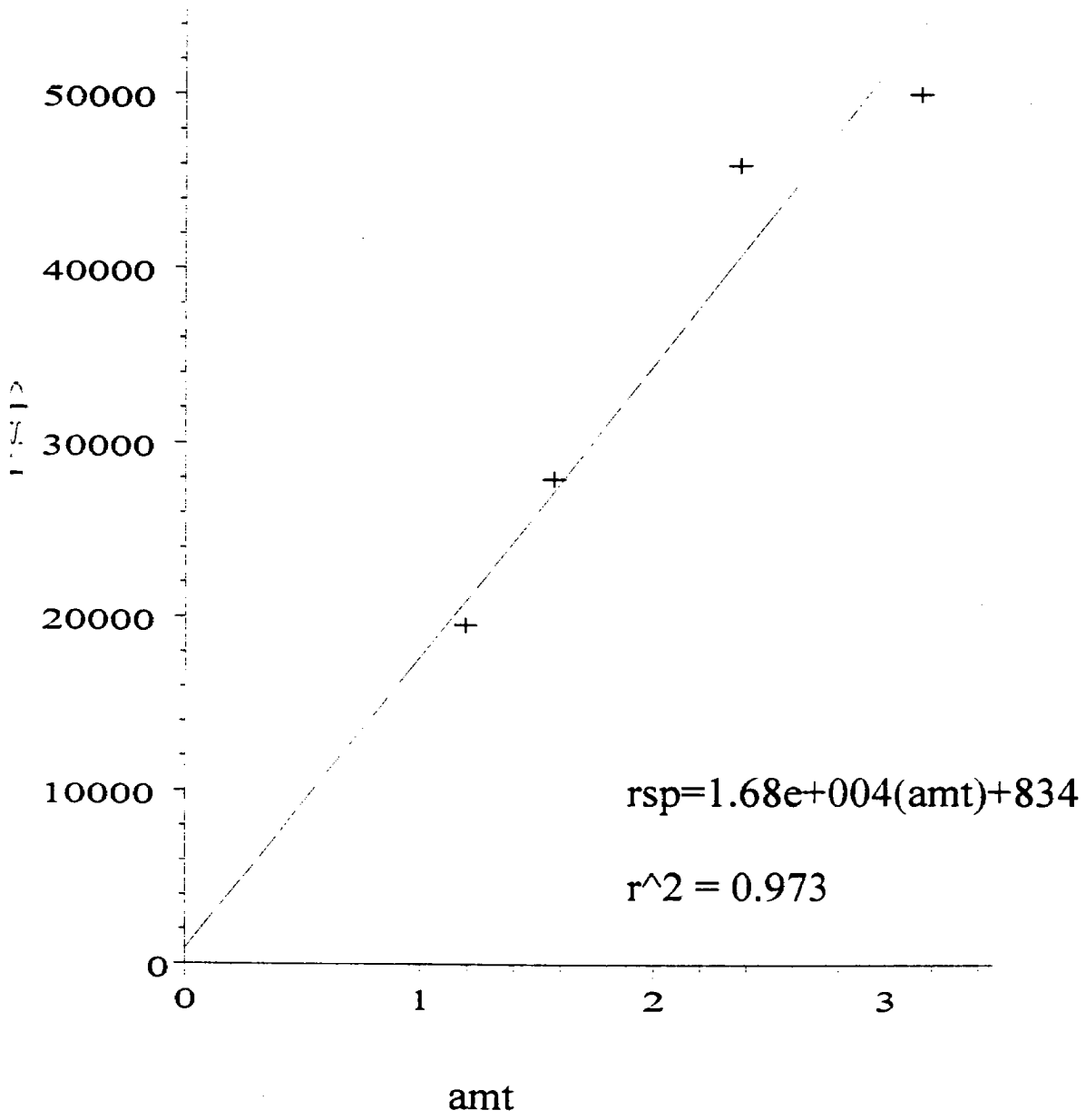
p-Xylene


50000
40000
30000
20000
10000
0
0
1
2
3
amt
rsp=1.68e+004(amt)+834
r^2 = 0.973

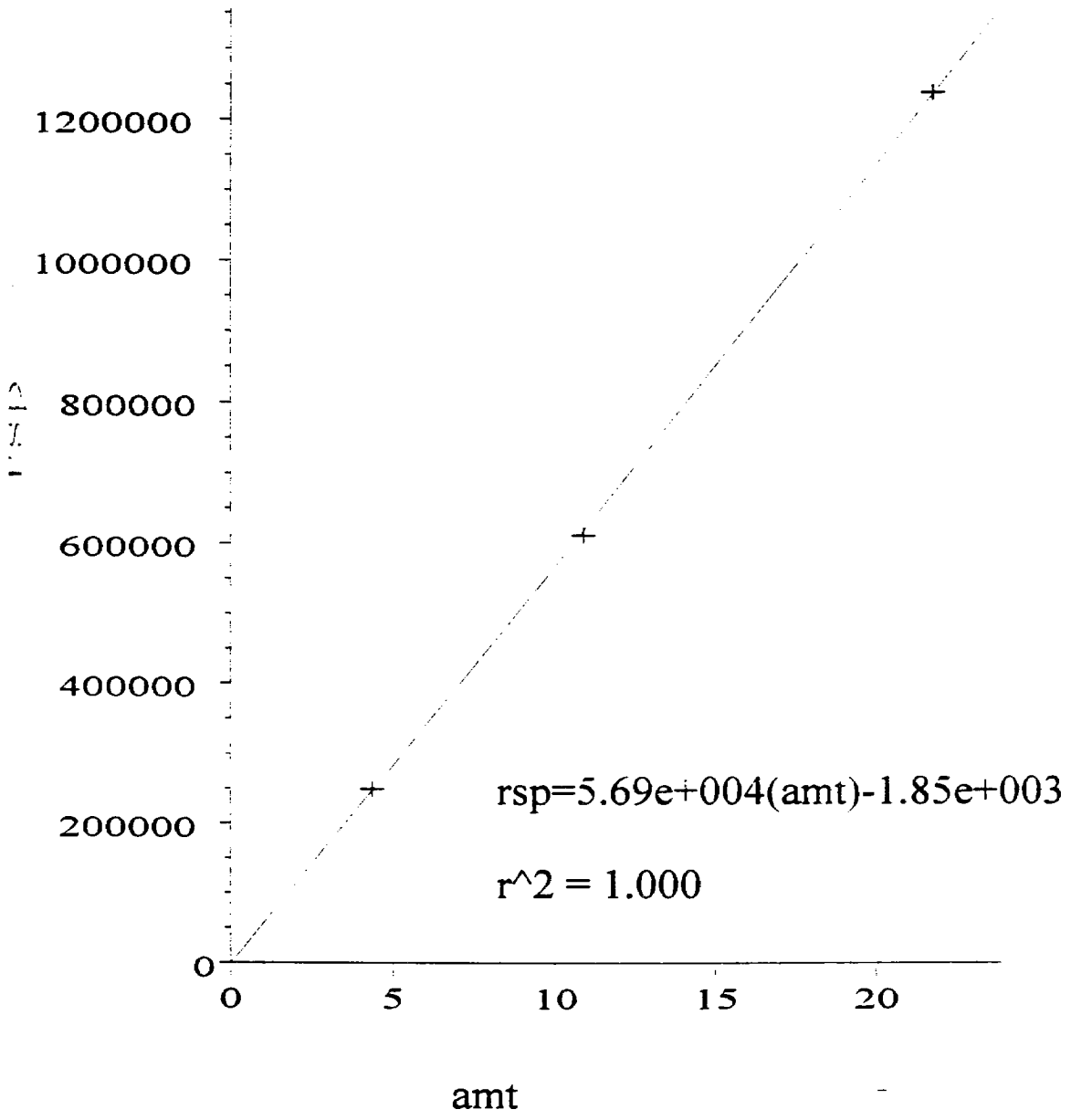
m-Xylene


50000
40000
30000
20000
10000
0
0
1
2
3
amt
rsp=1.68e+004(amt)+834
r^2 = 0.973

o-Xylene


50000
40000
30000
20000
10000
0
0
1
2
3
amt
rsp=1.68e+004(amt)+834
r^2 = 0.973

Styrene


1200000
1000000
800000
600000
400000
200000
0
0
5
10
15
20
amt
rsp=5.69e+004(amt)-1.85e+003
r^2 = 1.000

Method: D:\SOLVAY\METHOD.MTH

Calibration Table

#	RT	Lvl	ppm	Amt/Area	Ref Istd I#	Name
1	1.004	1	10.34	5.796e-005	1	Butadiene
		3	7.29	5.8655e-005		
		4	5.22	5.5687e-005		
		5	6.27	5.9418e-005		
2	1.980	1	5.65	2.4157e-005	1	Hexane
		2	2.22	2.913e-005		
		3	4.45	2.6806e-005		
		4	3.35	2.6402e-005		
		5	1.68	2.9548e-005		
3	3.226	1	19.09	2.0504e-004	1	Methylene Chloride
		2	7.49	2.4014e-004		
		3	15.04	2.2692e-004		
		4	11.31	2.2439e-004		
		5	5.67	2.383e-004		
4	3.869	2	5.19	1.123e-004	1	TCE
		3	10.41	9.7713e-005		
		4	7.83	9.6717e-005		
		5	3.93	1.0868e-004		
5	6.085	2	3.24	3.2029e-005	1	Benzene
		3	6.5	2.9062e-005		
		4	4.89	2.8317e-005		
		5	2.45	3.0432e-005		
6	7.300	1	5.46	1.1927e-004	1	MEK
		3	15.06	1.0532e-004		
		4	11.33	1.1094e-004		
7	11.804	1	11.33	0.0001	1	Acrylonitrile
8	12.132	2	5.83	5.6519e-005	1	Toluene
		3	11.71	5.049e-005		
		4	8.81	4.6413e-005		
9	15.601	2	1.8	4.5547e-005	1	Ethyl Benzene
		3	3.62	4.4538e-005		
		4	2.72	3.6029e-005		
		5	1.37	4.2076e-005		
10	16.004	2	1.57	5.6158e-005	1	p-Xylene
		3	3.15	6.2977e-005		
		4	2.37	5.1558e-005		
		5	1.19	6.0935e-005		
11	16.368	2	1.57	5.6158e-005	1	m-Xylene
		3	3.15	6.2977e-005		
		4	2.37	5.1558e-005		
		5	1.19	6.0935e-005		
12	16.720	2	1.57	5.6158e-005	1	o-Xylene
		3	3.15	6.2977e-005		
		4	2.37	5.1558e-005		
		5	1.19	6.0935e-005		
13	17.771	3	21.75	1.7566e-005	1	Styrene
		4	10.91	1.7822e-005		
		5	4.37	1.7587e-005		

Method Information

Solvay Method for the following compounds: acrylonitrile, benzene, 1,3-butadiene, ethylbenzene, n-hexane, 1,1,1-trichloroethane, methylene chloride, styrene, toluene, xylene, 2-butanone, trichloroethene.
GC Conditions: 5% SP1200, 1.75% Bentone on 100/120 mesh Supplecort.
Init=50 time=5.00 rate=10 final=100 time=2.5 rate=20 final=120 time=7.00 total run time=19.00 Gas Sample Loop=5ml

Integration Events

Events:	Value:	Time:
Initial Area Reject	1	INITIAL
Initial Peak Width	0.040	INITIAL
Shoulder Detection	OFF	INITIAL
Initial Threshold	2	INITIAL
Threshold	0	2.250
Threshold	3	5.134
Threshold	1	7.847
Threshold	4	10.763
Threshold	1	13.312
Threshold	2	14.730
Threshold	0	17.413

Calibration Settings

Title:

Reference window:	5.000 %
Non-reference window:	15.000 %
Units of amount:	ppm
Multiplier:	1.0
RF uncal peaks:	0.0
ISTD# to adjust uncal peaks:	0
Sample Amount:	0.0

Sample ISTD Information

No Sample ISTD Amounts

Multilevel Information

Fit: Linear
Origin: Include

SOLVAY MINERALS
CAE Project No. 7473
4/26/95

Compounds Of Interest

Cmpd	den	mol wt
Butadiene	na	54.09
Hexane	0.663	86.18
Methylene Chloride	1.326	84.94
Trichloroethane	1.442	133.41
Benzene	0.879	78.11
2-Butanone	0.805	72.10
Acrylonitrile	0.806	53.06
Toluene	0.866	92.14
Ethylbenzene	0.867	106.17
Xylene	0.860	106.16
Styrene	0.906	104.14

Stock Standard 1

Air

pre flow (cc/min)	post flow (cc/min)	time (min)	tot vol (ft3)
736	736	13	0.338

Other Constituents

	vol liquid (ul)
Hexane	300
Methylene Chloride	500
Trichloroethane	500
Benzene	300
2-Butanone	200
Toluene	200
Ethylbenzene	200

SOLVAY2016_6_000513

SOLVAY MINERALS
CAE Project No. 7473
4/26/95

Results For Stock Standard 1

Total Gas Volume

(ft3)
0.359

Concentrations

	(ppm)
Hexane	5461
Methylene Chloride	18461
Trichloroethane	12783
Benzene	7985
2-Butanone	5283
Toluene	4447
Ethylbenzene	3864

Stock Standard 2

Air

pre flow (cc/min)	post flow (cc/min)	time (min)	tot vol (ft3)
736	736	13	0.338

Other Constituents

	vol liquid (ul)
Hexane	300
Methylene Chloride	500
Trichloroethane	500
Benzene	300
2-Butanone	700
Toluene	400
Ethylbenzene	200
Xylene	200

SOLVAY2016_6_000514

SOLVAY MINERALS
CAE Project No. 7473
4/26/95

Results For Stock Standard 2

Total Gas Volume

(ft3)
0.367

Concentrations

	(ppm)
Hexane	5346
Methylene Chloride	18072
Trichloroethane	12514
Benzene	7817
2-Butanone	18102
Toluene	14074
Ethylbenzene	4354
Xylene	3783

Working Standards

WS1

air

pre flow (cc/min)	post flow (cc/min)	time (min)
742	744	13.00

other constituents

10 ml stock 1
100 ul Butadiene

concentrations

	(ppm)
Hexane	5.65
Methylene Chloride	19.09
Trichloroethane	13.22
Benzene	8.26
2-Butanone	5.46
Toluene	4.60
Ethylbenzene	4.00
Butadiene	10.34

SOLVAY2016_6_000515

SOLVAY MINERALS
CAE Project No. 7473
4/26/95

WS2

air

pre flow (cc/min)	post flow (cc/min)	time (min)
744	740	13.00

other constituents

4 ml stock 2
0 ul Butadiene

concentrations

	(ppm)
Hexane	2.22
Methylene Chloride	7.49
Trichloroethane	5.19
Benzene	3.24
2-Butanone	7.50
Toluene	5.83
Ethylbenzene	1.80
Xylene	1.57

WS3

air

pre flow (cc/min)	post flow (cc/min)	time (min)
740	738	13.00

other constituents

8 ml stock 2
70 ul Butadiene
1.0 ul Styrene

concentrations

	(ppm)
Hexane	4.45
Methylene Chloride	15.04
Trichloroethane	10.41
Benzene	6.50
2-Butanone	15.06
Toluene	11.71
Ethylbenzene	3.62
Xylene	3.15
Butadiene	7.29
Styrene	21.75

SOLVAY2016_6_000516

WS4

air

pre flow (cc/min)	post flow (cc/min)	time (min)
738	736	13.00

other constituents

6 ml stock 2
50 ul Butadiene
0.5 ul Styrene

concentrations

	(ppm)
Hexane	3.35
Methylene Chloride	11.31
Trichloroethane	7.83
Benzene	4.89
2-Butanone	11.33
Toluene	8.81
Ethylbenzene	2.72
Xylene	2.37
Butadiene	5.22
Styrene	10.91

WS5

air

pre flow (cc/min)	post flow (cc/min)	time (min)
736	735	13.00

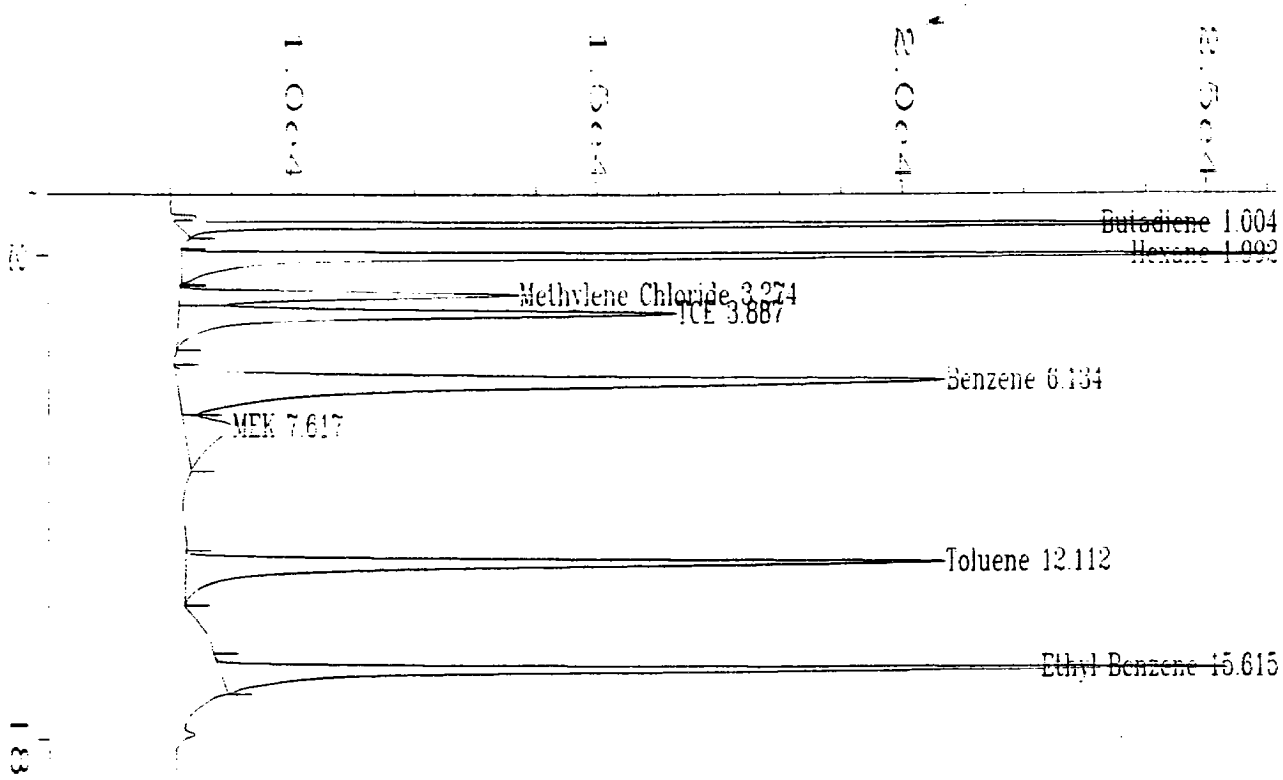
other constituents

3 ml stock 2
20 ul Butadiene
0.2 ul Styrene

concentrations

	(ppm)
Hexane	1.68
Methylene Chloride	5.67
Trichloroethane	3.93
Benzene	2.45
2-Butanone	5.68
Toluene	4.41
Ethylbenzene	1.37
Xylene	1.19
Butadiene	6.27
Styrene	4.37

SOLVAY2016_6_000517



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Area Percent Report

==========

Data File Name : D:\SOLVAY\CAL\WS1_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 07:58 PM
Report Created on: 03 May 95 01:20 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS1_0001.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.004	182706	16937	PB	0.178	11.6607
2	1.992	241980	17970	BB	0.209	15.4437
3	3.274	94365	5566	BV	0.260	6.0226
4	3.887	167634	8187	VB	0.304	10.6988
5	6.134	361448	12623	BV	0.424	23.0684
6	7.617	43436	780	VB	0.766	2.7722
7	12.112	242742	12476	BV	0.285	15.4924
8	15.615	232540	16576	BB	0.209	14.8412

Total area = 1566851

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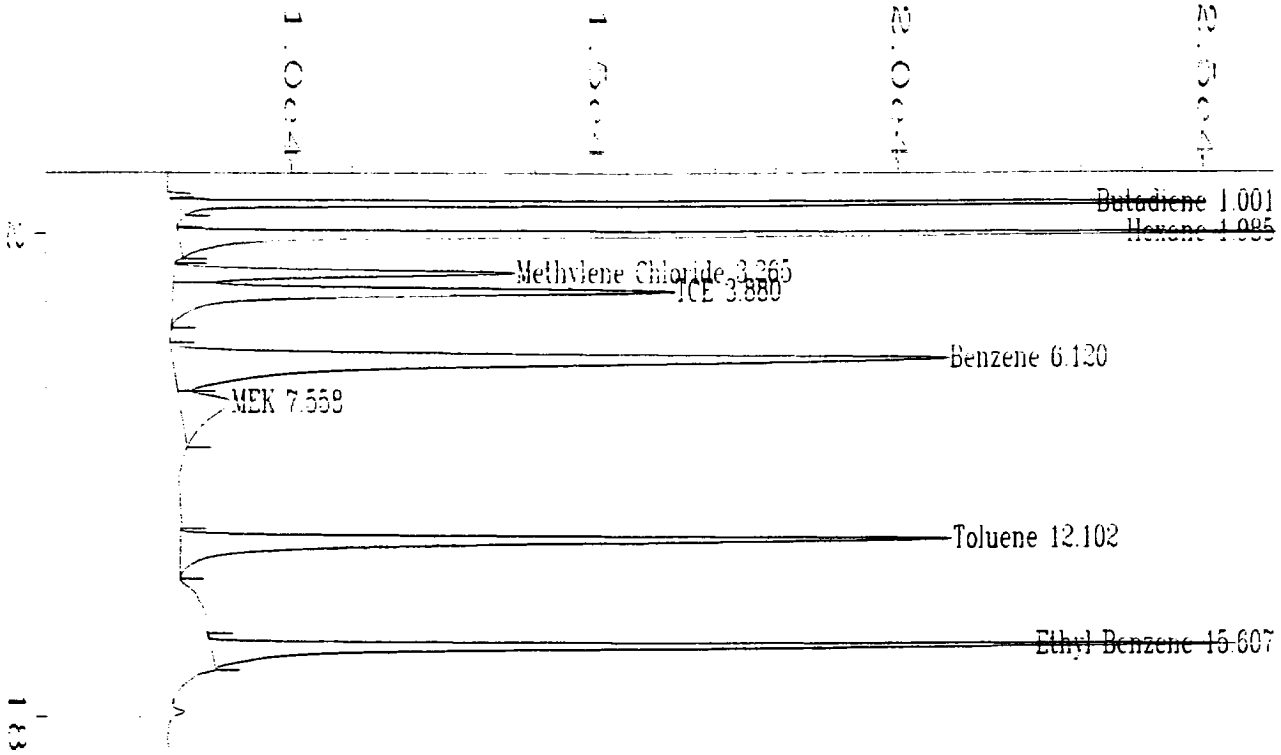

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Area Percent Report

==========

Data File Name : D:\SOLVAY\CAL\WS1_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 08:44 PM
Report Created on: 03 May 95 01:20 PM

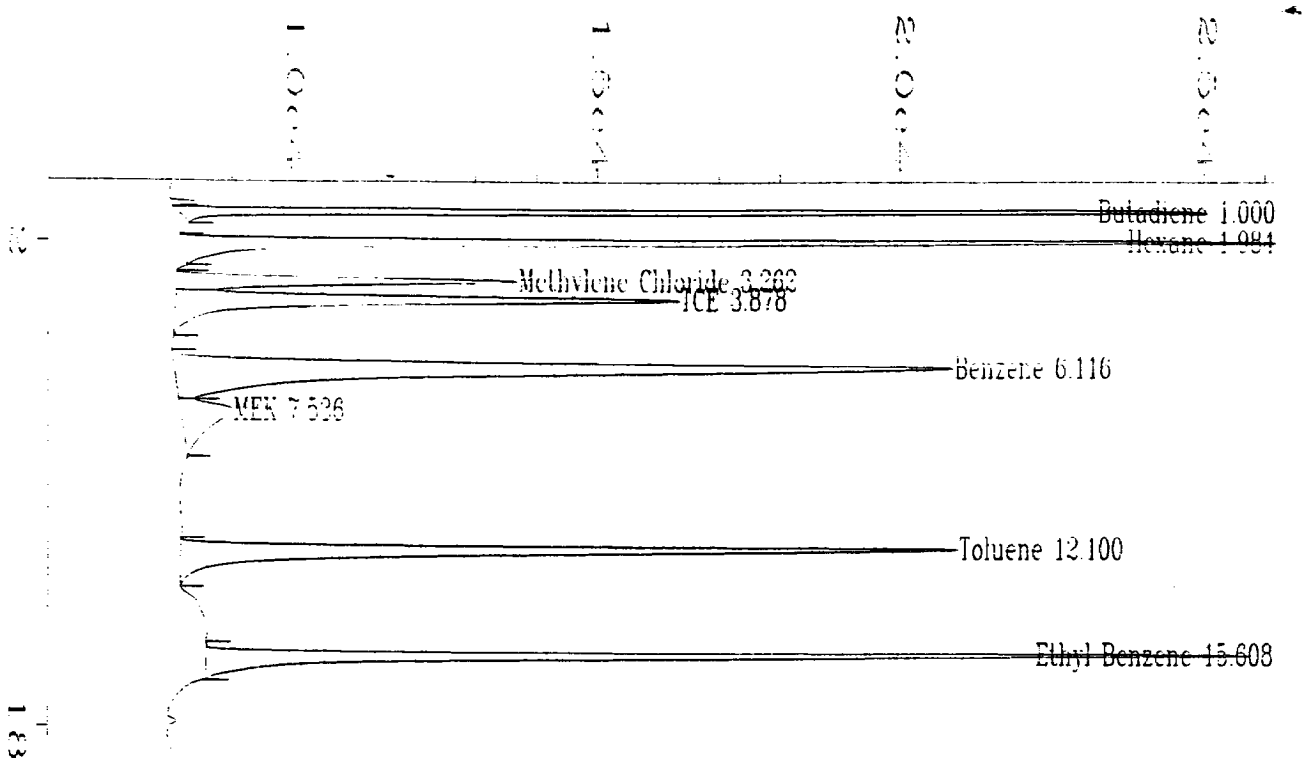
Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS1_0002.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.001	177140	16943	PB	0.172	11.6522
2	1.985	232002	18321	BB	0.198	15.2610
3	3.265	92746	5594	BV	0.255	6.1008
4	3.880	164285	8257	VB	0.296	10.8066
5	6.120	352436	12789	BV	0.409	23.1830
6	7.558	45167	834	VB	0.737	2.9711
7	12.102	234384	12731	BV	0.272	15.4176
8	15.607	222073	16898	BB	0.198	14.6078

Total area = 1520234

==========



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Area Percent Report

==========

Data File Name : D:\SOLVAY\CAL\WS1_0003.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 09:06 PM
Report Created on: 03 May 95 01:21 PM

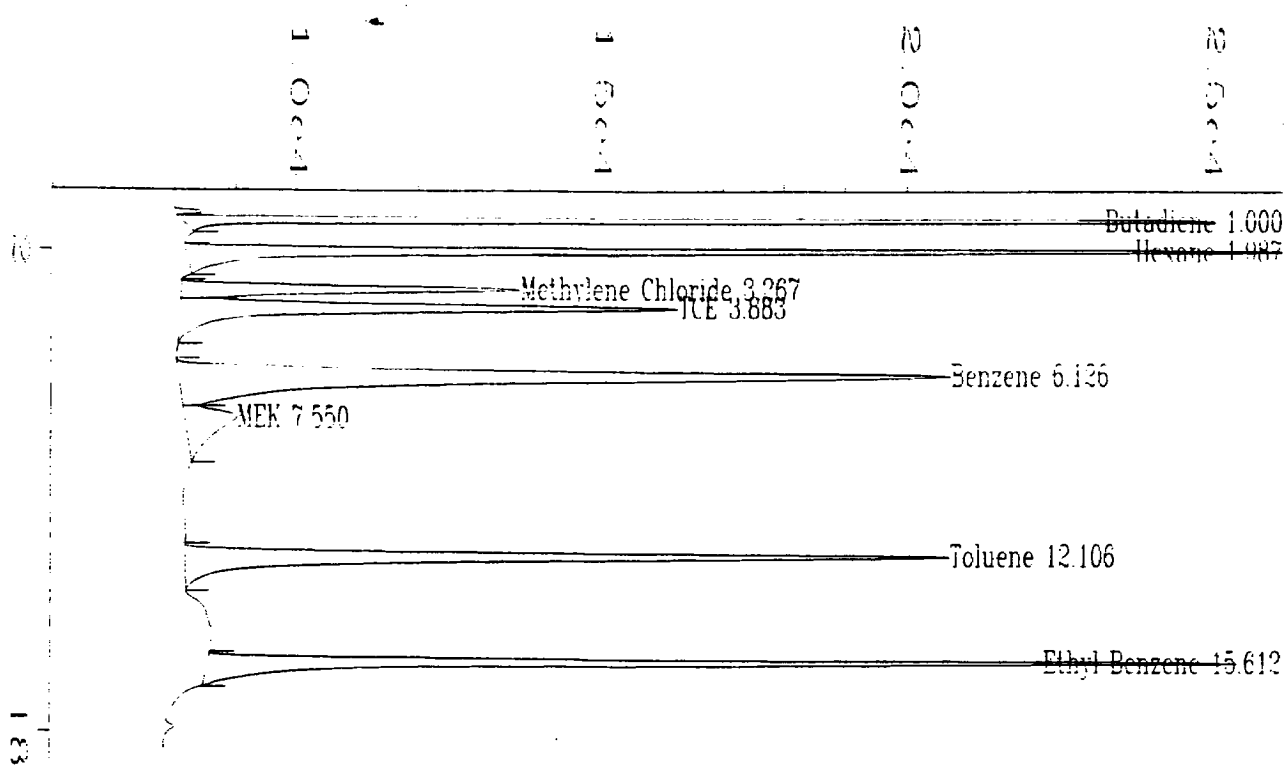
Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS1_0003.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.000	176692	16943	PB	0.172	11.5141
2	1.984	231132	18352	BB	0.197	15.0617
3	3.262	92774	5610	BV	0.254	6.0456
4	3.878	165137	8286	VB	0.296	10.7611
5	6.116	354632	12843	BV	0.410	23.1096
6	7.536	47390	864	VB	0.750	3.0882
7	12.100	236913	12806	BV	0.273	15.4384
8	15.608	229897	17188	BB	0.201	14.9812

Total area = 1534567

==========



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Area Percent Report

==========

Data File Name : D:\SOLVAY\CAL\WS1_0004.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 09:28 PM
Report Created on: 03 May 95 01:21 PM

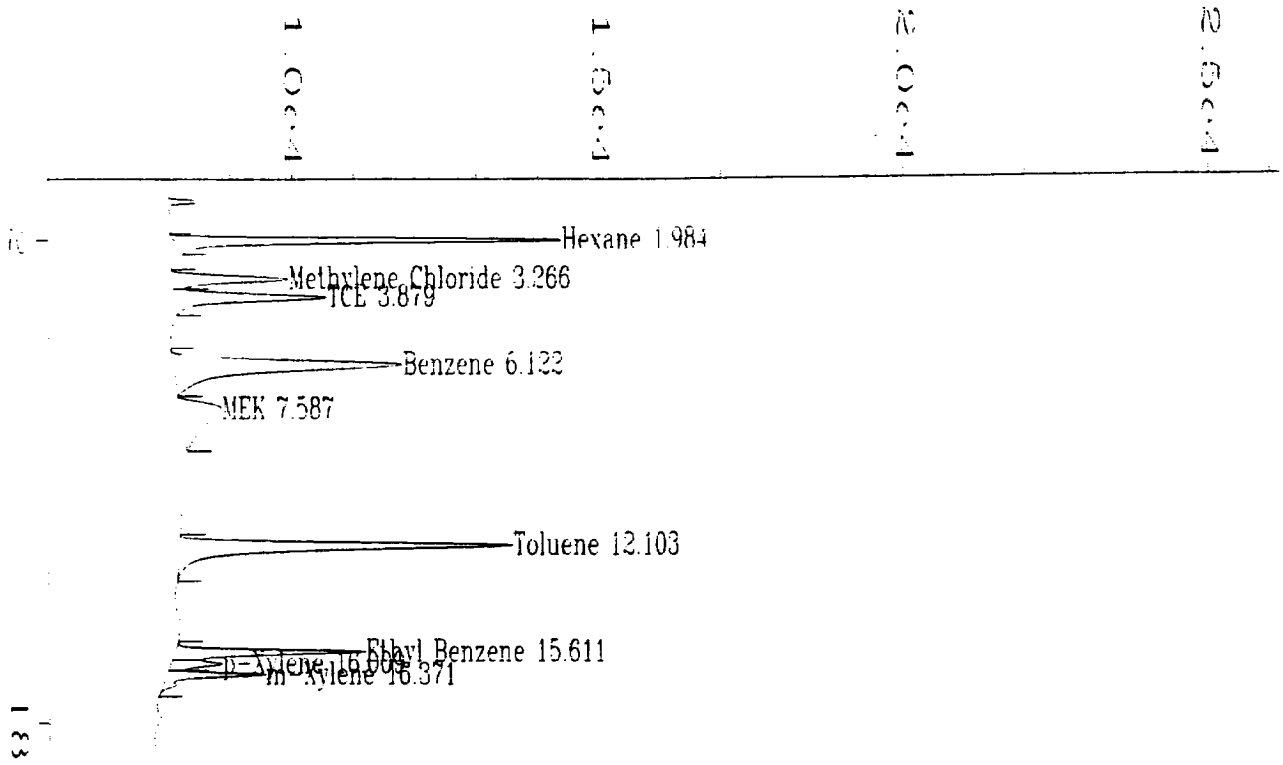
Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Fig. 1 in D:\SOLVAY\CAL\WS1_0004.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.000	177063	16951	PB	0.172	11.5335
2	1.987	230451	18140	BB	0.199	15.0111
3	3.267	92525	5568	BV	0.252	6.0269
4	3.883	164862	8181	VB	0.299	10.7388
5	6.126	354532	12656	BV	0.419	23.0935
6	7.550	47119	853	VB	0.745	3.0693
7	12.106	236078	12529	BV	0.277	15.3777
8	15.612	232569	16874	BB	0.206	15.1491

Total area = 1535198

==========



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Area Percent Report

==========

Data File Name : D:\SOLVAY\CAL\WS2_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 09:50 PM
Report Created on: 03 May 95 01:22 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS2_0001.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.984	75406	6309	BB	0.186	16.4308
2	3.266	30904	1890	BV	0.244	6.7338
3	3.879	45547	2489	VB	0.280	9.9246
4	6.122	99521	3743	BV	0.396	21.6853
5	7.587	35482	677	VB	0.728	7.7314
6	12.103	100146	5441	BB	0.272	21.8214
7	15.611	40109	3118	BV	0.195	8.7397
8	16.009	11559	854	VV	0.199	2.5187
9	16.371	20259	1625	VB	0.183	4.4144

Total area = 458932

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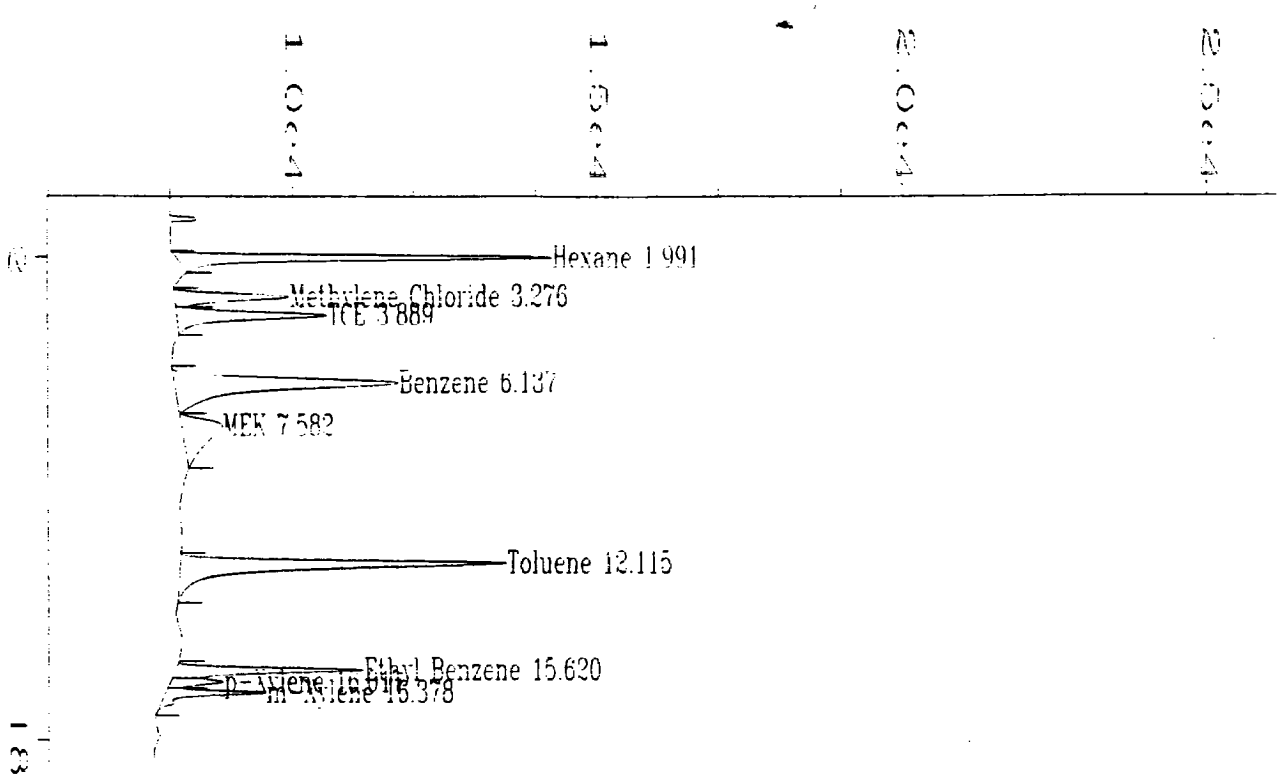

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS2_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 10:19 PM
Report Created on: 03 May 95 01:23 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS2_0002.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.991	76451	6181	BB	0.196	16.1695
2	3.276	31356	1889	BV	0.247	6.6318
3	3.889	46591	2467	VB	0.286	9.8540
4	6.137	102988	3704	BV	0.410	21.7822
5	7.582	35605	665	VB	0.744	7.5306
6	12.115	106595	5386	BB	0.289	22.5450
7	15.620	40641	3107	BV	0.198	8.5956
8	16.017	11752	869	VV	0.200	2.4857
9	16.378	20830	1651	VB	0.185	4.4056

Total area = 472808

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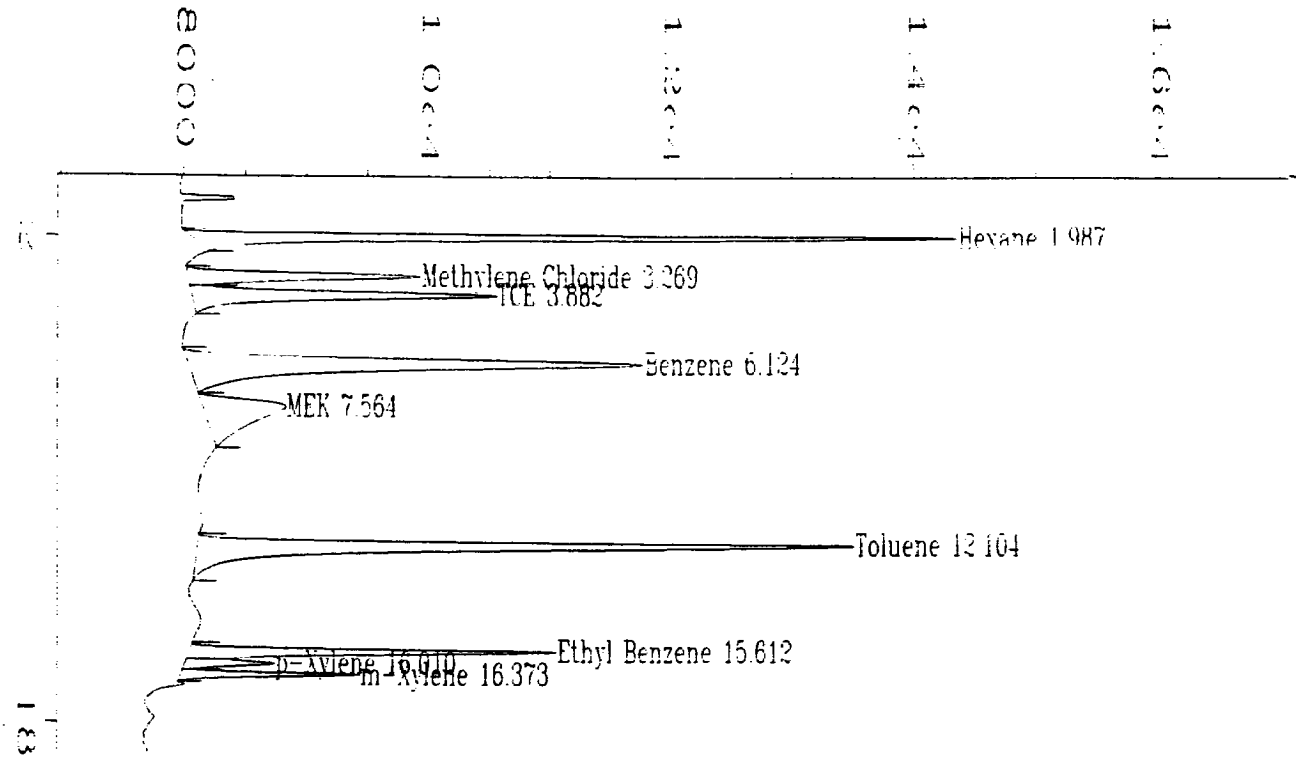

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS2_0003.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 10:41 PM
Report Created on: 03 May 95 01:23 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS2_0003.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.987	76522	6305	BB	0.193	16.9996
2	3.269	31131	1906	BV	0.248	6.9159
3	3.882	45935	2494	VB	0.277	10.2045
4	6.124	99844	3756	BV	0.399	22.1806
5	7.564	35187	679	VB	0.728	7.8170
6	12.104	100909	5419	BB	0.274	22.4171
7	15.612	37730	3019	BV	0.191	8.3819
8	16.010	9001	733	VV	0.184	1.9996
9	16.373	13882	1469	VV	0.148	3.0838

Total area = 450140

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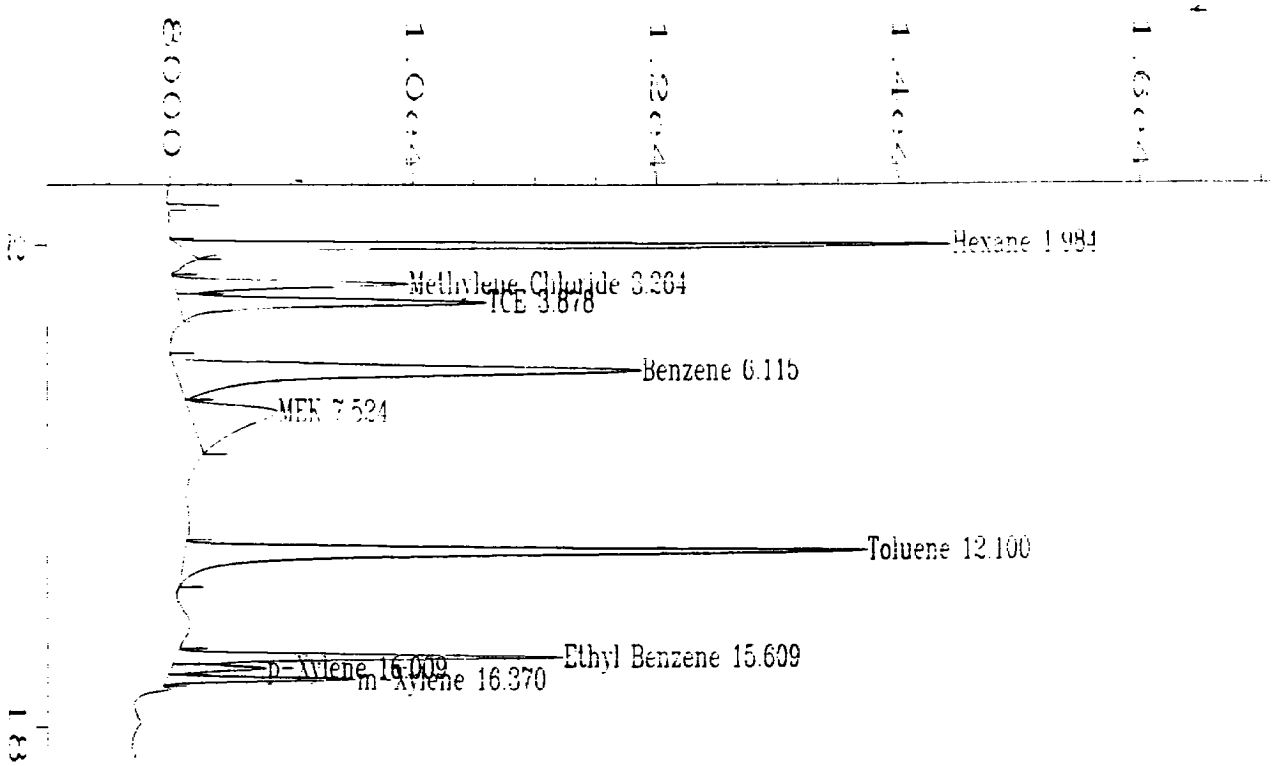

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS2_0004.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 11:03 PM
Report Created on: 03 May 95 01:24 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS2_0004.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.984	76461	6367	BB	0.192	16.4855
2	3.264	31367	1929	BV	0.247	6.7630
3	3.878	46796	2541	VB	0.280	10.0896
4	6.115	102273	3836	BV	0.396	22.0507
5	7.524	37811	724	VB	0.722	8.1522
6	12.100	104956	5615	BB	0.275	22.6292
7	15.609	39600	3181	BV	0.190	8.5379
8	16.009	9726	782	VV	0.187	2.0970
9	16.370	14818	1565	VV	0.148	3.1948

Total area = 463809

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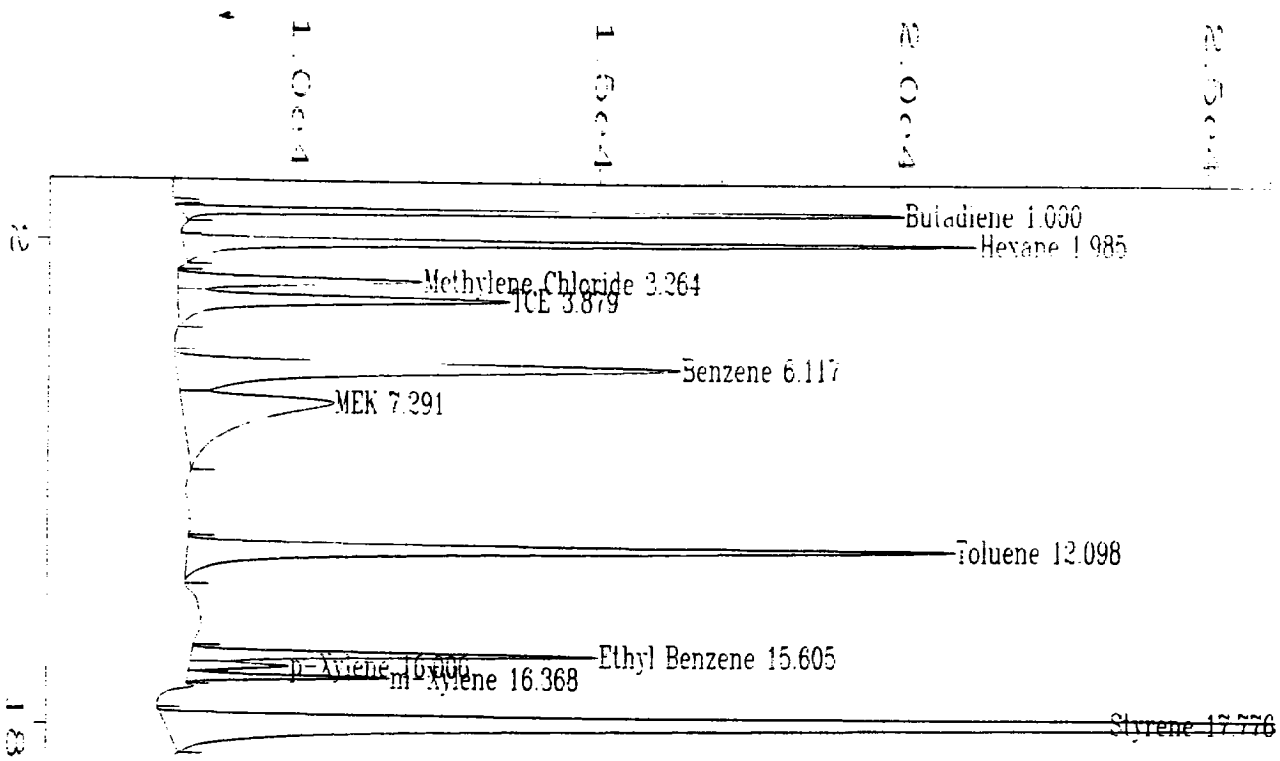

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS3_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 11:25 PM
Report Created on: 03 May 95 02:00 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS3_0001.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.000	124339	11910	PB	0.172	5.0589
2	1.985	165687	13114	BB	0.198	6.7412
3	3.264	66429	4023	BV	0.253	2.7027
4	3.879	108275	5475	VB	0.296	4.4053
5	6.117	225356	8321	BV	0.400	9.1689
6	7.291	142258	2502	VB	0.782	5.7880
7	12.098	234213	12632	BV	0.273	9.5292
8	15.605	81748	6696	BV	0.187	3.3260
9	16.006	19657	1625	VV	0.182	0.7998
10	16.368	31059	3308	VV	0.147	1.2637
11	17.776	1258816	90188	BBA	0.210	51.2164

Total area = 2457836

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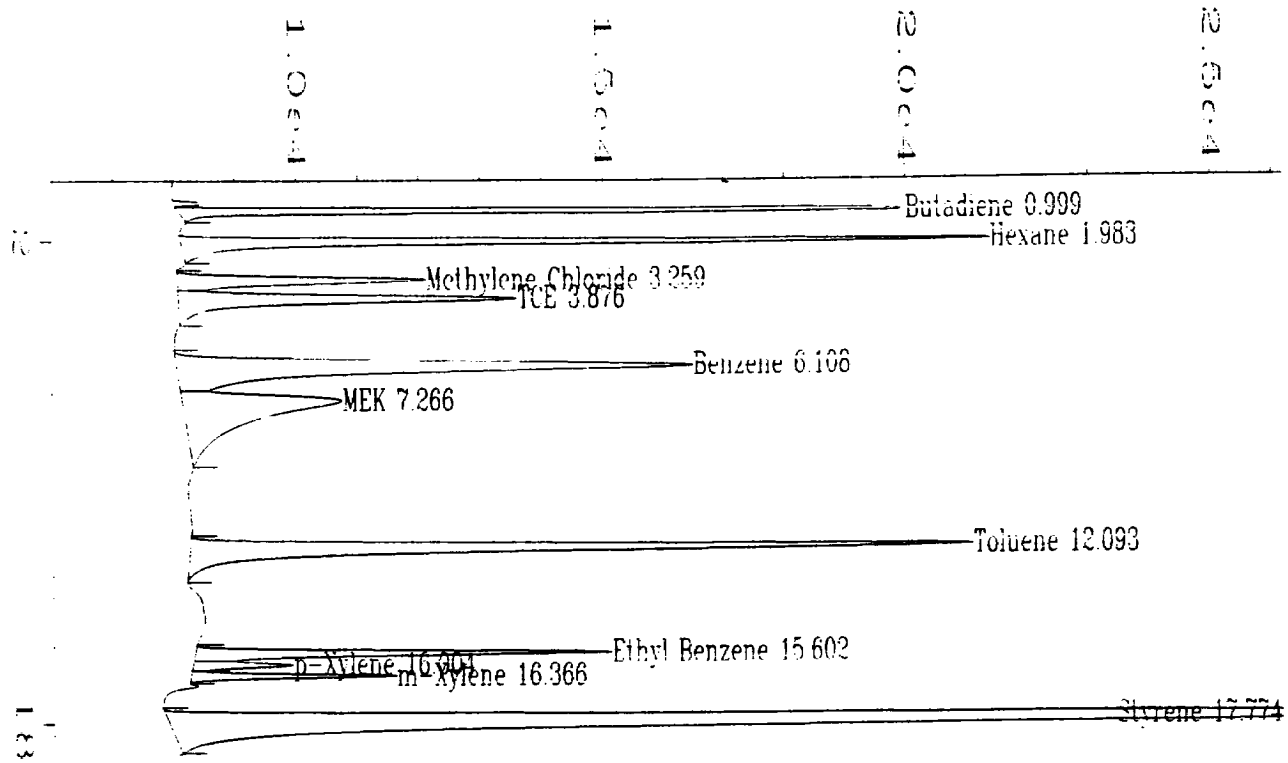

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS3_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 11:47 PM
Report Created on: 03 May 95 02:01 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Fig. 1 in D:\SOLVAY\CAL\WS3_0002.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	0.999	124123	11902	PB	0.172	5.0642
2	1.983	165752	13280	BB	0.196	6.7628
3	3.259	66352	4060	BV	0.248	2.7072
4	3.876	106707	5532	VB	0.290	4.3537
5	6.108	224139	8442	BV	0.393	9.1450
6	7.266	143145	2598	VB	0.777	5.8404
7	12.093	233400	12862	BV	0.268	9.5228
8	15.602	82251	6806	BV	0.186	3.3559
9	16.004	19467	1629	VV	0.181	0.7943
10	16.366	31278	3351	VV	0.146	1.2762
11	17.774	1254345	91288	BBA	0.208	51.1777

Total area = 2450958

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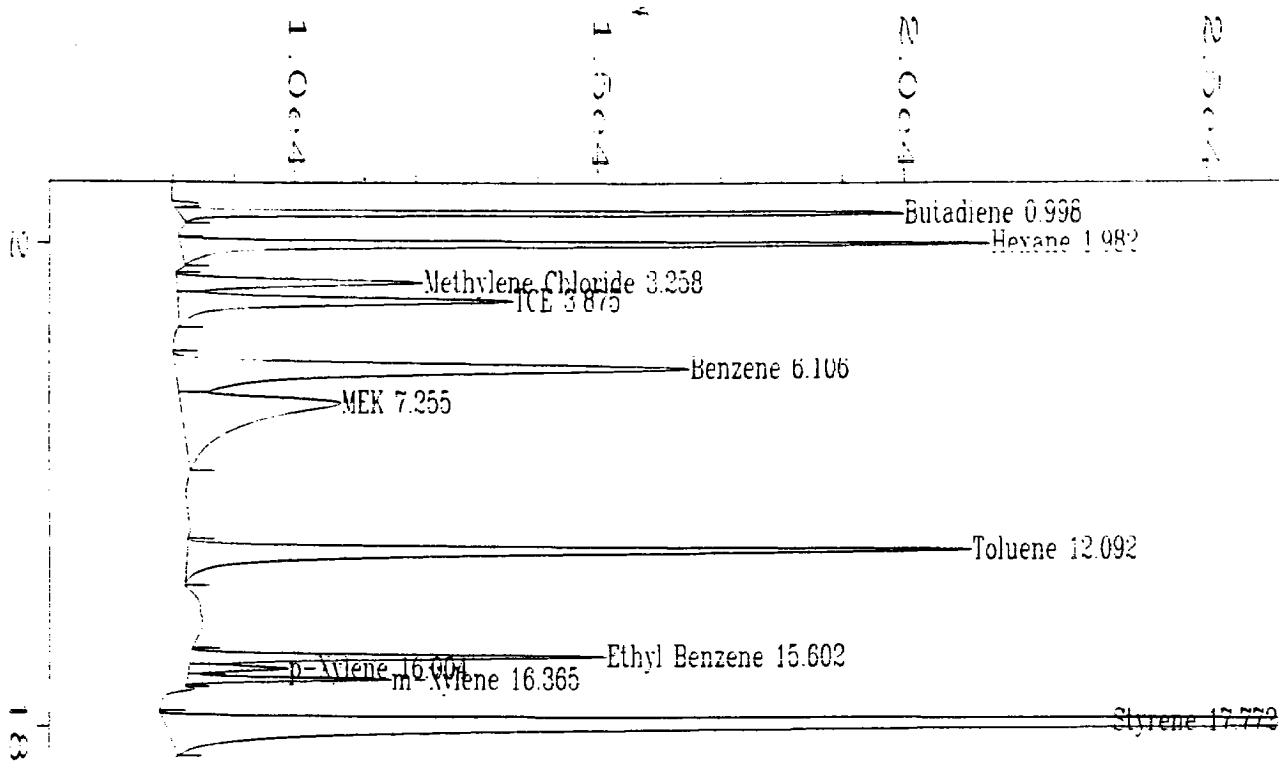

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS3_0003.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 00:09 AM
Report Created on: 03 May 95 02:01 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS3_0003.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	0.998	123947	11905	PB	0.172	5.0423
2	1.982	165992	13314	BB	0.196	6.7527
3	3.258	66218	4066	BV	0.247	2.6938
4	3.875	105962	5535	VB	0.288	4.3106
5	6.106	224324	8473	BV	0.394	9.1257
6	7.255	145684	2640	VB	0.760	5.9265
7	12.092	233575	12899	BV	0.268	9.5020
8	15.602	82461	6852	BV	0.185	3.3546
9	16.004	19305	1627	VV	0.179	0.7853
10	16.365	31348	3375	VV	0.146	1.2753
11	17.772	1259349	91865	BBA	0.207	51.2312

Total area = 2458166

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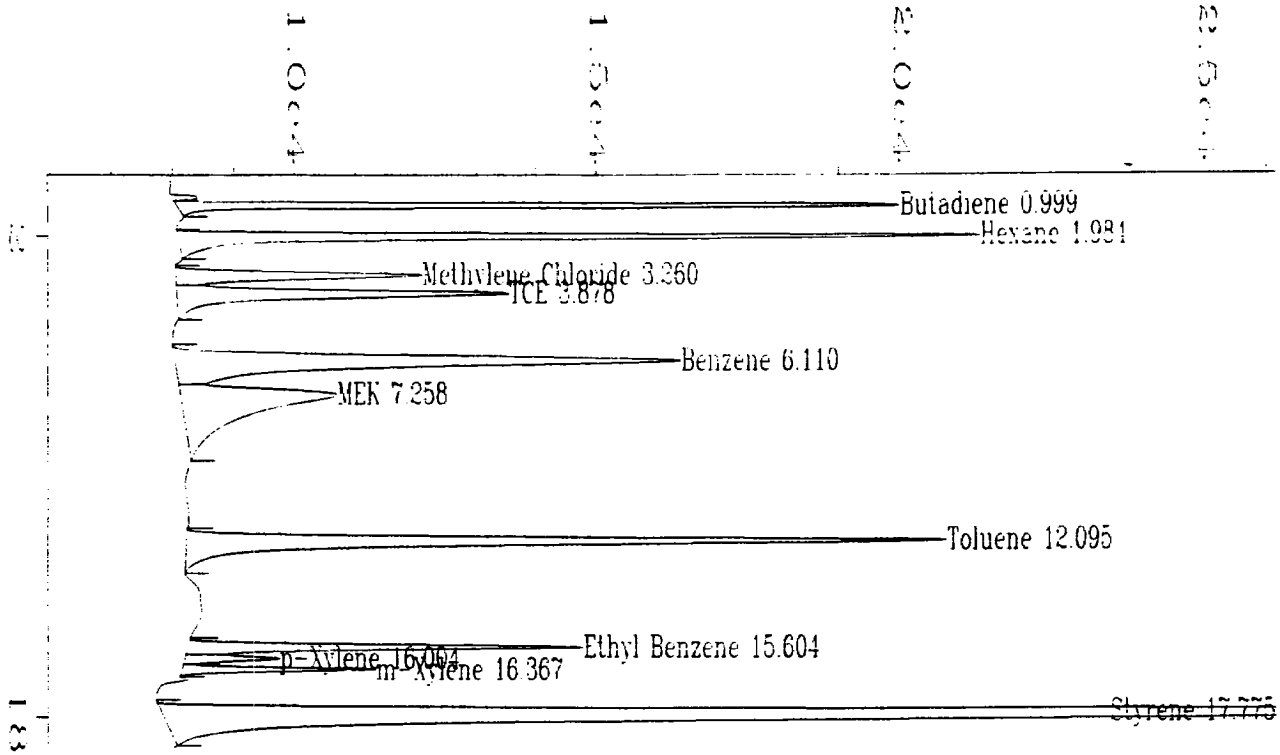

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Area Percent Report

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ata File Name : D:\SOLVAY\CAL\WS3_0005.D
erator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
un Time Bar Code:
cquired on : 27 Apr 95 00:53 AM
Report Created on: 03 May 95 02:02 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

ig. 1 in D:\SOLVAY\CAL\WS3_0005.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	0.999	124733	11920	PB	0.145	5.2904
2	1.984	166597	13226	BB	0.197	7.0660
3	3.260	66122	4054	BV	0.249	2.8045
4	3.878	105198	5482	VB	0.289	4.4618
5	6.110	220821	8368	BV	0.391	9.3659
6	7.258	140855	2570	VB	0.761	5.9742
7	12.095	226522	12521	BV	0.268	9.6077
8	15.604	78651	6522	BV	0.185	3.3359
9	16.004	18467	1546	VV	0.180	0.7833
10	16.367	29492	3175	VV	0.146	1.2509
11	17.775	1180266	85211	BBA	0.209	50.0596

Total area = 2357722

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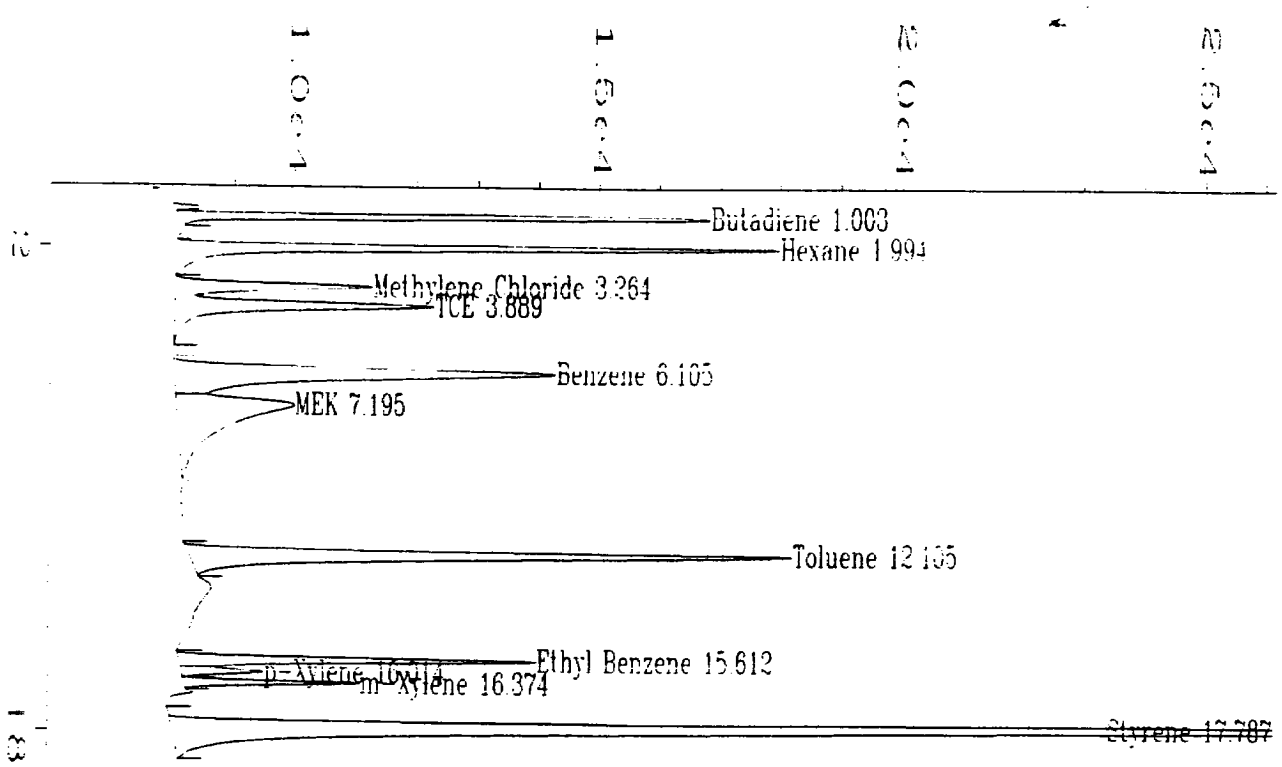

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS4_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Run 1
Run Time Bar Code:
Acquired on : 27 Apr 95 08:57 AM
Report Created on: 04 May 95 11:08 AM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH

Sig. 1 in D:\SOLVAY\CAL\WS4_0001.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.003	94272	8740	PB	0.146	6.1706
2	1.994	132893	9934	BV	0.209	8.6985
3	3.264	51803	3235	VV	0.242	3.3908
4	3.889	85736	4264	VB	0.298	5.6119
5	6.105	171904	6277	BV	0.407	11.2520
6	7.195	114989	1935	VB	0.818	7.5266
7	12.105	180336	9939	BB	0.270	11.8039
8	15.612	71549	5865	BV	0.187	4.6832
9	16.014	15716	1342	VV	0.178	1.0287
10	16.374	27013	2892	VV	0.146	1.7681
11	17.787	581557	40172	BBA	0.217	38.0658

Total area = 1527768

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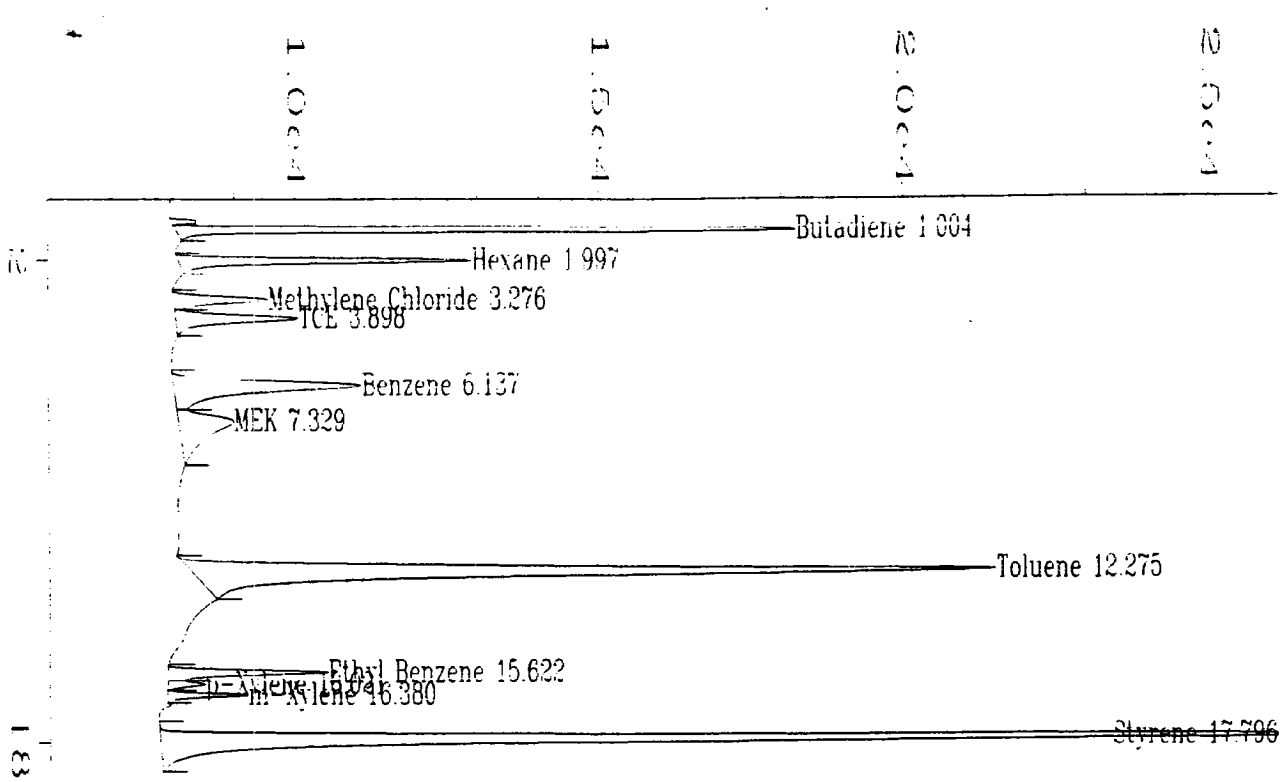

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS5_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 09:04 AM
Report Created on: 03 May 95 03:10 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Fig. 1 in D:\SOLVAY\CAL\WS5_0001.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.004	109738	10187	PB	0.146	10.2373
2	1.997	59182	4823	BB	0.194	5.5209
3	3.276	24839	1538	BV	0.248	2.3172
4	3.898	36885	2008	VB	0.279	3.4409
5	6.137	82328	3081	BV	0.400	7.6803
6	7.329	44443	900	VB	0.690	4.1460
7	12.275	285420	13249	BB	0.312	26.6263
8	15.622	32278	2627	BV	0.188	3.0111
9	16.021	7220	611	VV	0.178	0.6736
10	16.380	12358	1310	VV	0.148	1.1528
11	17.796	377258	26115	BBA	0.216	35.1936

Total area = 1071949

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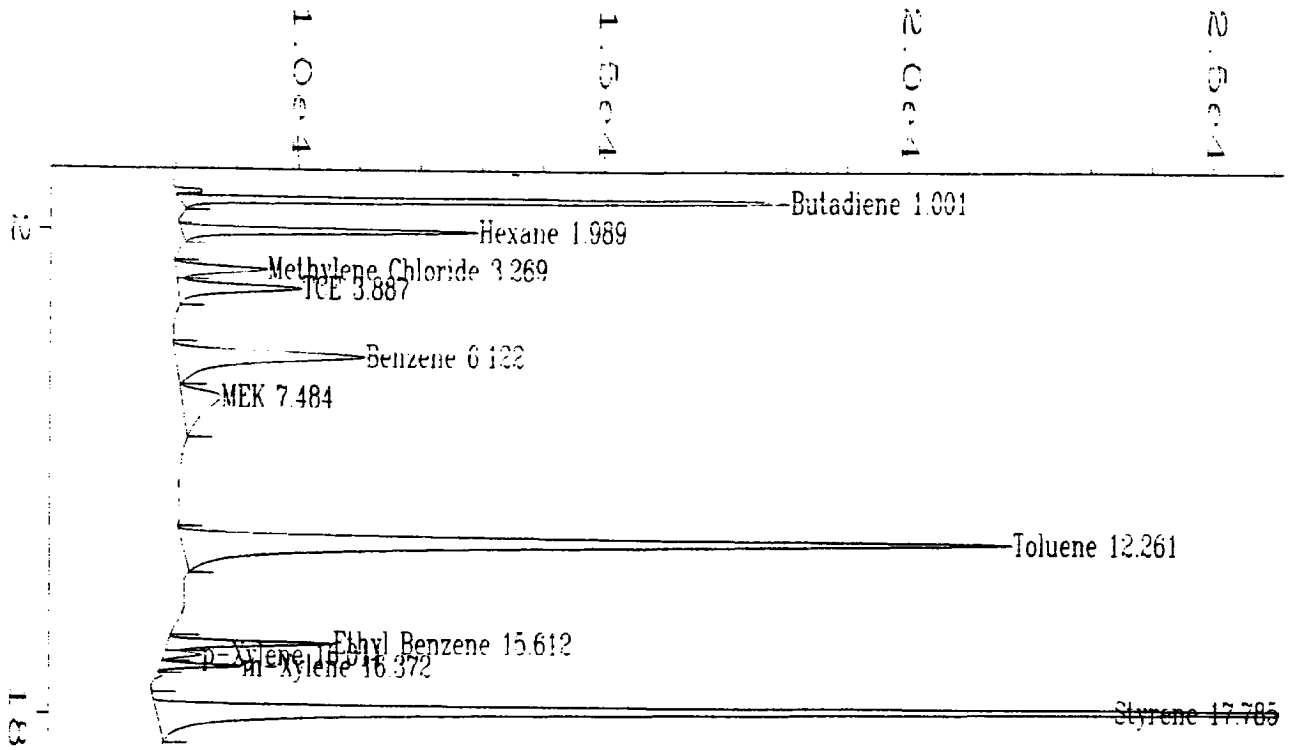

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS5_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 09:25 AM
Report Created on: 03 May 95 03:11 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS5_0002.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.001	105499	10005	PB	0.144	10.0408
2	1.989	57831	4850	BB	0.190	5.5041
3	3.269	23857	1488	BV	0.244	2.2706
4	3.887	36614	2024	VB	0.276	3.4848
5	6.122	81334	3101	BV	0.390	7.7409
6	7.484	31265	640	VB	0.673	2.9757
7	12.261	294627	13642	BB	0.312	28.0409
8	15.612	32521	2697	BV	0.185	3.0952
9	16.011	7056	611	VV	0.175	0.6716
10	16.372	11997	1325	VV	0.143	1.1418
11	17.785	368100	26299	BBA	0.211	35.0337

Total area = 1050703

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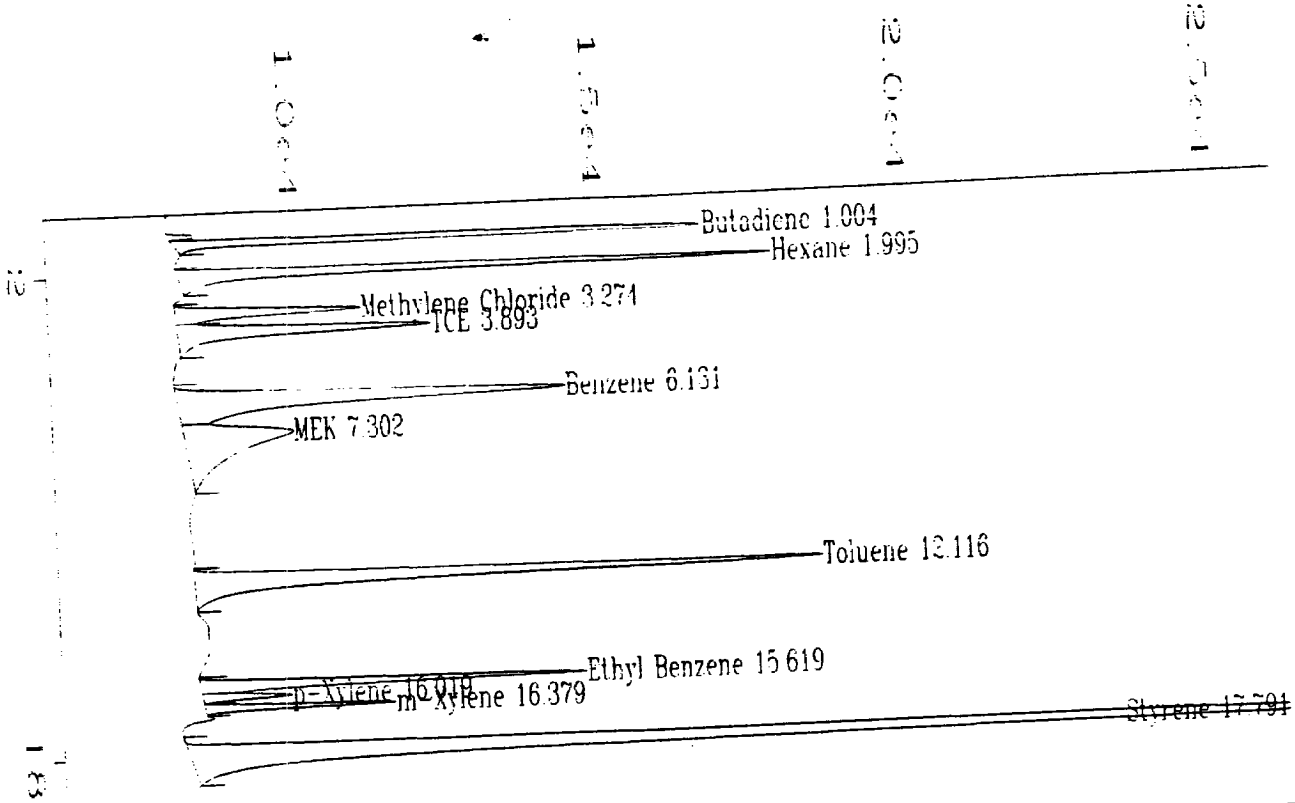

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS4_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Run 1
Run Time Bar Code:
Acquired on : 27 Apr 95 09:26 AM
Report Created on: 03 May 95 02:05 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS4_0002.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.004	93696	8726	PB	0.145	5.7839
2	1.995	127239	9819	BB	0.204	7.8545
3	3.274	50452	3073	BV	0.252	3.1144
4	3.893	81962	4198	VB	0.292	5.0596
5	6.131	177254	6419	BV	0.406	10.9419
6	7.302	102751	1814	VB	0.780	6.3428
7	12.116	200660	10372	BV	0.284	12.3868
8	15.619	78785	6380	BV	0.190	4.8634
9	16.019	17219	1474	VV	0.178	1.0629
10	16.379	29316	3159	VV	0.146	1.8097
11	17.791	660620	45467	BBA	0.217	40.7802

Total area = 1619955

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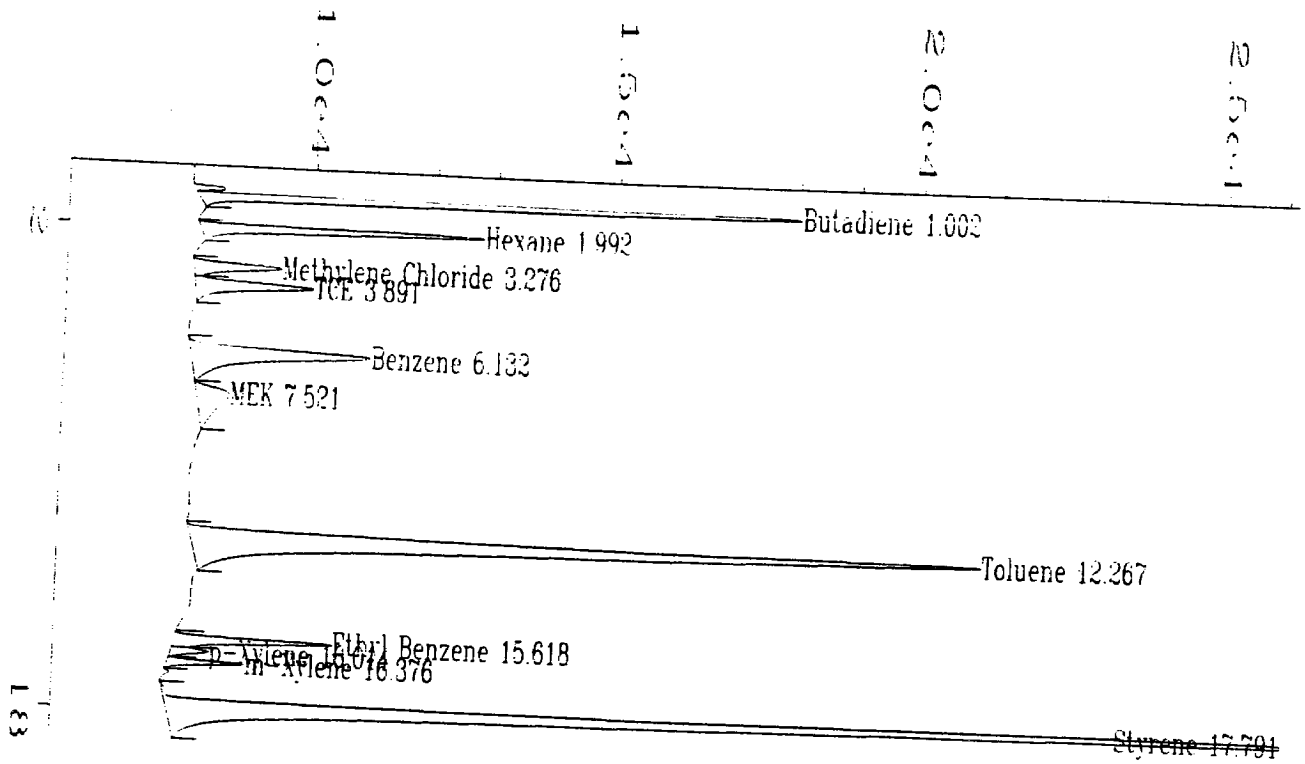

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS5_0003.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 09:49 AM
Report Created on: 03 May 95 03:11 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS5_0003.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.002	104704	9932	PB	0.147	9.9727
2	1.992	56026	4662	BB	0.190	5.3363
3	3.276	23542	1444	BV	0.252	2.2423
4	3.891	35915	1947	VB	0.281	3.4208
5	6.132	79965	2962	BV	0.403	7.6164
6	7.521	25881	540	VB	0.669	2.4651
7	12.267	293590	13009	BB	0.324	27.9636
8	15.618	32580	2589	BV	0.192	3.1032
9	16.014	7587	629	VV	0.183	0.7226
10	16.376	11829	1266	VV	0.147	1.1267
11	17.791	378280	25780	BBA	0.219	36.0302

Total area = 1049899

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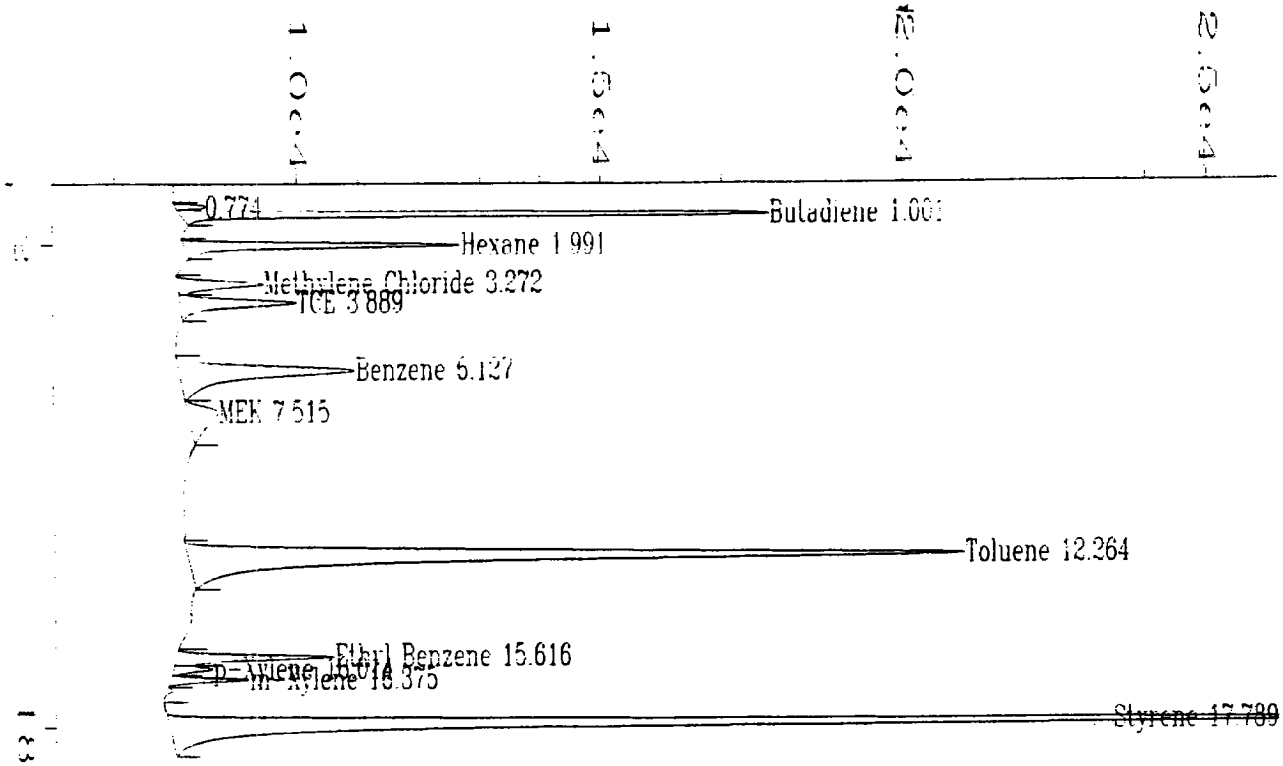

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS5_0004.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 10:13 AM
Report Created on: 03 May 95 03:12 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS5_0004.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	0.774	4567	473	BV	0.132	0.4346
2	1.001	102151	9700	PB	0.143	9.7195
3	1.991	54385	4541	BB	0.189	5.1747
4	3.272	22936	1410	BV	0.247	2.1823
5	3.889	35234	1907	VB	0.280	3.3524
6	6.127	78405	2893	BV	0.401	7.4601
7	7.515	22299	497	VB	0.648	2.1217
8	12.264	293181	12861	BB	0.327	27.8956
9	15.616	32862	2592	BV	0.193	3.1268
10	16.014	7883	645	VV	0.184	0.7501
11	16.375	12187	1290	VV	0.148	1.1595
12	17.789	384901	26253	BBA	0.219	36.6226

Total area = 1050991

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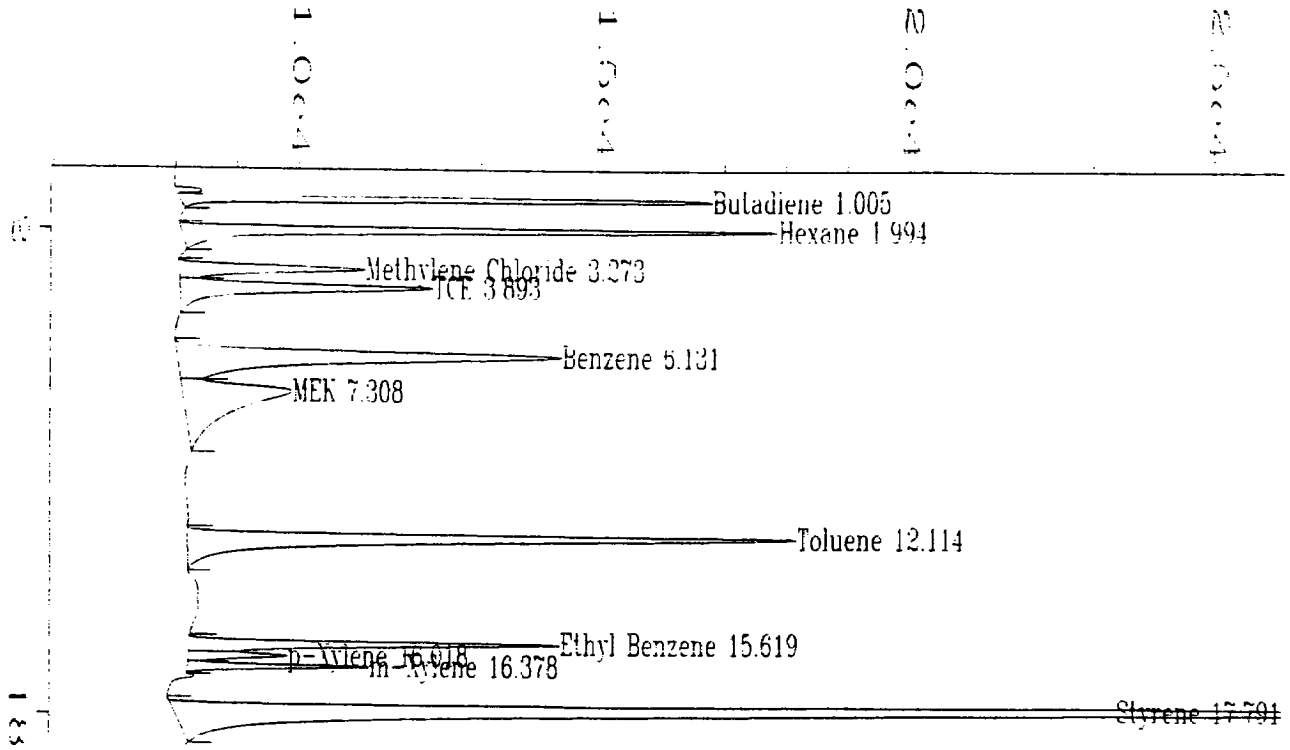

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Area Percent Report

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Data File Name : D:\SOLVAY\CAL\WS4_0004.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Run 1
Run Time Bar Code:
Acquired on : 27 Apr 95 10:19 AM
Report Created on: 03 May 95 02:06 PM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : SOLVAY.MTH

Sig. 1 in D:\SOLVAY\CAL\WS4_0004.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.005	93249	8730	PB	0.145	6.0980
2	1.994	126317	9800	BB	0.203	8.2604
3	3.273	50038	3053	BV	0.253	3.2722
4	3.893	80604	4150	VB	0.291	5.2710
5	6.131	170347	6317	BV	0.398	11.1397
6	7.308	100225	1787	VB	0.777	6.5542
7	12.114	188570	10010	BV	0.278	12.3314
8	15.619	76227	6097	BV	0.190	4.9848
9	16.018	20695	1619	VV	0.190	1.3533
10	16.378	28060	2979	VV	0.147	1.8350
11	17.791	594855	40996	BBA	0.217	38.9001

Total area = 1529188

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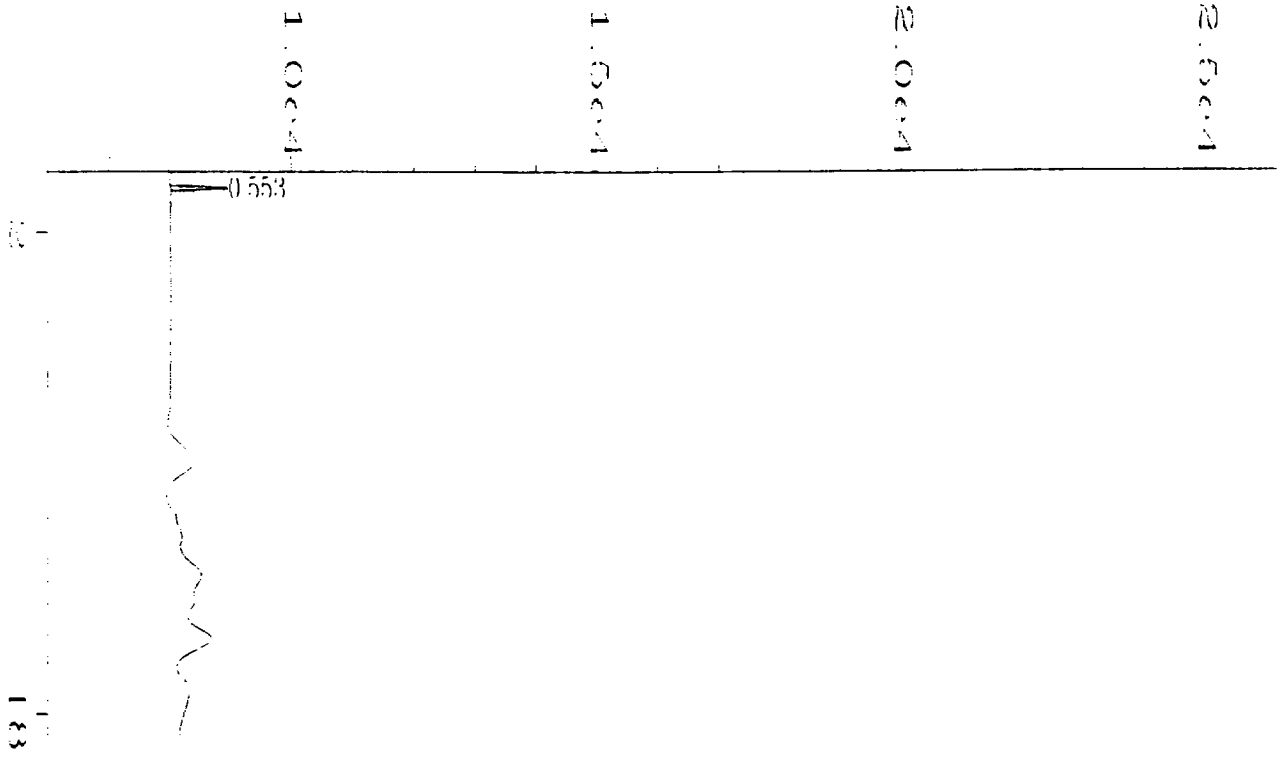

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External Standard Report

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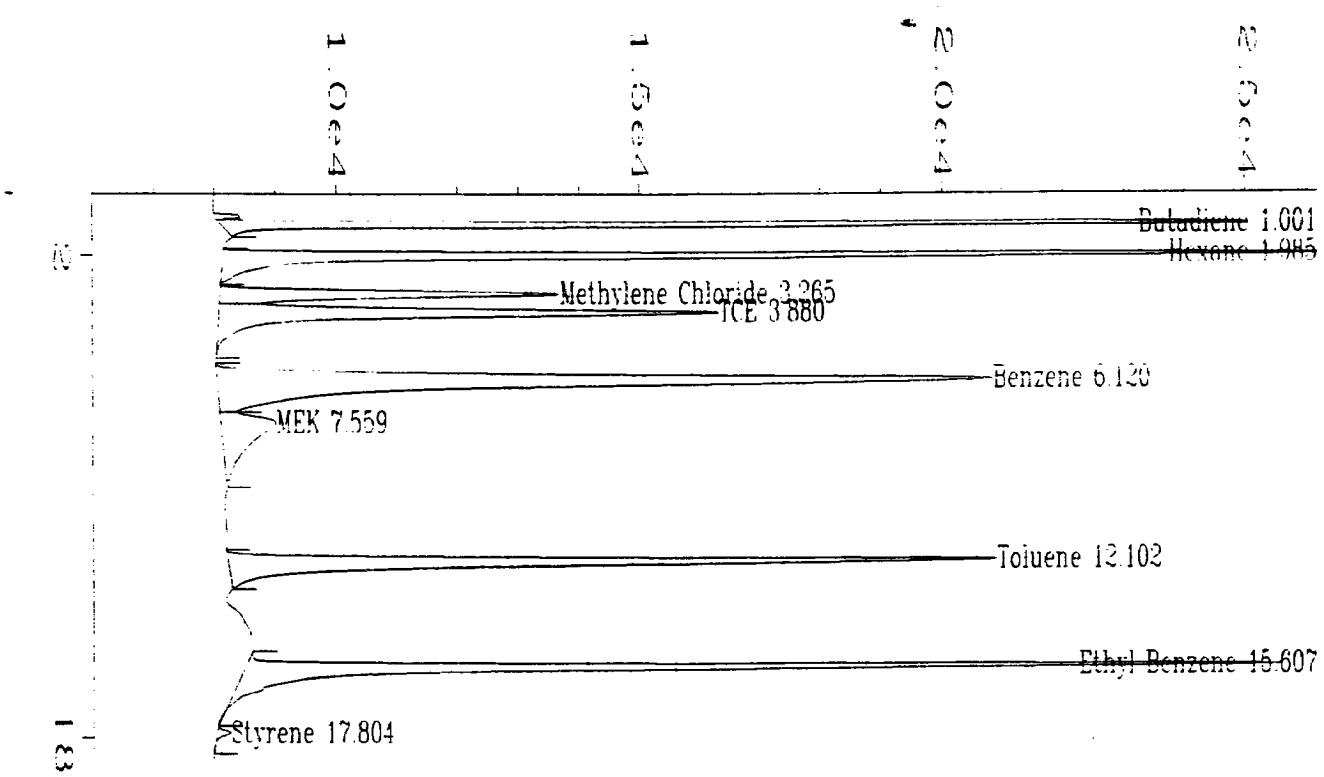
ata File Name	: D:\SOLVAY\CAL\ZERO_001.D		
erator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: parameters	Injection Number	:
un Time Bar Code	:	Sequence Line	:
cquired on	: 26 Apr 95 12:43 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:36 PM	Analysis Method	: METHOD.MTH
ast Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
ultiplier	: 1	ISTD Amount	:

ig. 1 in D:\SOLVAY\CAL\ZERO_001.D

et Time	Area	Type	Width	Ref#	ppm	Name
1.004	* not found *			1		Butadiene
1.980	* not found *			1		Hexane
3.226	* not found *			1		Methylene Chloride
3.869	* not found *			1		TCE
6.085	* not found *			1		Benzene
7.300	* not found *			1		MEK
11.804	* not found *			1		Acrylonitrile
12.132	* not found *			1		Toluene
15.601	* not found *			1		Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.368	* not found *			1		m-Xylene
16.720	* not found *			1		o-Xylene
17.771	* not found *			1		Styrene

ot all calibrated peaks were found



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External Standard Report

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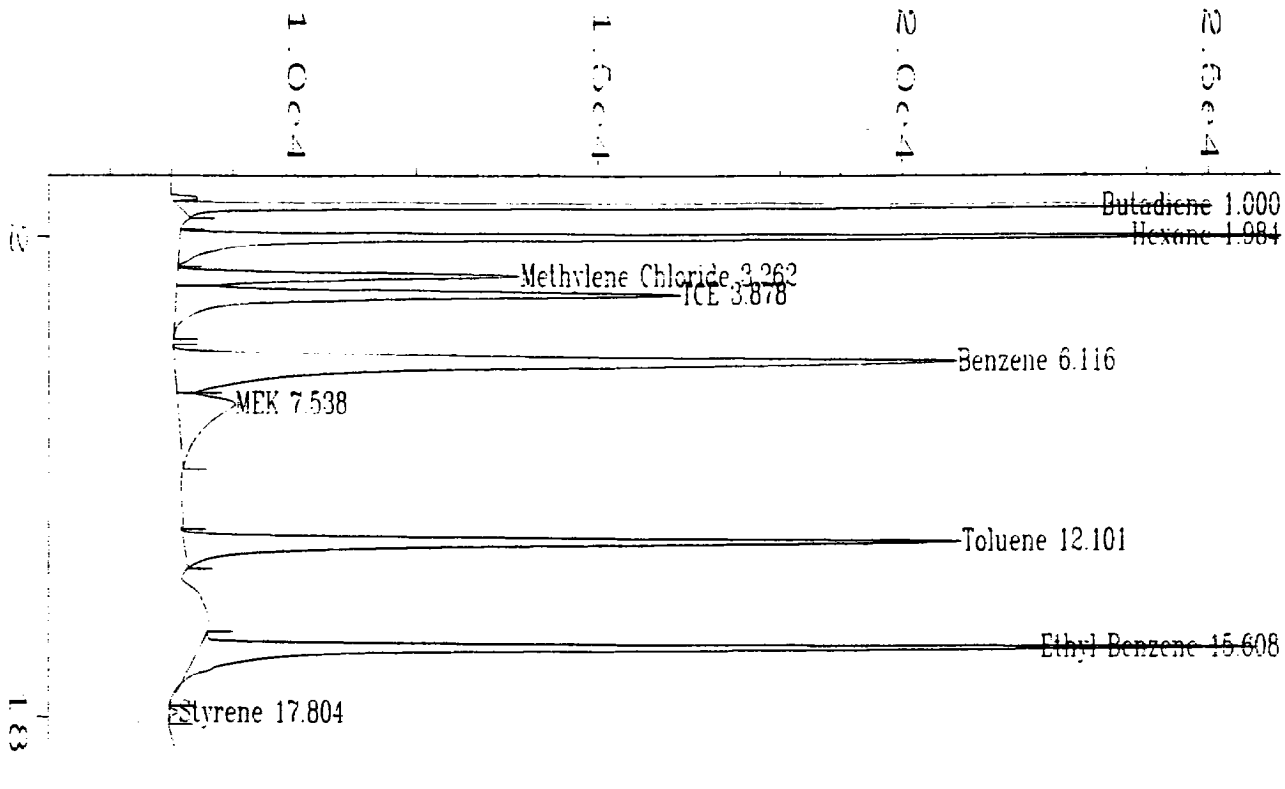
Data File Name : D:\SOLVAY\CAL\WS1_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 08:44 PM
Report Created on: 04 May 95 02:22 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\CAL\WS1_0002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.001	177140	PB	0.172	1	10.298	Butadiene
1.985	236735	BV	0.201	1	5.982	Hexane
3.265	92879	PV	0.255	1	19.910	Methylene Chloride
3.880	165622	VB	0.298	1	16.211	TCE
6.120	355230	BV	0.411	1	10.282	Benzene
7.559	57544	VB	0.845	1	6.360	MEK
11.804	* not found *			1		Acrylonitrile
12.102	229222	BB	0.267	1	11.395	Toluene
15.607	243513	BV	0.211	1	10.174	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.368	* not found *			1		m-Xylene
16.720	* not found *			1		o-Xylene
17.804	2660	PB	0.193	1	0.0792	Styrene

Not all calibrated peaks were found



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External Standard Report

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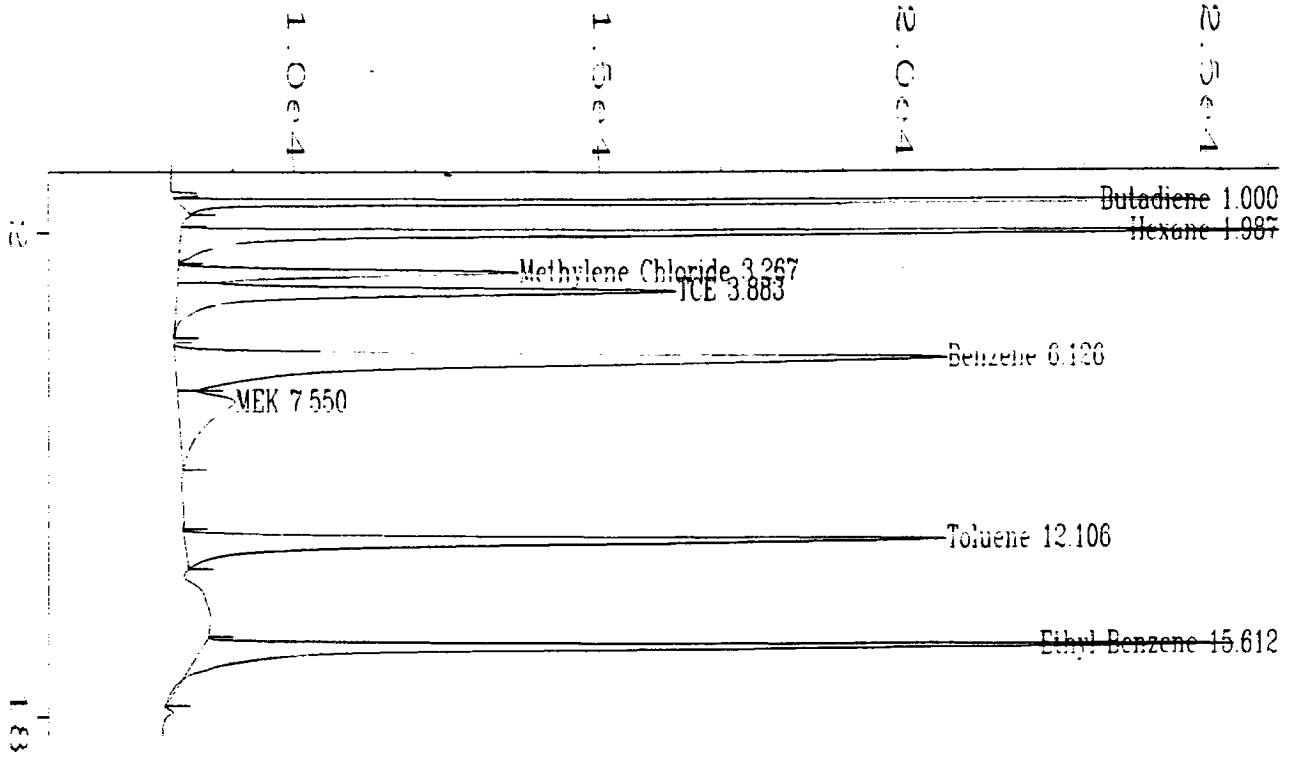
Data File Name	: D:\SOLVAY\CAL\WS1_0003.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 26 Apr 95 09:06 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:23 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS1_0003.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.000	176692	PB	0.172	1	10.272	Butadiene
1.984	237064	BV	0.201	1	5.990	Hexane
3.262	92923	PV	0.254	1	19.920	Methylene Chloride
3.878	166521	VB	0.298	1	16.297	TCE
6.116	357383	BV	0.412	1	10.343	Benzene
7.538	59847	VB	0.859	1	6.603	MEK
11.804	* not found *			1		Acrylonitrile
12.101	232207	BB	0.269	1	11.542	Toluene
15.608	244444	BV	0.209	1	10.213	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.368	* not found *			1		m-Xylene
16.720	* not found *			1		o-Xylene
17.804	1857	PB	0.187	1	0.0651	Styrene

Not all calibrated peaks were found



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External Standard Report

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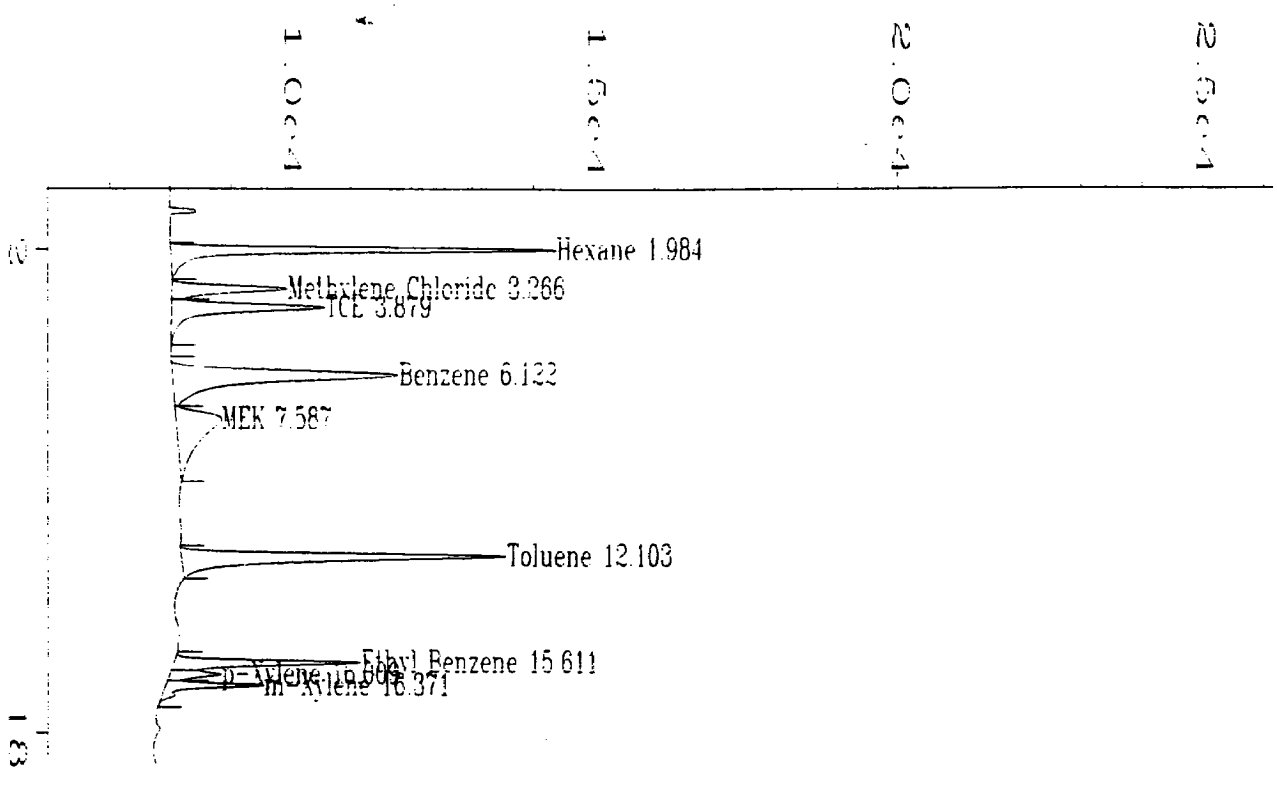
Data File Name	: D:\SOLVAY\CAL\WS1_0004.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 26 Apr 95 09:28 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:23 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS1_0004.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.000	177063	PB	0.172	1	10.293	Butadiene
1.987	236239	BV	0.202	1	5.970	Hexane
3.267	92713	PV	0.252	1	19.876	Methylene Chloride
3.883	166456	VB	0.301	1	16.291	TCE
6.126	357422	BV	0.421	1	10.344	Benzene
7.550	60715	VB	0.857	1	6.694	MEK
11.804	* not found *			1		Acrylonitrile
12.106	232353	BB	0.274	1	11.549	Toluene
15.612	240135	BB	0.210	1	10.033	Ethyl Benzene
16.004	* not found *			1	-	p-Xylene
16.368	* not found *			1		m-Xylene
16.720	* not found *			1		o-Xylene
17.771	* not found *			1		Styrene

Not all calibrated peaks were found



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External Standard Report

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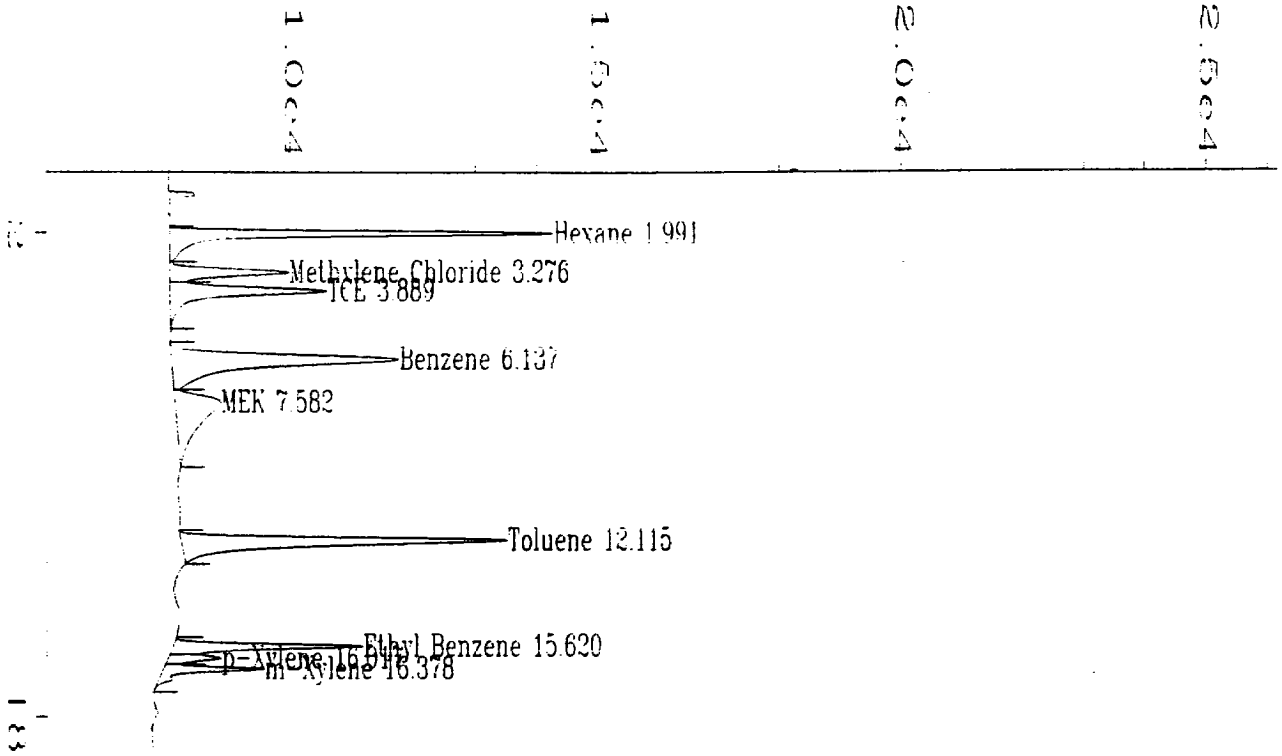
Data File Name	: D:\SOLVAY\CAL\WS2_0001.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 26 Apr 95 09:50 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:26 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS2_0001.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.004	* not found *			1		Butadiene
1.984	82450	BB	0.198	1	2.221	Hexane
3.266	31729	BV	0.247	1	7.187	Methylene Chloride
3.879	50720	VB	0.299	1	5.159	TCE
6.122	102110	BV	0.403	1	3.029	Benzene
7.587	47530	VB	0.856	1	5.302	MEK
11.804	* not found *			1		Acrylonitrile
12.103	95571	BB	0.264	1	4.838	Toluene
15.611	40109	BV	0.195	1	1.665	Ethyl Benzene
16.009	11559	VV	0.199	1	0.637	p-Xylene
16.371	20259	VB	0.183	1	1.155	m-Xylene
16.720	* not found *			1		o-Xylene
17.771	* not found *			1		Styrene

Not all calibrated peaks were found



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External Standard Report

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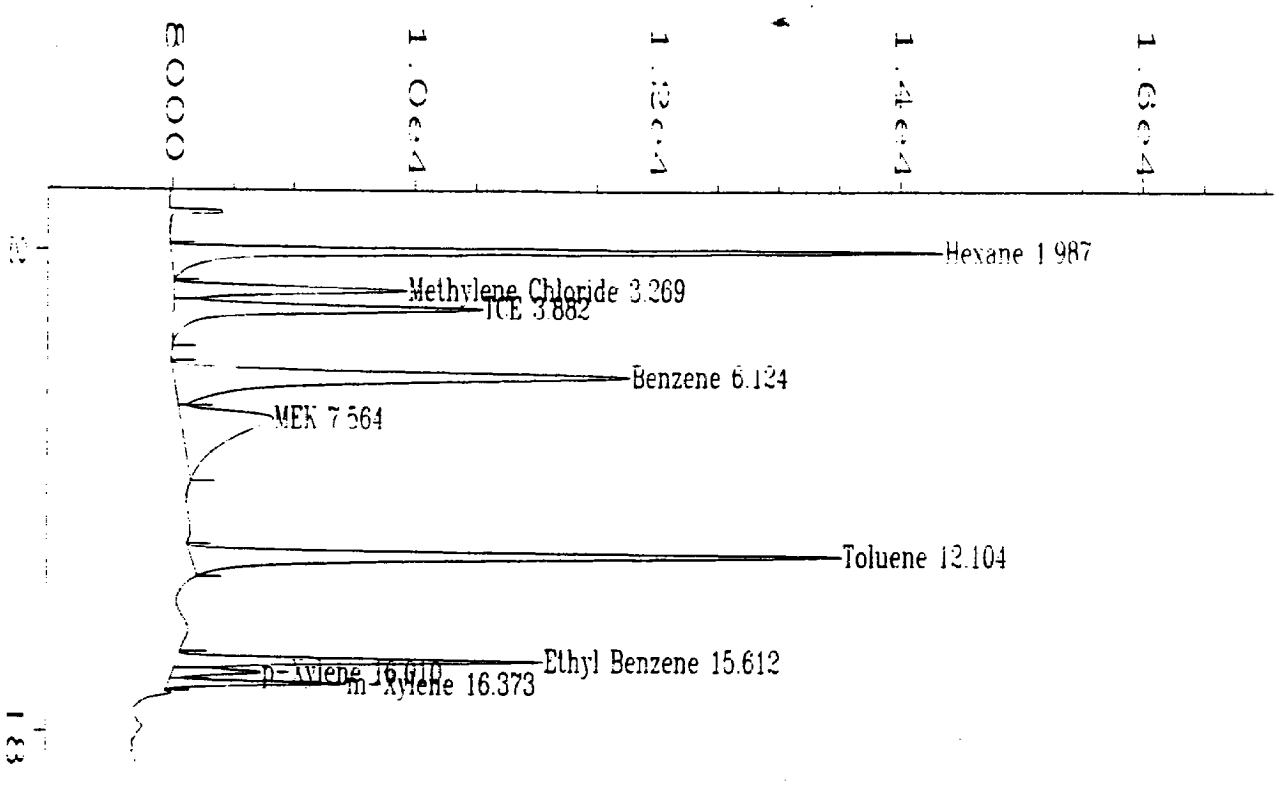
Data File Name : D:\SOLVAY\CAL\WS2_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 10:19 PM
Report Created on: 04 May 95 02:24 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\CAL\WS2_0002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.004	* not found *			1		Butadiene
1.991	86353	BV	0.212	1	2.316	Hexane
3.276	33439	VV	0.255	1	7.542	Methylene Chloride
3.889	53554	VB	0.311	1	5.432	TCE
6.137	106134	BV	0.418	1	3.145	Benzene
7.582	50035	VB	0.897	1	5.567	MEK
11.804	* not found *			1		Acrylonitrile
12.115	99753	BB	0.276	1	5.044	Toluene
15.620	40641	BV	0.198	1	1.687	Ethyl Benzene
16.017	11752	VV	0.200	1	0.649	p-Xylene
16.378	20830	VB	0.185	1	1.189	m-Xylene
16.720	* not found *			1		o-Xylene
17.771	* not found *			1		Styrene

Not all calibrated peaks were found



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External Standard Report

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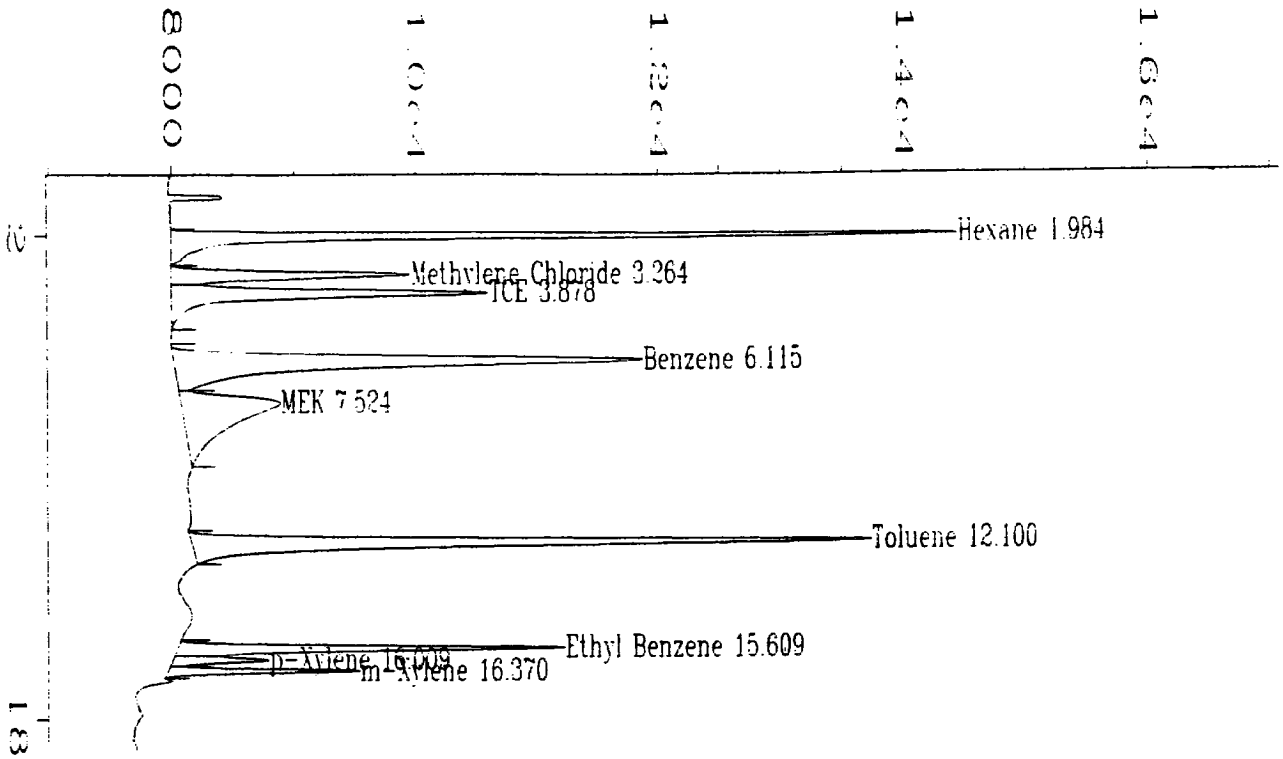
Data File Name	: D:\SOLVAY\CAL\WS2_0003.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 26 Apr 95 10:41 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:27 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS2_0003.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.004	* not found *			1		Butadiene
1.987	83460	BB	0.204	1	2.245	Hexane
3.269	31979	BV	0.251	1	7.239	Methylene Chloride
3.882	51003	VB	0.296	1	5.186	TCE
6.124	102766	BV	0.406	1	3.048	Benzene
7.564	48852	VB	0.855	1	5.442	MEK
11.804	* not found *			1		Acrylonitrile
12.104	95545	BB	0.264	1	4.837	Toluene
15.612	37730	BV	0.191	1	1.566	Ethyl Benzene
16.010	9001	VV	0.184	1	0.485	p-Xylene
16.373	13882	VV	0.148	1	0.776	m-Xylene
16.720	* not found *			1		o-Xylene
17.771	* not found *			1		Styrene

Not all calibrated peaks were found



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External Standard Report

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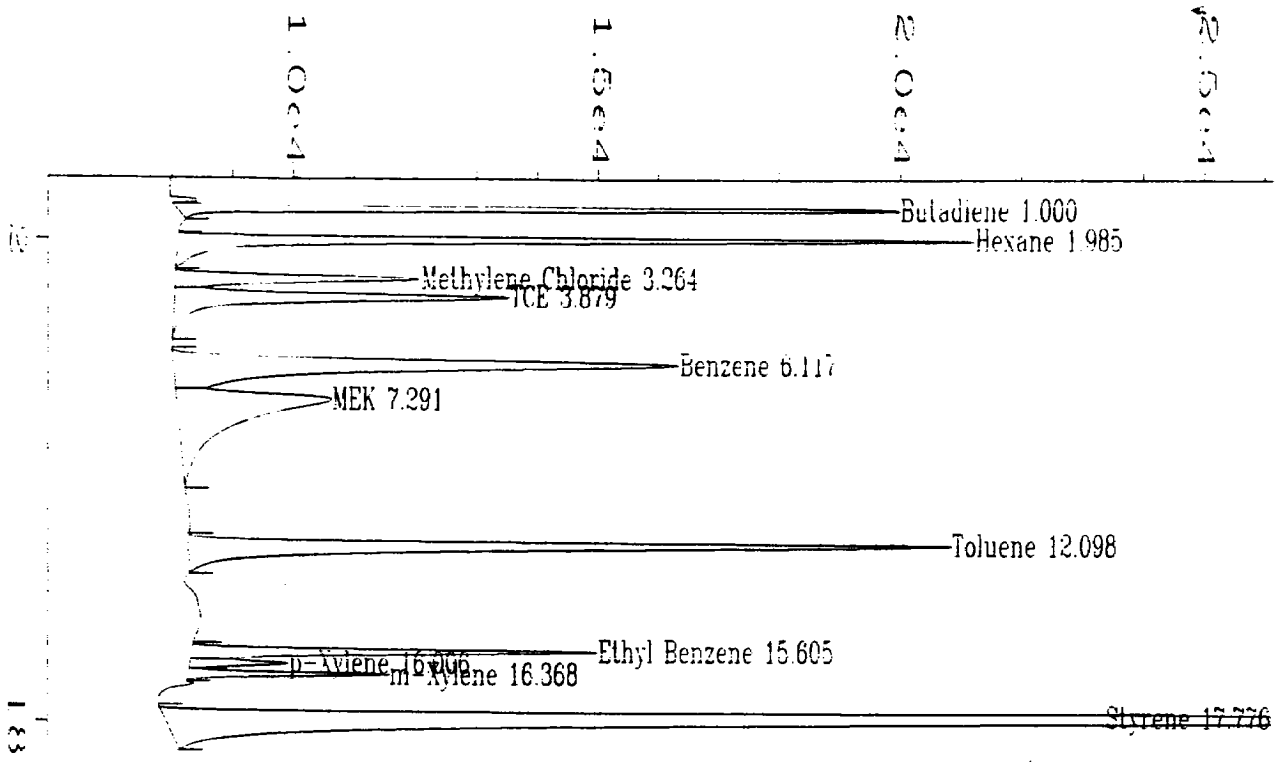
Data File Name	: D:\SOLVAY\CAL\WS2_0004.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 26 Apr 95 11:03 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:27 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS2_0004.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.004	* not found *			1		Butadiene
1.984	84598	BV	0.205	1	2.273	Hexane
3.264	32702	VV	0.251	1	7.389	Methylene Chloride
3.878	52629	VB	0.300	1	5.343	TCE
6.115	105164	BV	0.402	1	3.117	Benzene
7.524	51292	VB	0.853	1	5.699	MEK
11.804	* not found *			1		Acrylonitrile
12.100	99855	BB	0.266	1	5.049	Toluene
15.609	39600	BV	0.190	1	1.644	Ethyl Benzene
16.009	9726	VV	0.187	1	0.529	p-Xylene
16.370	14818	VV	0.148	1	0.831	m-Xylene
16.720	* not found *			1		o-Xylene
17.771	* not found *			1		Styrene

Not all calibrated peaks were found



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External Standard Report

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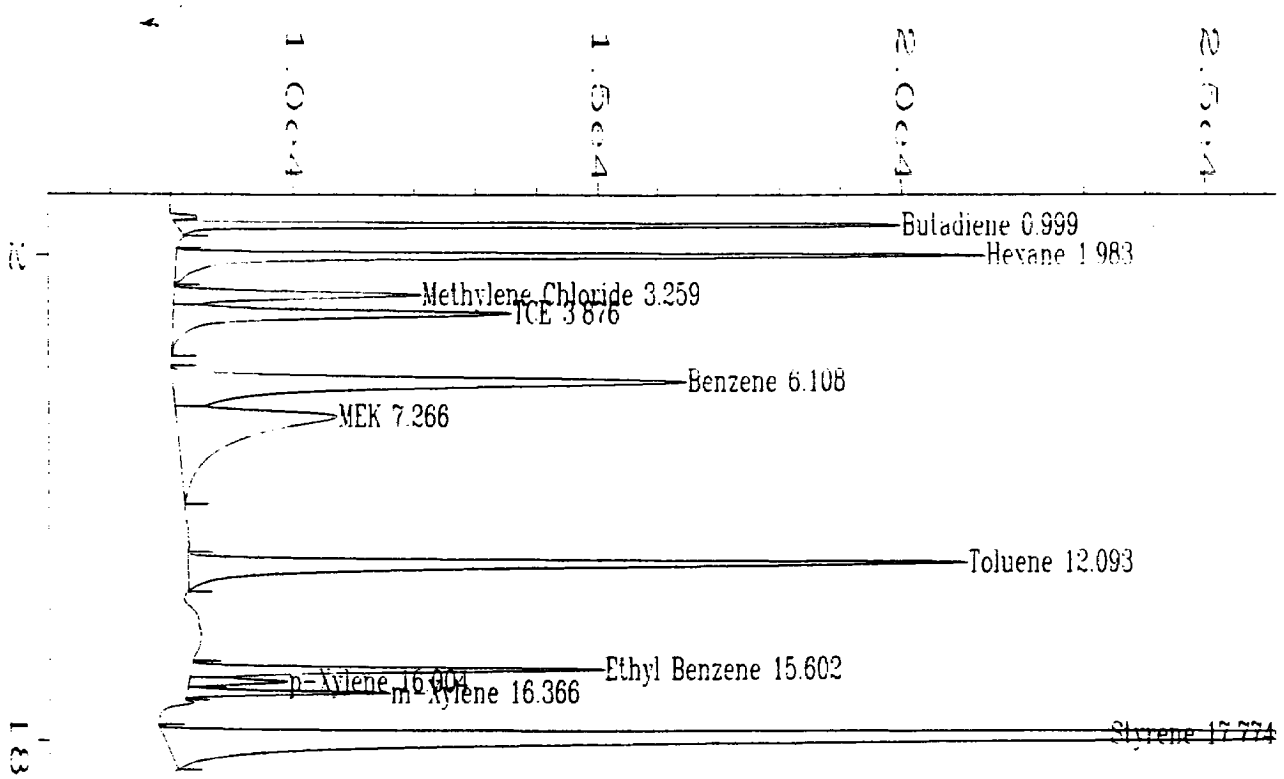
Data File Name : D:\SOLVAY\CAL\WS3_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 26 Apr 95 11:25 PM
Report Created on: 04 May 95 02:28 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\CAL\WS3_0001.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.000	124339	PB	0.172	1	7.220	Butadiene
1.985	170995	BV	0.203	1	4.379	Hexane
3.264	66803	PV	0.253	1	14.485	Methylene Chloride
3.879	111559	VB	0.302	1	11.011	TCE
6.117	226865	BV	0.401	1	6.604	Benzene
7.291	155839	VB	0.832	1	16.739	MEK
11.804	* not found *			1		Acrylonitrile
12.098	231098	BB	0.271	1	11.487	Toluene
15.605	81731	BV	0.187	1	3.406	Ethyl Benzene
16.006	19640	VV	0.182	1	1.118	p-Xylene
16.368	31030	VV	0.146	1	1.795	m-Xylene
16.720	* not found *			1		o-Xylene
17.776	1258298	BBA	0.210	1	22.155	Styrene

Not all calibrated peaks were found



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External Standard Report

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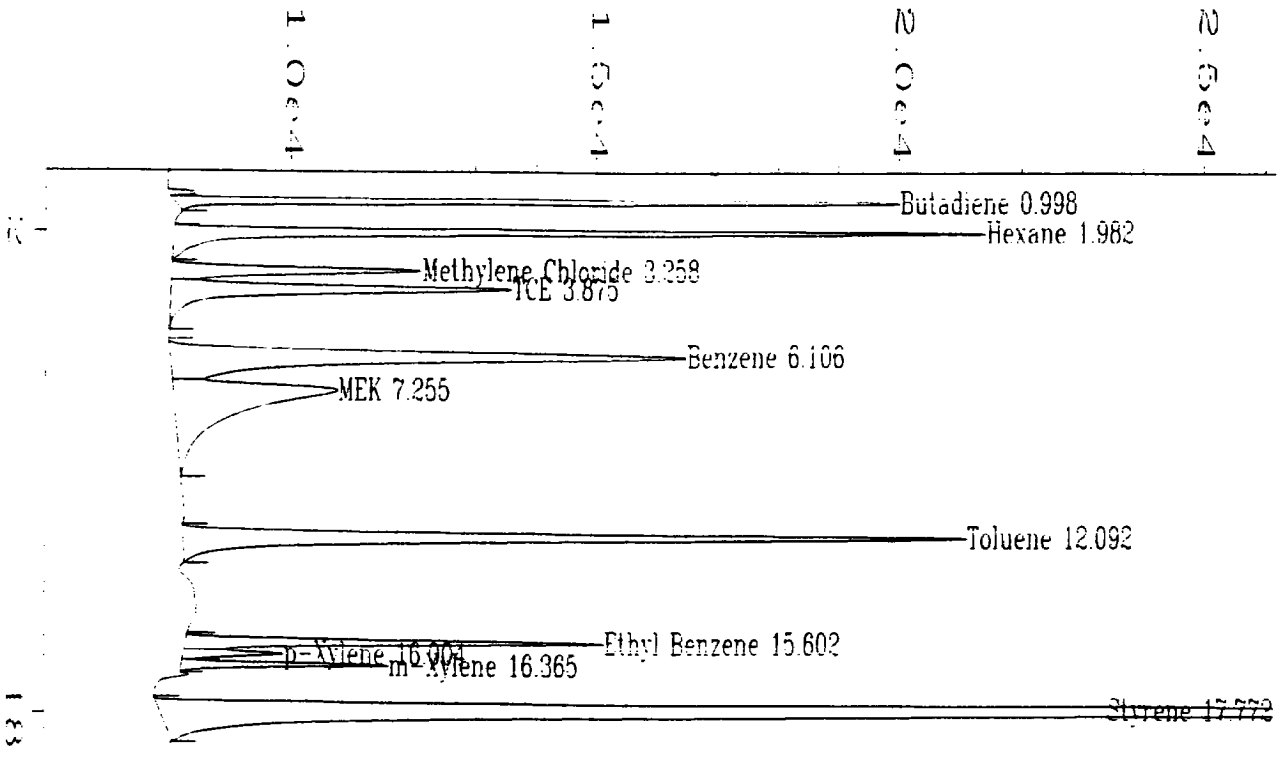
Data File Name	: D:\SOLVAY\CAL\WS3_0002.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 26 Apr 95 11:47 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:28 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS3_0002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.999	124123	PB	0.172	1	7.207	Butadiene
1.983	170989	BV	0.201	1	4.379	Hexane
3.259	66901	PV	0.249	1	14.505	Methylene Chloride
3.876	111181	VB	0.297	1	10.974	TCE
6.108	225898	BV	0.395	1	6.576	Benzene
7.266	158310	VB	0.830	1	16.999	MEK
11.804	* not found *			1		Acrylonitrile
12.093	230437	BB	0.266	1	11.455	Toluene
15.602	82252	BV	0.186	1	3.428	Ethyl Benzene
16.004	19470	VV	0.181	1	1.108	p-Xylene
16.366	31283	VV	0.146	1	1.810	m-Xylene
16.720	* not found *			1		o-Xylene
17.774	1254345	BBA	0.208	1	22.085	Styrene

Not all calibrated peaks were found



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External Standard Report

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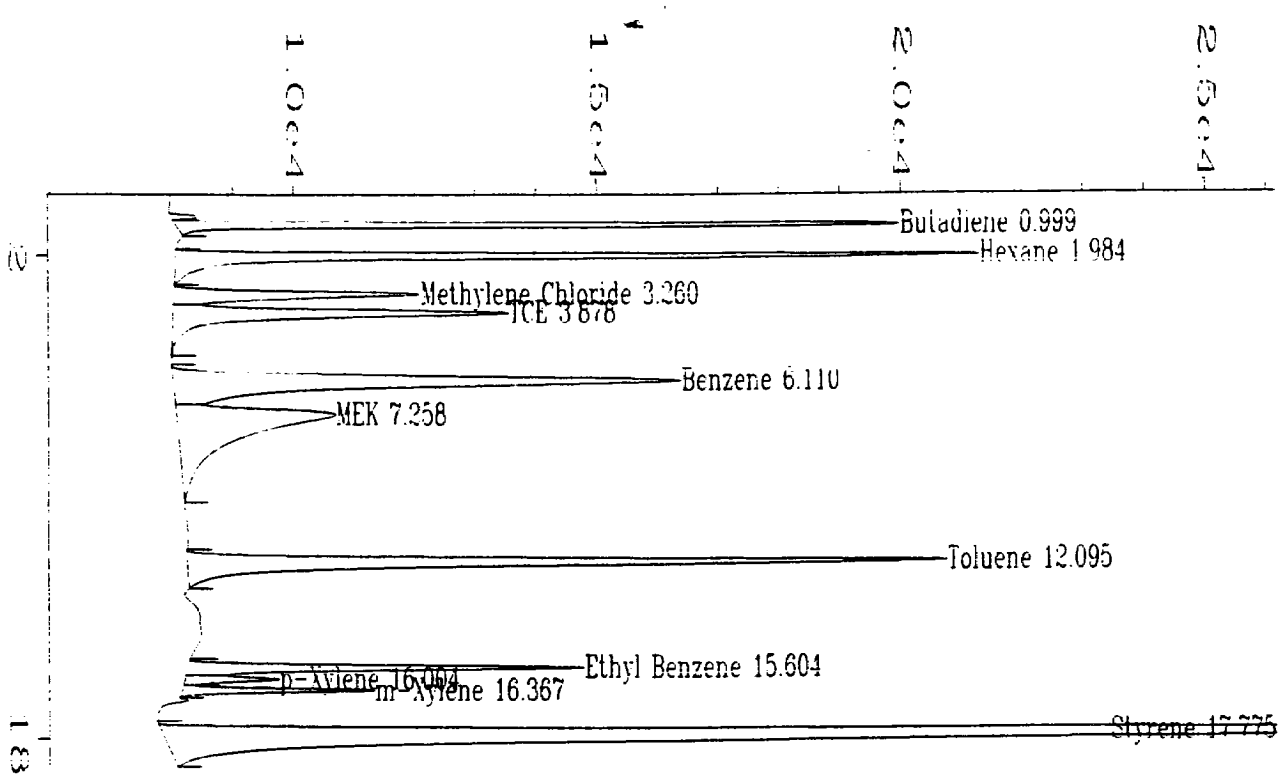
Data File Name	: D:\SOLVAY\CAL\WS3_0003.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 27 Apr 95 00:09 AM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:29 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS3_0003.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.998	123947	PB	0.172	1	7.197	Butadiene
1.982	170954	BV	0.200	1	4.379	Hexane
3.258	66781	PV	0.248	1	14.480	Methylene Chloride
3.875	110839	VB	0.296	1	10.941	TCE
6.106	225726	BV	0.395	1	6.571	Benzene
7.255	158939	VB	0.806	1	17.066	MEK
11.804	* not found *			1		Acrylonitrile
12.092	230680	BB	0.266	1	11.467	Toluene
15.602	82482	BV	0.185	1	3.438	Ethyl Benzene
16.004	19342	VV	0.180	1	1.100	p-Xylene
16.365	31404	VV	0.146	1	1.817	m-Xylene
16.720	* not found *			1		o-Xylene
17.772	1258879	BBA	0.207	1	22.165	Styrene

Not all calibrated peaks were found



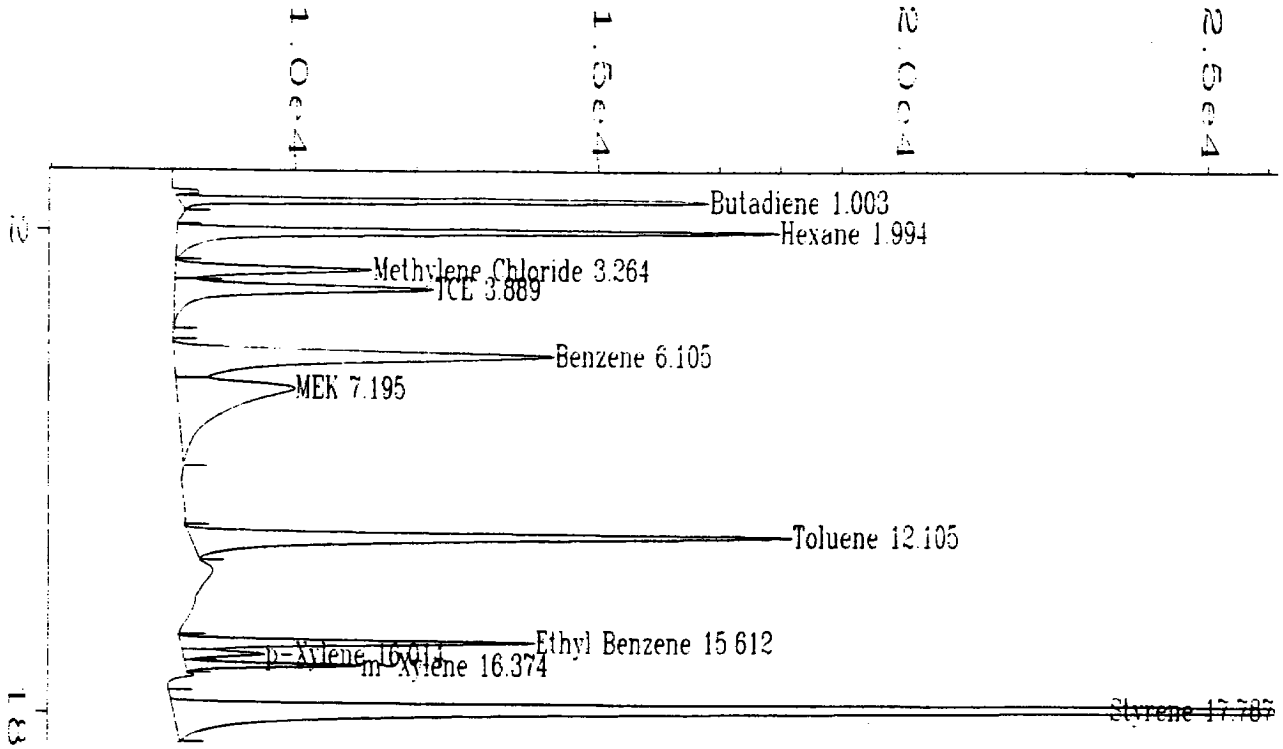
External Standard Report

Data File Name	: D:\SOLVAY\CAL\WS3_0005.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 27 Apr 95 00:53 AM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:29 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS3_0005.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.999	124733	PB	0.145	1	7.243	Butadiene
1.984	170835	BV	0.201	1	4.376	Hexane
3.260	66824	PV	0.250	1	14.489	Methylene Chloride
3.878	110137	VB	0.298	1	10.874	TCE
6.110	222608	BV	0.393	1	6.482	Benzene
7.258	156323	VB	0.816	1	16.790	MEK
11.804	* not found *			1		Acrylonitrile
12.095	223978	BB	0.266	1	11.138	Toluene
15.604	78651	BV	0.185	1	3.277	Ethyl Benzene
16.004	18467	VV	0.180	1	1.048	p-Xylene
16.367	29492	VV	0.146	1	1.703	m-Xylene
16.720	* not found *			1		o-Xylene
17.775	1180266	BBA	0.209	1	20.783	Styrene

Not all calibrated peaks were found



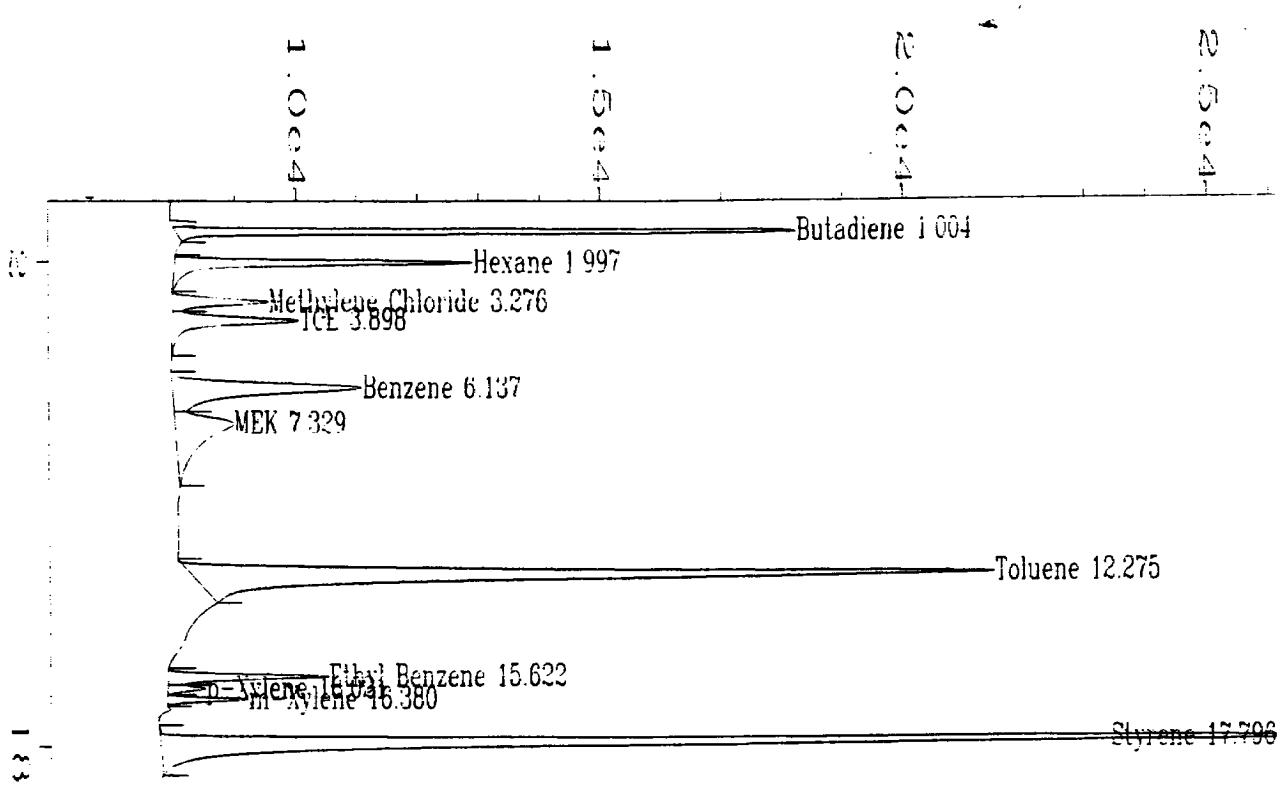
External Standard Report

Data File Name	: D:\SOLVAY\CAL\WS4_0001.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Run 1	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 27 Apr 95 08:57 AM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:30 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS4_0001.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.003	94272	PB	0.146	1	5.467	Butadiene
1.994	132893	BV	0.209	1	3.450	Hexane
3.264	51803	VV	0.242	1	11.364	Methylene Chloride
3.889	85736	VB	0.298	1	8.527	TCE
6.105	172090	BV	0.407	1	5.034	Benzene
7.195	115643	VB	0.821	1	12.494	MEK
11.804	* not found *			1		Acrylonitrile
12.105	180336	BB	0.270	1	8.997	Toluene
15.612	71549	BV	0.187	1	2.980	Ethyl Benzene
16.014	15716	VV	0.178	1	0.885	p-Xylene
16.374	27013	VV	0.146	1	1.556	m-Xylene
16.720	* not found *			1		o-Xylene
17.787	581557	BBA	0.217	1	10.257	Styrene

Not all calibrated peaks were found



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External Standard Report

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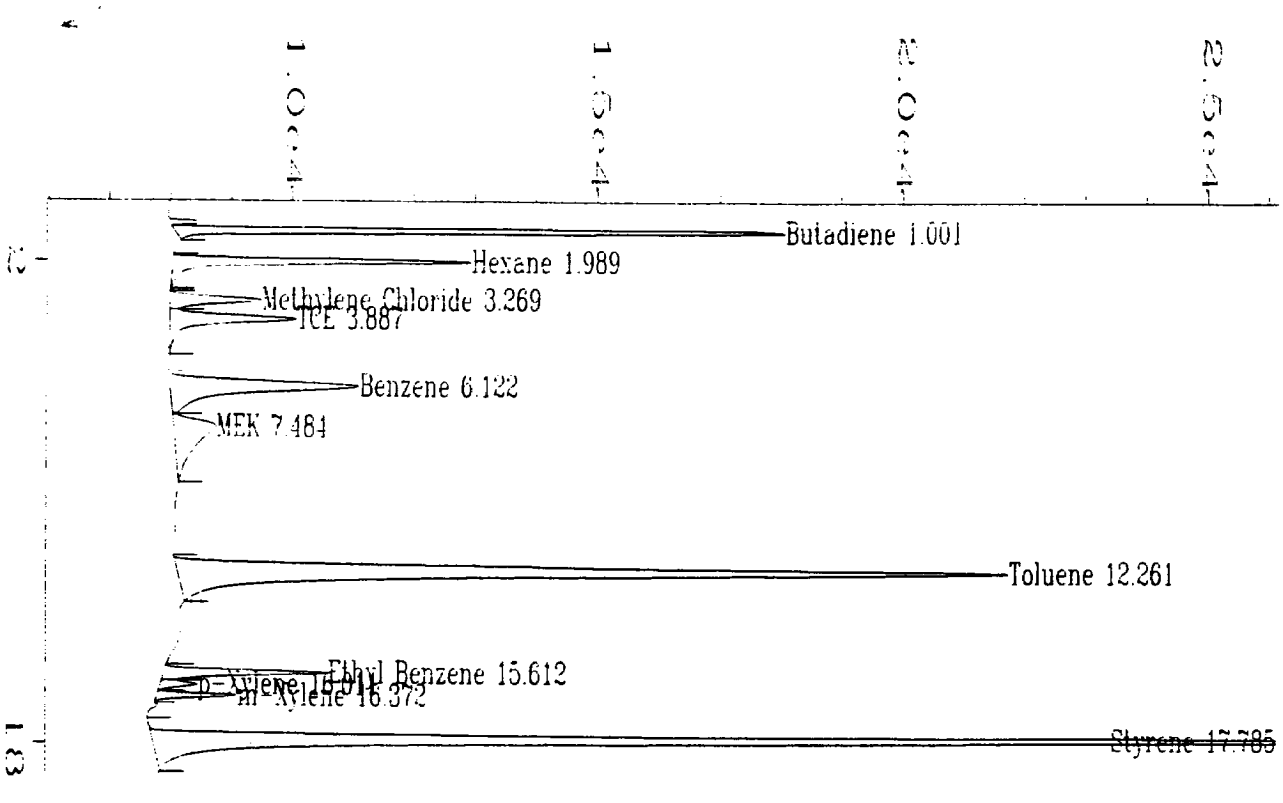
Data File Name : D:\SOLVAY\CAL\WS5_0001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 09:04 AM
Report Created on: 04 May 95 02:31 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\CAL\WS5_0001.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.004	109738	PB	0.146	1	6.369	Butadiene
1.997	64677	BB	0.206	1	1.787	Hexane
3.276	25622	BV	0.252	1	5.916	Methylene Chloride
3.898	41873	VB	0.301	1	4.308	TCE
6.137	84094	BV	0.404	1	2.513	Benzene
7.329	54202	VB	0.775	1	6.007	MEK
11.804	* not found *			1		Acrylonitrile
12.275	285420	BB	0.312	1	14.152	Toluene
15.622	32280	BV	0.188	1	1.338	Ethyl Benzene
16.021	7224	VV	0.178	1	0.380	p-Xylene
16.380	12365	VV	0.148	1	0.685	m-Xylene
16.720	* not found *			1		o-Xylene
17.796	377258	BBA	0.216	1	6.665	Styrene

Not all calibrated peaks were found



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External Standard Report

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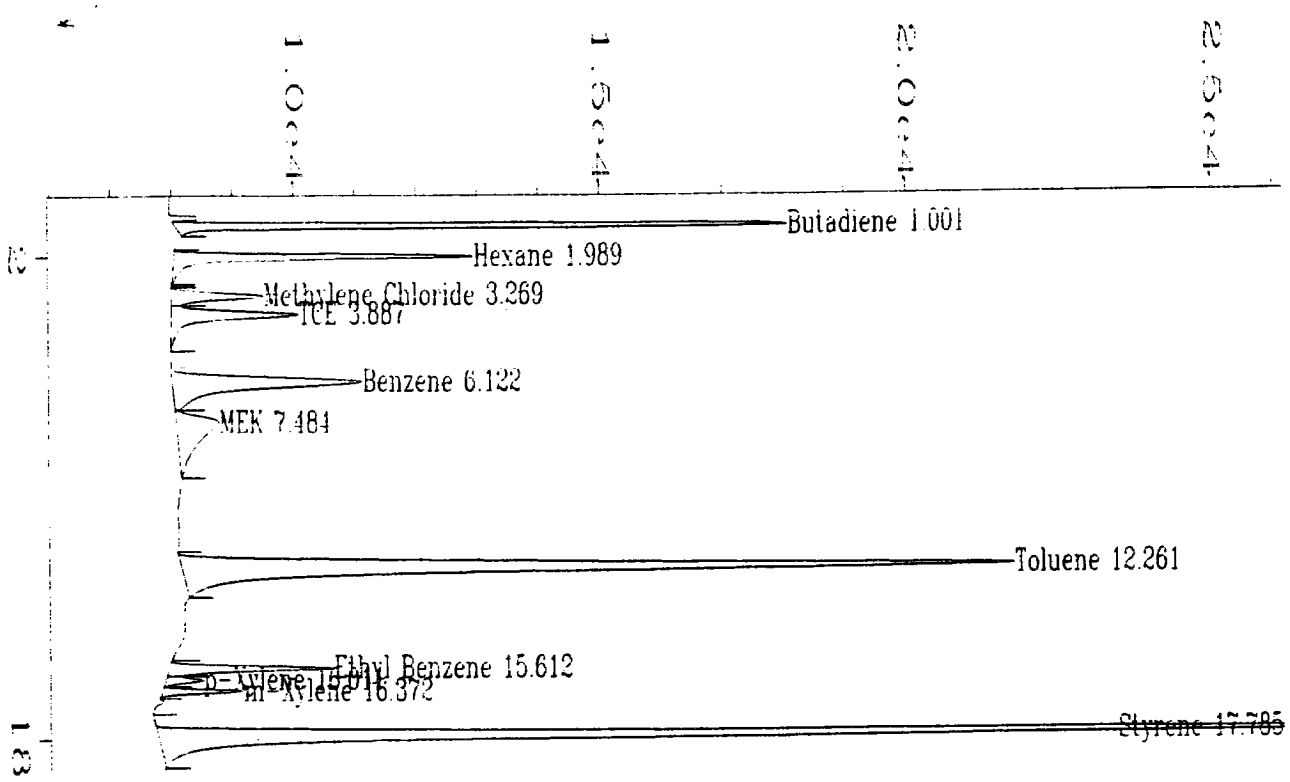
Data File Name	: D:\SOLVAY\CAL\WS5_0002.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 27 Apr 95 09:25 AM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:33 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS5_0002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.001	105499	PB	0.144	1	6.122	Butadiene
1.989	62467	BB	0.199	1	1.733	Hexane
3.269	24620	BV	0.247	1	5.708	Methylene Chloride
3.887	41493	VB	0.297	1	4.271	TCE
6.122	83249	BV	0.395	1	2.489	Benzene
7.484	40166	VB	0.774	1	4.525	MEK
11.804	* not found *			1		Acrylonitrile
12.261	294627	BB	0.312	1	14.604	Toluene
15.612	32521	BV	0.185	1	1.348	Ethyl Benzene
16.011	7056	VV	0.175	1	0.370	p-Xylene
16.372	11997	VV	0.143	1	0.664	m-Xylene
16.720	* not found *			1		o-Xylene
17.785	367986	BBA	0.211	1	6.502	Styrene

Not all calibrated peaks were found



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External Standard Report

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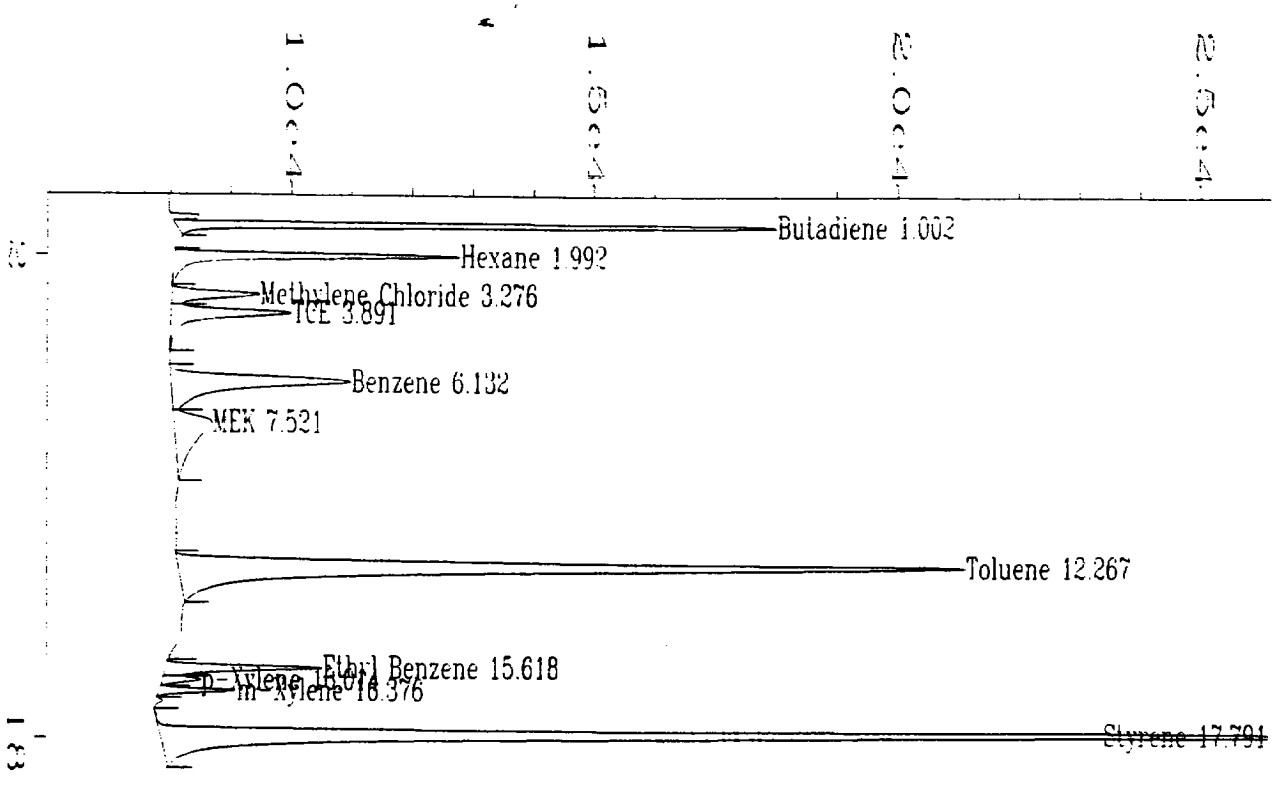
Data File Name : D:\SOLVAY\CAL\WS5_0002.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : Calibration
Run Time Bar Code:
Acquired on : 27 Apr 95 09:25 AM
Report Created on: 04 May 95 02:33 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\CAL\WS5_0002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.001	105499	PB	0.144	1	6.122	Butadiene
1.989	62467	BB	0.199	1	1.733	Hexane
3.269	24620	BV	0.247	1	5.708	Methylene Chloride
3.887	41493	VB	0.297	1	4.271	TCE
6.122	83249	BV	0.395	1	2.489	Benzene
7.484	40166	VB	0.774	1	4.525	MEK
11.804	* not found *			1		Acrylonitrile
12.261	294627	BB	0.312	1	14.604	Toluene
15.612	32521	BV	0.185	1	1.348	Ethyl Benzene
16.011	7056	VV	0.175	1	0.370	p-Xylene
16.372	11997	VV	0.143	1	0.664	m-Xylene
16.720	* not found *			1		o-Xylene
17.785	367986	BBA	0.211	1	6.502	Styrene

Not all calibrated peaks were found



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External Standard Report

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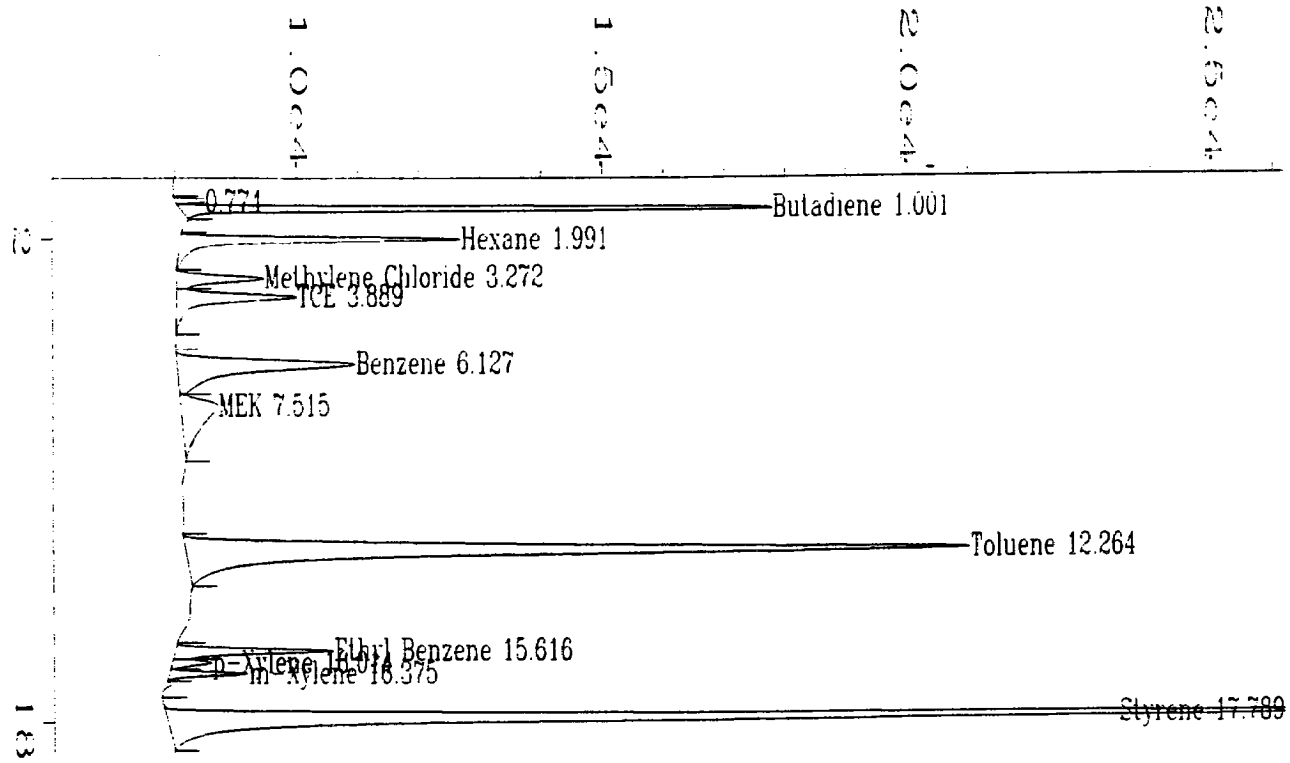
Data File Name	: D:\SOLVAY\CAL\WS5_0003.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 27 Apr 95 09:49 AM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:33 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS5_0003.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.002	104704	PB	0.147	1	6.075	Butadiene
1.992	61637	BB	0.202	1	1.713	Hexane
3.276	24367	BV	0.256	1	5.655	Methylene Chloride
3.891	40992	VB	0.304	1	4.223	TCE
6.132	83081	BV	0.412	1	2.484	Benzene
7.521	38916	VB	0.832	1	4.393	MEK
11.804	* not found *			1		Acrylonitrile
12.267	296204	BB	0.326	1	14.681	Toluene
15.618	32666	BV	0.192	1	1.354	Ethyl Benzene
16.014	7725	VV	0.184	1	0.410	p-Xylene
16.376	12088	VV	0.148	1	0.669	m-Xylene
16.720	* not found *			1		o-Xylene
17.791	377840	PBA	0.219	1	6.675	Styrene

Not all calibrated peaks were found



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External Standard Report

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Data File Name	: D:\SOLVAY\CAL\WS5_0004.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: Calibration	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 27 Apr 95 10:13 AM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:34 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\CAL\WS5_0004.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
1.001	102151	PB	0.143	1	5.927	Butadiene
1.991	60107	BB	0.202	1	1.676	Hexane
3.272	23790	BV	0.252	1	5.535	Methylene Chloride
3.889	40660	VB	0.306	1	4.191	TCE
6.127	82411	BV	0.413	1	2.465	Benzene
7.515	37251	VB	0.839	1	4.217	MEK
11.804	* not found *			1		Acrylonitrile
12.264	295527	BB	0.329	1	14.648	Toluene
15.616	32862	BV	0.193	1	1.362	Ethyl Benzene
16.014	7883	VV	0.184	1	0.419	p-Xylene
16.375	12187	VV	0.148	1	0.675	m-Xylene
16.720	* not found *			1		o-Xylene
17.789	385261	BBA	0.219	1	6.806	Styrene

Not all calibrated peaks were found

D

WEIGHT SHEETS

D

Particulate Testing
Weight Sheet

Client Solvay Mineral	Project Number 65-7473	Analyst TW
Plant	Unit EP-1,2 STACK	Balance GA110/GA2000
Test Date 4/25/95		

Description	Wt. No.	I.D. and Sample Description[1]	Sample volume (ml)[2]	Date/ Time	Gross Weight (g)	Tare Weight (g)	Date/ Time	Net Weight (g)
Type Filter	1	085180		5/12 810	.3663	.3661	4/20 847	
Run Blank		Clean		5/12 1425	.3662			
Location ALL		-01	T (F) B		.3663			.0006
Type Filter	2	085185		5/12 810	.3866	.3735	4/20 851	
Run 1		Brown Particulate		5/12 1425	.3867			
Location		-02	T (F) B		.3867			.0132
Type Filter	3	085183		5/12 810	.3894	.3723	4/20 856	
Run 2		Brown Particulate		5/12 1420	.3893			
Location		-03	T (F) B		.3894			.0171
Type Filter	4	085184		5/12 810	.3875	.3727	4/20 850	
Run 3		Brown Particulate		5/12 1420	.3873			
Location		-04	T (F) B		.3874			.0147
Type DI H_2O	5	647	100	5/15 830	107.6678	107.6671	5/11 815	
Run Blank		Clean		5/16 830	107.6682			
Location ALL		-05	T F (B)		107.6680			.0001
Type F½ H_2O	6	XX61	210	5/15 830	107.1173	107.1011	5/10 1020	
Run 1		Brown Residue		5/16 830	107.1175			
Location		-06	T F (B)		107.1174			0083
Type F½ H_2O	7	K1	205	5/15 825	105.0132	105.0005	5/10 1020	
Run 2		Brown Residue		5/16 830	105.0136			
Location		-07	T F (B)		105.0134			.0129
Type F½ H_2O	8	K3	195	5/15 830	90.6457	90.6313	5/10 1040	
Run 3		Brown Residue		5/16 830	90.6460			
Location		-08	T F (B)		90.6459			.0151
Type $MeCl_2$	9	XX3	225	5/15 825	103.4573	103.4573	5/11 1445	
Run Blank		Clean		5/16 830	103.4586			
Location ALL		-09	T F (B)		103.4585			.0007
Type B½ Organic	10	115	205	5/15 825	122.9616	122.9347	5/11 830	
Run 1		Heavy Brown Residue		5/16 830	122.9611			
Location		-10	T F (B)		122.9614			.0267

[1] Note appearance of particulate
[2] Two volumes (e.g. 500/100) indicate an aliquot was taken.
Indicate (T)himble, (F)ilter, or (B)eaker in box below.

CAE P4 ver 1.0
D:\vpforms\weight

Particulate Testing
Weight Sheet

Client SOLVAY MINERAL	Project Number 65-7473	Analyst TW
Plant	Unit EP 1,2 STACK	Balance GA200D
Test Date 4/25/95		

Description	Wt. No.	I.D. and Sample Description[1]	Sample volume (ml)[2]	Date/ Time	Gross Weight (g)	Tare Weight (g)	Date/ Time	Net Weight (g)
Type B 1/2 INORGANIC	1	F28	915/100	5/15 825	125.3934	125.3928	5/11 815	
Run 1		Brown Residue		5/16 835	125.3936			
Location		-13	T F (B)		125.3935			.0007
Type B 1/2 ORGANIC	2	622	205	5/15 825	108.9030	108.8840	5/11 830	
Run 2		Brown/Yellow Residue		5/16 830	108.9028			
Location		-11	T F (B)		108.9029			.0189
Type B 1/2 INORGANIC	3	65	910/100	5/15 825	106.5746	106.5732	5/11 1445	
Run 2		Brown Residue		5/16 835	106.5748			
Location		-14	T F (B)		106.5747			.0015
Type B 1/2 ORGANIC	4	XX79	205	5/15 825	106.0174	105.9879	5/11 815	
Run 3		Brown/Yellow Residue		5/16 830	106.0171			
Location		-12	T F (B)		106.0173			.0294
Type B 1/2 INORGANIC	5	XX29	860/100	5/15 825	110.3014	110.3076	5/11 815	
Run 3		Brown Residue		5/16 835	110.3015			
Location		-15	T F (B)		110.3015			.0019
Type	6							
Run								
Location			T F B					
Type	7							
Run								
Location			T F B					
Type	8							
Run								
Location			T F B					
Type	9							
Run								
Location			T F B					
Type	10							
Run								
Location			T F B					

[1] Note appearance of particulate
[2] Two volumes (e.g. 500/100) indicate an aliquot was taken.
Indicate (T)himble, (F)ilter, or (B)eaker in box below.

CAE P4 ver 1.0
D:\vpforms\weight

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 1&2 Calciner Stack

PARTICULATE WEIGHT SHEET

Run No.	Blank	1	2	3
Date (1995)		April 25	April 25	April 25
Start Time (approx.)		11:45	14:19	16:57
Stop Time (approx.)		13:27	15:54	18:30
Front Half Particulate H_2O Wash				
ID Identifier	647	XX61	K1	K8
Sample volume (ml)	100	210	205	195
Aliquot used (ml)	100	210	205	195
Tare weight (g)	107.6679	107.1091	105.0005	90.6308
Gross weight (g)	107.6680	107.1174	105.0134	90.6459
Correction factor (g)		0.0002	0.0002	0.0002
Net weight (g)	0.0001	0.0081	0.0127	0.0149
Front Half Particulate Filter				
ID Identifier	85180	85185	85183	85184
Tare weight (g)	0.3669	0.3735	0.3723	0.3727
Gross weight (g)	0.3663	0.3867	0.3894	0.3874
Net weight (g)		0.0132	0.0171	0.0147
Front Half Total Particulate				
m_n Matter collected (g)		0.0213	0.0298	0.0296
Back Half Organic Particulate				
ID Identifier	XX3	115	G22	XX79
Sample volume (ml)	225	205	205	205
Aliquot used (ml)	225	205	205	205
Tare weight (g)	103.4578	122.9347	108.8840	105.9879
Gross weight (g)	103.4585	122.9614	108.9029	106.0173
Correction factor (g)		0.0006	0.0006	0.0006
m_n Net weight (g)	0.0007	0.0261	0.0183	0.0288
Back Half Inorganic Particulate				
ID Identifier	647	F28	G5	XX29
Sample volume (ml)	100	915	910	860
H_2O condensate (ml)	0	205.0	156.0	158.0
Sample volume minus H_2O (ml)	100	710	754	702
Aliquot used (ml)	100	100	100	100
Tare weight (g)	107.6679	125.3928	106.5732	110.3076
Gross weight (g)	107.6680	125.3935	106.5747	110.3095
Correction factor (g)		0.0007	0.0008	0.0007
m_n Net weight (g)	0.0001	0.0057	0.0129	0.0156
Back Half Total Particulate				
m_n Net weight (g)		0.0318	0.0312	0.0444
Total Particulate				
m_n Net weight (g)		0.0530	0.0610	0.0740

FIELD DATA

E

Orsat Readings

Client: SOLVAY	Project Number: 7473
Plant: GREEN RIVER, WY	Unit: EP-1,2
Date: 4/25/95	Fuel Type: COAL CALCINER
Orsat ID: 85	Leak Check? ✓

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

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	STACK	1	1	8.0	22.4	14.4		1145	1600	SR
			2	8.0	22.2	14.2				
			3	8.1	22.4	14.3				
			Avg.	8.0	22.3	14.3				
2	STACK	2	1	8.2	22.4	14.2		1419	1730	SR
			2	8.1	22.3	14.2				
			3	8.2	22.4	14.2				
			Avg.	8.2		14.2				
3	STACK	3	1	8.2	22.4	14.2		1657	1915	MH
			2	8.2	22.2	14.0				
			3	8.2	22.4	14.2				
			Avg.	8.2		14.1				
			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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Meth 5/202

Train Set-up Data

JOB #: 7473
Solvay

Loacation EP1&2 STACK

Run # 1

Box # 65-9

Filter # 85186 5 RML

Date 4/~~26~~ 25/95 RML

			Gross	Tare	Net
Imp 1	100 ml	DI H2O	669.7	534.5	135.2
Imp 2	100 ml	DI H2O	591.6	546.0	45.6
Imp 3	100 ml	DI H2O	555.8	548.3	7.5
Imp 4	Empty				
Imp 5	Silica Gel		755.1	738.4	16.7

Total
188.3
205.0

Run # 2

Box # 14

Filter # ~~85185~~ 85183 RML

Date 4/~~26~~ 25/95 RML

			Gross	Tare	Net
Imp 1	100 ml	DI H2O	673.1	538.3	134.8
Imp 2	100 ml	DI H2O	558.2	547.3	10.9
Imp 3	100 ml	DI H2O	540.0	538.4	1.6
Imp 4	Empty				
Imp 5	Silica Gel		765.4	757.2	8.2

Total
147.3
155.5

Run # 3

Box # 71-20

Filter # 85184

Date 4/~~26~~ 25/95 RML

			Gross	Tare	Net
Imp 1	100 ml	DI H2O	684.4	~~533.9~~ 549.8	134.6
Imp 2	100 ml	DI H2O	555.0	544.1	10.9
Imp 3	100 ml	DI H2O	553.0	551.2	1.8
Imp 4	Empty				
Imp 5	Silica Gel		770.6	760.2	10.4

Total
147.3
157.5

TEST LOCATION: STACK

PARTICULATE TESTING FIELD DATA SHEET

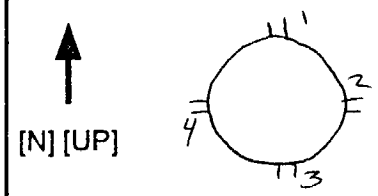
METHOD: 5/202 **PAGE** 1 **OF** 2

UNIT: EP 1+2 **RUN:** 1

Client SOLVAY MINERALS	Project No. 7473
Plant GREEN RIVER	Date 25 APRIL 95
Meter Operator M. HYNES	
Probe Operator E. McGAFFICK	

Meter Box No. D-7	Sample Box No. 65-9
Meter Yd 0.9966	Meter ΔH@ 1.8228
K Factor 2.05 ~~1.99~~	Pitot Cp 0.84
Leak Rate Before 0.01 [cfm] [Lpm] @ 15 (in.Hg)	
Leak Rate After 0.007 [cfm] [Lpm] @ 13 (in.Hg)	
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



113.1 ft²

Duct Dimensions (in.) 144"

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-0.3	6"		

Amb. Temp. (°F) 50	Bar. Press. 23.58 [in. Hg] [mbar]
Probe I.D. No. ~~G06A 65~~ SR 12-1-94-2	
Liner Material GLASS	

Filter No. 85185		
Thimble No. NA		
Nozzle Diameter 0.255	Nozzle I.D.	

H_2O 188.3 [ml] [gm]	Silica Gel (gm) 16.7
Total V_{lc} 205.0	

Start Time: 11:45	Stop Time: 1327

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft³] [L] 827.25	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	1.3	2.7	829.74	430	250	245	50	71	69	10		
2	5.0	1.3	2.7	832.16	430	251	245	51	71	69	10		
3	7.5	1.3	2.7	834.63	430	250	240	51	75	70	11		
4	10.0	1.4	2.9	837.16	430	250	238	51	76	70	12		
5	12.5	1.2	2.5	839.57	430	250	239	50	77	71	11		
6	15.0	0.94	1.9	841.68	428	252	234	52	78	71	7		
2-1	17.5	1.2	2.5	~~843.~~ MN	430	250	251	48	77	72	9		844.06
2	20.0	1.2	2.5	846.41	434	250	248	49	78	72	10		
3	22.5	1.3	2.7	848.89	434	252	242	47	78	72	11		
4	25.0	1.2	2.5	851.26	434	252	244	49	77	72	10		
5	27.5	1.1	2.3	853.55	434	250	242	50	76	72	9		
6	30.0	0.83	1.7	855.54	430	250	238	51	75	71	7		LEAK CHECK AFTER 30 min
	Total	*25.89	58.3	55.81	10229				1778	1607			
	Average	1.0788	2.4		426				70.5				

SOLVAY2016_6_000564

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: EP 1+2 **RUN:** 1

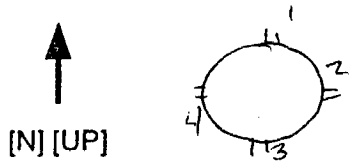
5 PARTICULATE TESTING FIELD DATA SHEET

METHOD: 5/202 **PAGE** 2 **OF** 2

Client SOLVAY MINERALS	Project No. 7473
Plant GREEN RIVER	Date 25 APRIL 95
Meter Operator M. HYNES	
Probe Operator E. McGAFFICK	

Meter Box No. D-7	Sample Box No. 65-9
Meter Yd 0.9966	Meter ΔH@ 1.8228
K Factor 2.05	Pitot Cp 0.84
Leak Rate Before [cfm] [Lpm] @ (in.Hg)	
Leak Rate After [cfm] [Lpm] @ (in.Hg)	
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.) 144" ID			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

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

Start Time:	Stop Time:

Traverse Point Number	Min/pt 25 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft³] [L] 855.73	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
3-1	32.5	1.3	2.7	~~857.99~~ MH	425	251	263	55	70	69	9		858.09
2	35	1.3	~~2.4~~ MH	860.43	424	253	260	56	71	69	10		2.7
3	37.5	1.4	2.9	862.97	423	250	260	56	71	69	12		
4	40	1.3	2.7	865.42	423	250	260	56	72	69	11		
5	42.5	1.1	2.3	867.74	421	250	260	55	72	69	10		
6	45	0.82	1.7	869.67	419	250	260	55	72	69	7		
4-1	47.5	1.2	2.5	872.05	425	249	252	56	72	69	10		
2	50	1.2	2.5	874.41	421	251	248	57	73	69	10		
3	52.5	1.3	2.7	876.88	420	252	249	57	74	69	11		
4	55	1.2	2.5	879.26	419	252	256	57	74	69	10		
5	57.5	0.94	1.9	881.35	418	250	250	55	74	69	8		
6	60	0.78	1.6	883.25	417	249	246	55	74	69	7		
	Total	*25.89	58.3	55.81									
	Average	1.0788	2.4										

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

DS-001 General
CNVS/TRG.R3-4/6/94

SOLVAY2016_6_000565

TEST LOCATION: STACK

PARTICULATE TESTING FIELD DATA SHEET

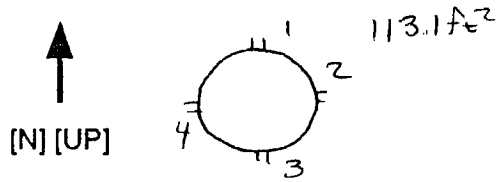
METHOD: 5/202 **PAGE** 1 **OF** 2

UNIT: EP 1+2 **RUN:** 2

Client SOLVAY MINERALS	Project No. 7473
Plant GREEN RIVER	Date 25 APRIL 95
Meter Operator M. HYWES	
Probe Operator E. McGAFFICK	

Meter Box No. D-7	Sample Box No.
Meter Yd 0.9966	Meter ΔH@ 1.8228
K Factor 0.55	Pitot Cp 0.84
Leak Rate Before 0.008 [cfm] [Lpm] @ 15 (in.Hg)	
Leak Rate After 0.005 [cfm] [Lpm] @ 6 (in.Hg)	
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.) 144"			
Static Press. (in. H_2O) -0.3	Port Len. (in.) 6"	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F) 50	Bar. Press. 23.58 [in. Hg] [mbar]
Probe I.D. No. G06A-65	
Liner Material GLASS	

Filter No. 85183		
Thimble No. NA		
Nozzle Diameter 0.185	Nozzle I.D. 0.	

H_2O 147.3 [ml] [gm]	Silica Gel (gm) 8.2
Total V_{lc} 155.5	

Start Time: 1419	Stop Time: 1554

Traverse Point Number	Min/pt 3.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft³] [L] 883.63	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
4-1	3.5	1.3	0.72	885.53	424	251	248	50	69	68	4		
2	7	1.2	0.66	887.57	423	251	252	50	70	68	4		
3	10.5	1.2	0.66	889.12	420	251	251	52	70	68	4		
4	14	1.1	0.61	890.82	419	260	255	50	71	68	4		
5	17.5	0.92	0.51	892.39	418	249	255	48	71	68	3		
6	21	0.77	0.42	893.80	415	249	259	46	71	68	3		
3-1	24.5	~~0~~ 1.3	0.72	895.67	429	250	258	45	71	68	4		
2	28	1.3	0.72	897.53	428	252	260	44	72	68	4		
3	31.5	1.3	0.72	899.39	427	252	255	43	72	67	4		
4	35	1.3	0.72	901.25	427	250	250	43	73	67	4		
5	38.5	1.2	0.66	903.02	424	250	247	42	72	67	4		
6	42	0.81	0.45	904.52	420	249	245	42	71	67	3		
	Total	*26.155	15.85	42.54	10301				1654	1576			
	Average	1.0898	0.66		429				67.3				

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

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CNVS/TRG.R3-4/6/94

TEST LOCATION: STACK

PARTICULATE TESTING FIELD DATA SHEET

METHOD: 5/202 **PAGE** 2 **OF** 2

UNIT: EP 1+2 **RUN:** 2

Client SOLVAY MINERALS	Project No. 7473
Plant GREEN RIVER	Date 25 APRIL 95
Meter Operator M. HYNES	
Probe Operator E. McGAFFICK	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

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

Start Time:	Stop Time:

Traverse Point Number	Min/pt 3.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L] 904.52	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
2-1	45.5	1.3	0.72	906.38	437	252	247	41	68	65	4		
2	49	1.4	0.77	908.35	440	250	248	41	68	65	5		
3	52.5	1.4	0.77	910.22	441	248	246	41	68	65	5		
4	56	1.3	0.72	912.06	441	251	249	41	67	64	5		
5	59.5	1.1	0.61	913.78	440	250	250	41	67	64	4		
6	63	0.79	0.43	915.24	436	249	252	41	67	64	3		
1	66.5	1.4	0.77	917.15	433	250	250	42	66	64	5		
2	70	1.4	0.77	919.04	433	250	251	42	66	64	5		
3	73.5	1.4	0.77	920.98	434	250	248	42	66	63	5		
4	77	1.4	0.77	~~920~~ mH	433	251	246	42	66	62	5		922.88
5	80.5	1.2	0.66	924.63	431	250	242	42	66	62	4		
6	84	0.94	0.52	926.17	428	249	240	42	66	62	3		
	Total	*											
	Average												

SOLVAY2016_6_00056

DS001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: EP 1+2 **RUN:** 3

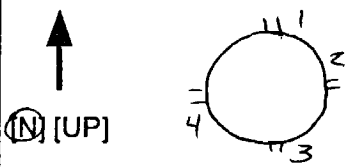
PARTICULATE TESTING FIELD DATA SHEET

METHOD: 5/202 **PAGE** 1 **OF** 2

Client SOLVAY MINERALS	Project No. 7473
Plant GREEN RIVER	Date 25 APRIL 95
Meter Operator M. HYNES	
Probe Operator E. McGAFFICK	

Meter Box No. D7	Sample Box No.
Meter Yd 0.9966	Meter ΔH@ 1.8228
K Factor 0.55	Pitot Cp 0.84
Leak Rate Before 0.008 [cfm] [Lpm] @ 15 (in.Hg)	
Leak Rate After 0.002 [cfm] [Lpm] @ 5 (in.Hg)	
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



113.1 ft²

Duct Dimensions (in.) 144" ID

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] (Out) of page	First point all the way (In) [Out]
-0.3	6"		

Amb. Temp. (°F) 50	Bar. Press. 23.58 (in. Hg) [mbar]
Probe I.D. No. G06A-65	
Liner Material GLASS	

Filter No. 85184		
Thimble No. NA		
Nozzle Diameter 0.185	Nozzle I.D.	

H_2O 147.3 [ml] (gm)	Silica Gel (gm) 10.4
Total V_{lc} 157.5	

Start Time: 1657	Stop Time: 1830

Traverse Point Number	Min/pt 3 5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. (ft³) [L] 928.22	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	3 5	1.4	0.77	930.16	428	250	250	45	63	61	3		
2	7	1.5	0.80	932.12	429	252	246	46	64	61	3		
3	10.5	1.5	0.80	934.05	430	251	255	47	65	61	3		
4	14	1.4	0.77	935.97	430	250	260	47	66	61	3		
5	17.5	1.2	0.66	937.79	430	249	257	47	67	61	3		
6	21	0.89	0.50	~~939.35~~ 939.30	426	249	252	47	67	62	2		939.30
1-1	24.5	1.3	0.72	941.15	437	249	247	48	66	61	3		
2	28	1.3	0.72	943.00	438	251	255	48	67	61	3		
3	31.5	1.4	0.77	944.89	439	250	255	48	67	61	3		
4	35	1.3	0.72	946.73	440	250	256	49	67	61	3		
5	38.5	1.1	0.61	948.43	438	250	258	49	67	61	3		
6	42	0.83	0.46	949.90	435	249	249	49	67	61	3		
	Total	*26.24	15.94	42.40	10255				1599	1471			
	Average	1.0935	0.66		427				64.0				

SOLVAY2016_6_0005658

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: EP 1+2 **RUN:** 3

PARTICULATE TESTING FIELD DATA SHEET

METHOD: 5/202 **PAGE** 2 **OF** 2

Client SOLVAY MINERALS, INC	Project No. 7473
Plant GREEN RIVER	Date 25 APRIL 95
Meter Operator M. HYNES	
Probe Operator E. McGAFFICK	

Meter Box No. 07	Sample Box No.
Meter Yd 0.9966	Meter ΔH@ 1.8228
K Factor 0.55	Pitot Cp 0.84
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

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

Start Time:	Stop Time:

Traverse Point Number	Min/pt 3.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft³] [L] 949.90	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
3-1	45.5	1.3	0.72	951.74	429	251	262	49	66	61	3		
2	49	1.4	0.77	953.65	427	251	254	50	66	61	3		
3	52.5	1.4	0.77	955.56	427	252	256	50	67	61	3		
4	56	1.3	0.72	957.41	425	251	260	50	67	61	3		
5	59.5	1.1	0.61	959.13	421	250	254	50	67	61	3		
6	63	0.78	0.43	960.53	417	249	250	50	67	61	3		
4-1	66.5	1.2	0.66	962.27	424	248	252	50	67	62	3		
2	70	1.3	0.72	964.13	421	251	249	51	67	62	3		
3	73.5	1.2	0.66	965.89	419	251	252	51	68	62	3		
4	~~80.5~~ 77	1.2	0.66	967.65	419	251	251	50	68	62	3		
5	80.5	0.98	0.54	969.26	414	250	255	50	68	62	3		
6	84	0.69	0.38	970.62	412	250	251	50	68	62	3		
	Total	*26.24	15.94	42.40	10255				1599	1471			
	Average	1.0935	0.66		427				64.0				

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

DS 001 General
CNVS/TRG.R3-4/6/94

SOLVAY2016 6 000569

Orsat Readings

Client Solvay Minerals	Project Number 7473
Plant Green River WY	Unit E1+2 / EP5
Date 4-28-95	Fuel Type
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	EP 1+2	R1	1	7	22.0	15.0				EM
			2	7.2	22.2	15.0				
			3	7	22.0	15.0				
			Avg.	7.06	22.06	15.0				
2	EP 1+2	R2	1	6.8	22.2	15.4				EM
			2	7	22.2	15.2				
			3	7	22.2	15.2				
			Avg.	6.9	22.2	15.26				
3	EP 1+2	R3	1	7	22.6	15.6				EM
			2	7.4	22.8	15.4				
			3	7.4	22.8	15.4				
			Avg.	7.26	22.7	15.46				
1	EP5 varied flame	R1 EP5	1	12.6	23.0	10.4				EM
			2	12.6	23.0	10.4				
			3	12.6	23.0	10.4				
			Avg.	12.6	23.0	10.4				
2	EP5 varied flame	R2 EP5	1	11.2	22.8	11.6				EM
			2	11.2	23.0	11.8				
			3	11.2	22.8	11.6				
			Avg.	11.2	22.86	11.66				
3	EP5 varied flame	R3 EP5	1	120	23.0	11.0				EM
			2	12.2	23.0	10.8				
			3	12.0	23.0	11.0				
			Avg.	12.06	23.0	10.9				
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							

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DIAGNOSTIC

Velocity Determination Field Data Sheet

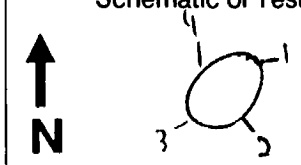
Location: Calciner Run: 1-2-3

Page 1 of 1

Client Solvay Minerals	Project Number 7173
Plant Green River WY	Unit EP5
Date 4-28-95	Inlet/Outlet/Stack
Data Recorder E. M'Gaffick / K. Collins	
Probe Operator R. Luikaart	

Pyrometer Number D-7	Pitot Cp .84
Pitot Leak Check: ✓ Before	✓ After
Static Pressure (inches H_2O) (+/-) -0.2	

Schematic of Testing Location



First point all the way IN OUT

Area (ft^2)	Port Len (in)	Gas Flow
8S4	5" And 13"	IN OUT

Ambient Temp. (°F) 55	Bar. Press. (in. Hg) 23.66
IGS Bag ID Number SEE MOISTURE DATA	
% O_2 SEE BELOW	% CO_2 SEE BELOW
% Moisture: SEE MOISTURE DATA	Assumed/Measured
Start Time SEE BELOW AM/PM	Stop Time SEE BELOW AM/PM

PROBE # 11-19-92-1

	% O_2	% CO_2
RUN 1	10.4	12.6
RUN 2	11.7	11.2
RUN 3	10.9	12.1

R1 Start 13:15 End 13:21 R2 Start 15:50 End 15:58 R3 Start 17:19 End 17:26

Traverse Point Number	Veocity Head ΔPs	Stack Temp (°F)		Traverse Point Number	Velocity Head ΔPs	Stack Temp (°F)		Traverse Point Number	Velocity Head ΔPs	Stack Temp (°F)		Traverse Point Number	Velocity Head ΔPs	Stack Temp (°F)		Notes
1-1	.14	308		1-1	.14	308		1-1	.14	304						
2	.13	307		2	.13	308		2	.13	303						
3	.10	302		3	.11	307		3	.12	300						
2-1	.13	305		2-1	.13	309		2-1	.15	299						
2	.14	303		2	.13	308		2	.12	298						
3	.12	301		3	.12	307		3	.11	297						
3-1	.13	303		3-1	.14	306		3-1	.12	298						
2	.13	299		2	.14	305		2	.12	299						
3	.11	296		3	.11	306		3	.11	298						
4-1	.12	298		4-1	.14	303		4-1	.12	298						
2	.11	296		2	.13	304		2	.12	298						
3	.11	295		3	.11	304		3	.12	297						
Total	4.1945	3613			4.2803	3675			4.2102	3589						
Average	.3495	301			.3567	306			.3509	299						

SOLVAY2016_6_00057

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Location: [illegible] Run: 1

Moisture Determination Field Data Sheet

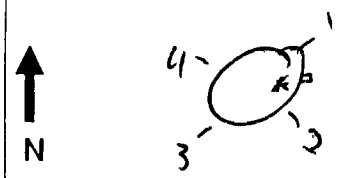
Page 1 of .

Client Solvay Minerals	Project Number 7473
Plant Green River WY	Unit EP5
Date 4-28-95	Inlet/outlet/stack
Meter Operator E. M'Gaffick	
Probe Operator "	

Sample Box Number Knockouts	
Pyrometer Number D 7	
Meter Box Number D 7	
Meter ΔH@ 1.8228	Meter Y_d .9966

Leak Rate Before: .001 cc/m cf/m @ 15 "Hg	
Leak Rate After: .000 cc/m cf/m @ 10 "Hg	

Schematic of Testing Location



First point all the way IN OUT	Method 4	
Area (ft^2) 85.9	Port Len. (in.) 5" and 13"	Gas Flow IN OUT
Filter Material NA		

Ambient Temp. (°F) 55	Bar. Press. (in. Hg) 23.66
Assumed Moisture (%) 36	

Heater Box Setting NA	Probe Heater Setting NA
Probe Length 3'	Probe Number NA
Probe Material S.S.	

IGS Bag ID Number EP5 R1	
% O_2 10.4	% CO_2 12.6
H_2O (ml) 222	Silica Gel (gm) 16.3
Total V_{lc} 238.3	

Start Time: 1:13 AM / PM Stop Time: 1:58 AM / PM

Traverse Point Number	Min/pt 5 / Clock Time 0	Pump Vacuum (in. Hg)	Stack Temp, Ts (°F)	Bath Temp, (°F)	Orifice Setting ΔH (in. H_2O)	Initial Volume 189.80 / Gas Sample Volume V_m Circle one: (L) (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\,in}$ (°F)	Outlet $T_{m\,out}$ (°F)	Probe Temp. T_p (°F)			Notes
*	5	6	Sev	50	1.8	193.85	68	68	NA			$\sqrt{\Delta P}$ = .3495
↓	10	6	Flow	49	↓	197.84	66	67	↓			TS = 301
↓	15	6	Data	51	↓	201.89	68	67	↓			B_wO = .3693
	20	6	↓	53	↓	205.89	72	68	↓			
	25	6	↓	54	↓	209.96	72	68	↓			
	30	6	↓	56	↓	214.00	69	66	↓			
Average							819					
Total						24.20		68.5				

D:\vpforms\moisture

SOLVAY2016 6 000572

Location: JACK Run: 2

DIAGNOSTIC

Moisture Determination Field Data Sheet

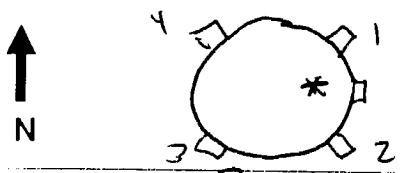
Page 1 of 1

Client	SOLVAY
Project Number	7473
Plant	GREEN RIVER WY
Unit	EP5
Date	4-28-95
Inlet/outlet/stack	
Meter Operator	K. COLLINS
Probe Operator	K. COLLINS

Sample Box Number	KNOCK OUTS
Pyrometer Number	D-7
Meter Box Number	D-7
Meter ΔH@	1.8228
Meter Y_d	.9966

Leak Rate Before:	.002 cc/m cf/m @	15	"Hg
Leak Rate After:	.002 cc/m cf/m @	8	"Hg

Schematic of Testing Location



First point all the way IN OUT	Method 4	
Area (ft^2) 85.9	Port Len. (in.) 5" & 13"	Gas Flow IN OUT
Filter Material N/A		

Ambient Temp. (°F) 55	Bar. Press. (in. Hg) 23.66
Assumed Moisture (%)	

Heater Box Setting	N/A	Probe Heater Setting	N/A
Probe Length	3'	Probe Number	N/A
Probe Material	STAINLESS STEEL		

IGS Bag ID Number	R2 EP5		
% O_2	11.66	% CO_2	11.2
H_2O (ml)	240	Silica Gel (gm)	10.3
Total V_{lc}	250.3		

Start Time:	15:32 AM / PM	Stop Time:	16:02 AM / PM

Traverse Point Number	Min/pt 5 / Clock Time	Pump Vacuum (in. Hg)	Stack Temp, Ts (°F)	Bath Temp, (°F)	Orifice Setting ΔH (in. H_2O)	Initial Volume 214.21 / Gas Sample Volume V_m Circle one: (L) (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\ in}$ (°F)	Outlet $T_{m\ out}$ (°F)	Probe Temp. T_p (°F)				Notes
*	5	6	SEE	54	1.8	218.24	68	67	N/A				
	10	6	FLOW	53		222.25	71	68					$\sqrt{\Delta P}_{AVE}$ = .3567
	15	6	DATA	53		226.26	69	66					$T_{S\,AVE}$ = 306
	20	6		53		230.25	68	66					B_{WO} = .3821
	25	6		52		234.24	70	66					
	30	6		52		238.25	71	67					
Average	—	—		53	1.8	—	68						
Total	—	—		317	10.8	24.04	817 ~~956~~ KSC						

SOLVAY2016_6_000573

Location: ALCINDER STACK Run: 3

Moisture Determination Field Data Sheet

Client: SOLVAY	Project Number: 7473
Plant: GREEN RIVER, WY	Unit: EP5
Date: 04-28-95	Inlet/outlet/stack
Meter Operator: K. COLLINS	
Probe Operator: K. COLLINS	

Sample Box Number: KNOCKOUTS	
Pyrometer Number: D-7	
Meter Box Number: D-7	
Meter ΔH@: 1.8228	Meter Y_d: .9966

Leak Rate Before:	.002	cc/m cf/m @	15	"Hg
Leak Rate After:	.002	cc/m cf/m @	10	"Hg

Schematic of Testing Location

First point all the way IN OUT	Method 4	
Area (ft²): 35.9	Port Len. (in.): 5" + 13"	Gas Flow IN OUT
Filter Material: N/A		

Ambient Temp. (°F): 55	Bar. Press. (in. Hg): 23.66
Assumed Moisture (%)	

Heater Box Setting: N/A	Probe Heater Setting: N/A
Probe Length: 3'	Probe Number: N/A
Probe Material: ~~STAINLESS~~ STAINLESS STEEL	

IGS Bag ID Number: R3 EP5	
% O_2: 10.9	% CO_2: 12.06
H_2O (ml): 210	Silica Gel (gm): 11.5
Total V_{lc}: 221.5	

Start Time: 16:59 AM / PM	Stop Time: 17:29 AM / PM

Traverse Point Number	Min/pt 5 / Clock Time	Pump Vacuum (in. Hg)	Stack Temp, Ts (°F)	Bath Temp, (°F)	Orifice Setting ΔH (in. H_2O)	Initial Volume 238.38 / Gas Sample Volume V_m Circle one: (L) (ft³)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\ in}$ (°F)	Outlet $T_{m\ out}$ (°F)	Probe Temp. T_p (°F)			Notes
*	5	6	SEE	55	1.8	242.13	61	60	N/A			AVE $\sqrt{\Delta P}$ = .3509
	10	7	VELOCITY	54		245.80	62	62				AVE T_s = 299
	15	8	DATA	54		249.76	63	61				BWO .3600
	20	8		55		253.70	68	63				
	25	8		55		257.64	66	62				
	30	8		55		261.55	65	61				
Average	—	—		—	1.8	23.17	63					
Total	—	—		—	10.3	—	754					

SOLVAY2016_6_000574

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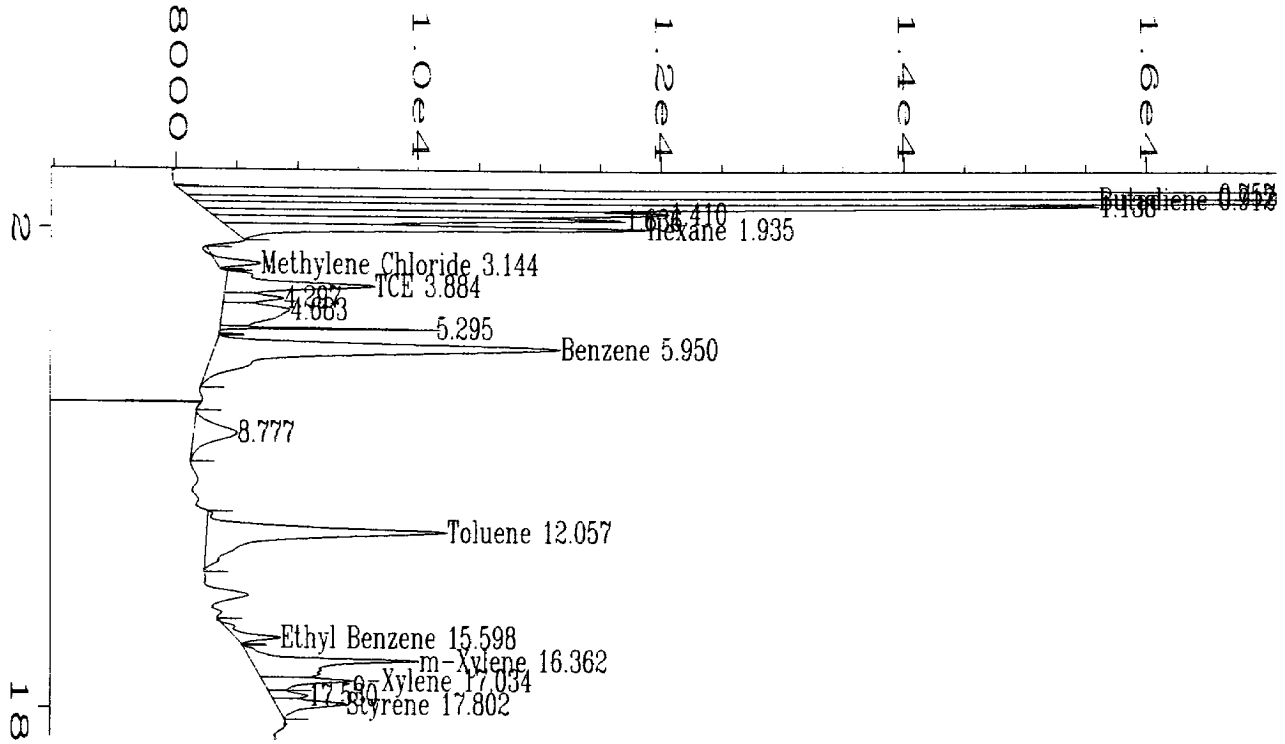

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External Standard Report

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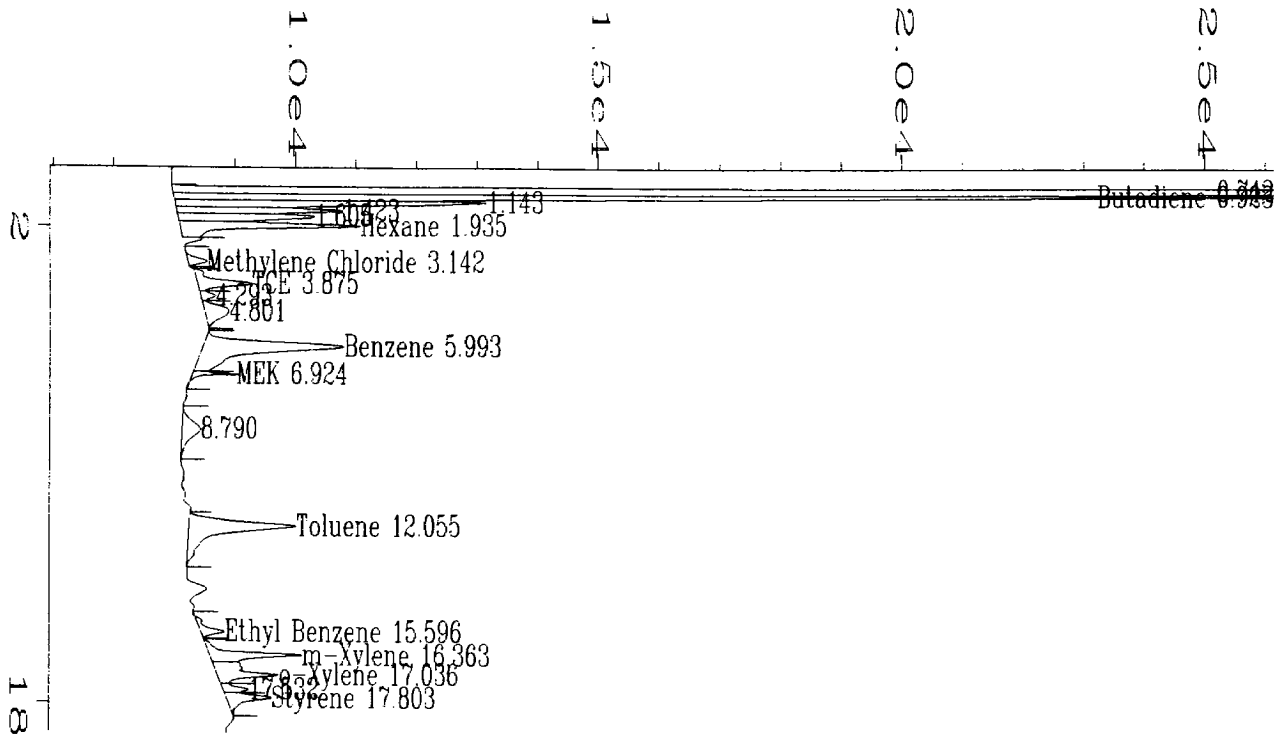
Data File Name : D:\SOLVAY\DIAG\SHORT_01.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : EP5 Short Flame
Run Time Bar Code:
Acquired on : 28 Apr 95 01:12 PM
Report Created on: 04 May 95 02:53 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\DIAG\SHORT_01.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.912	205870	VV	0.121	1	11.973	Butadiene
1.935	43333	VB	0.193	1	1.267	Hexane
3.144	4299	BV	0.185	1	1.479	Methylene Chloride
3.884	22828	BV	0.272	1	2.476	TCE
5.950	74162	BB	0.385	1	2.229	Benzene
7.300	* not found *			1		MEK
11.804	* not found *			1		Acrylonitrile
12.057	52752	BB	0.367	1	2.738	Toluene
15.598	5687	BBA	0.224	1	0.225	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.362	29892	BV	0.289	1	1.727	m-Xylene
17.034	10839	VV	0.207	1	0.595	o-Xylene
17.802	9897	VB	0.254	1	0.206	Styrene

Not all calibrated peaks were found



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External Standard Report

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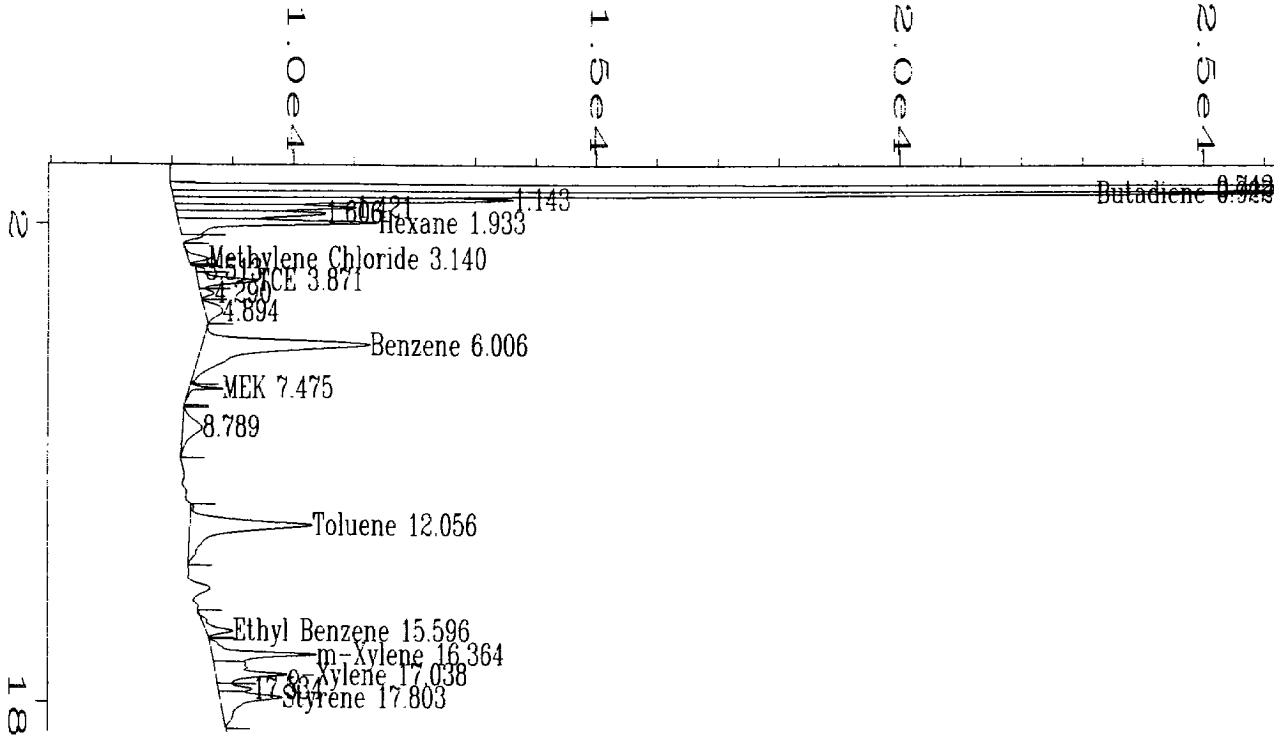
Data File Name : D:\SOLVAY\DIAG\SHORT_02.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : EP5 Short Flame
Run Time Bar Code:
Acquired on : 28 Apr 95 01:34 PM
Report Created on: 04 May 95 02:54 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\DIAG\SHORT_02.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.923	150588	VV	0.109	1	8.750	Butadiene
1.935	38985	VV	0.192	1	1.161	Hexane
3.142	4171	PV	0.197	1	1.453	Methylene Chloride
3.875	14857	BV	0.242	1	1.710	TCE
5.993	64384	BV	0.407	1	1.949	Benzene
6.924	4119	VB	0.095	1	0.718	MEK
11.804	* not found *			1		Acrylonitrile
12.055	46743	BB	0.368	1	2.443	Toluene
15.596	6231	BBA	0.234	1	0.248	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.363	21030	BV	0.200	1	1.200	m-Xylene
17.036	20556	VV	0.279	1	1.172	o-Xylene
17.803	12705	VB	0.252	1	0.256	Styrene

Not all calibrated peaks were found



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External Standard Report

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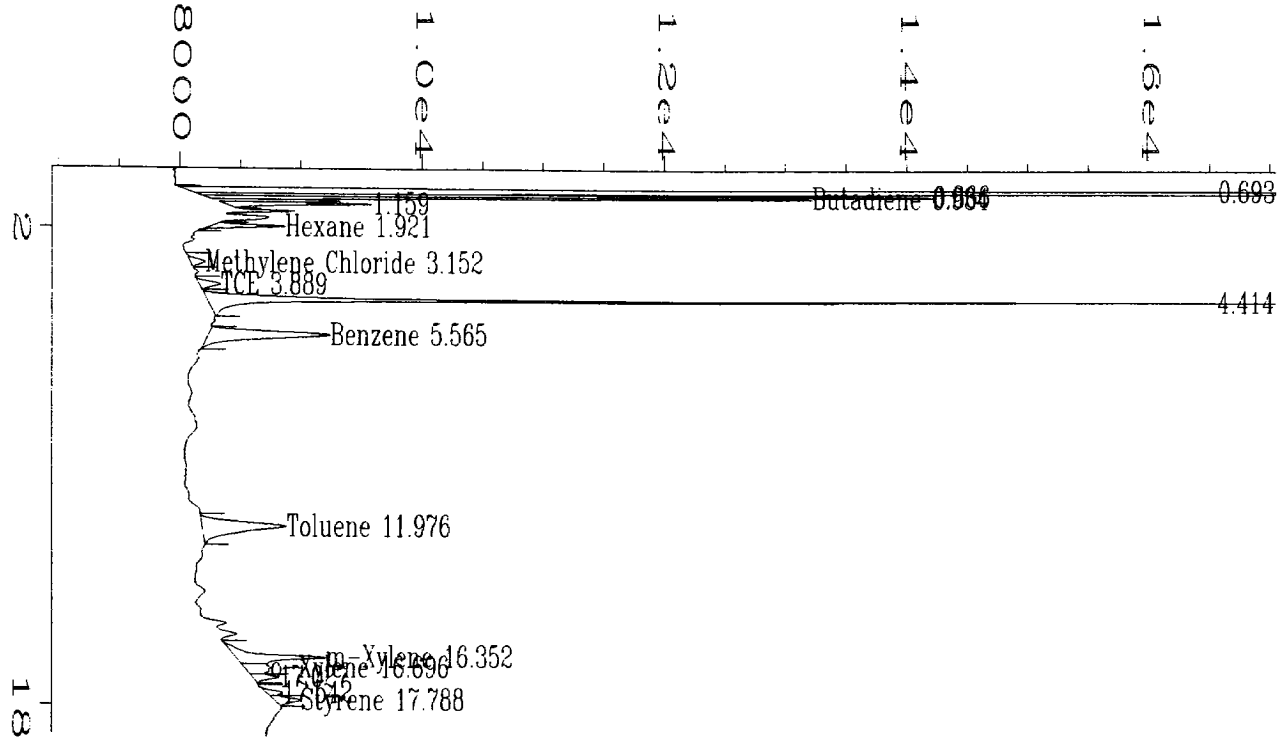
Data File Name : D:\SOLVAY\DIAG\SHORT_03.D
erator : J. Kaput
Instrument : HP 5890 N
Sample Name : EP5 Short Flame
Run Time Bar Code:
Acquired on : 28 Apr 95 01:56 PM
Report Created on: 04 May 95 02:54 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\DIAG\SHORT_03.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.922	168369	VV	0.109	1	9.787	Butadiene
1.933	43455	VV	0.192	1	1.270	Hexane
3.140	4426	PV	0.212	1	1.506	Methylene Chloride
3.871	14700	VV	0.227	1	1.695	TCE
6.006	79130	BV	0.415	1	2.371	Benzene
7.475	3190	VB	0.132	1	0.620	MEK
11.804	* not found *			1		Acrylonitrile
12.056	53789	BB	0.370	1	2.789	Toluene
15.596	6931	BBA	0.232	1	0.277	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.364	24846	BV	0.207	1	1.427	m-Xylene
17.038	25774	VV	0.295	1	1.482	o-Xylene
17.803	24308	VV	0.332	1	0.460	Styrene

Not all calibrated peaks were found



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External Standard Report

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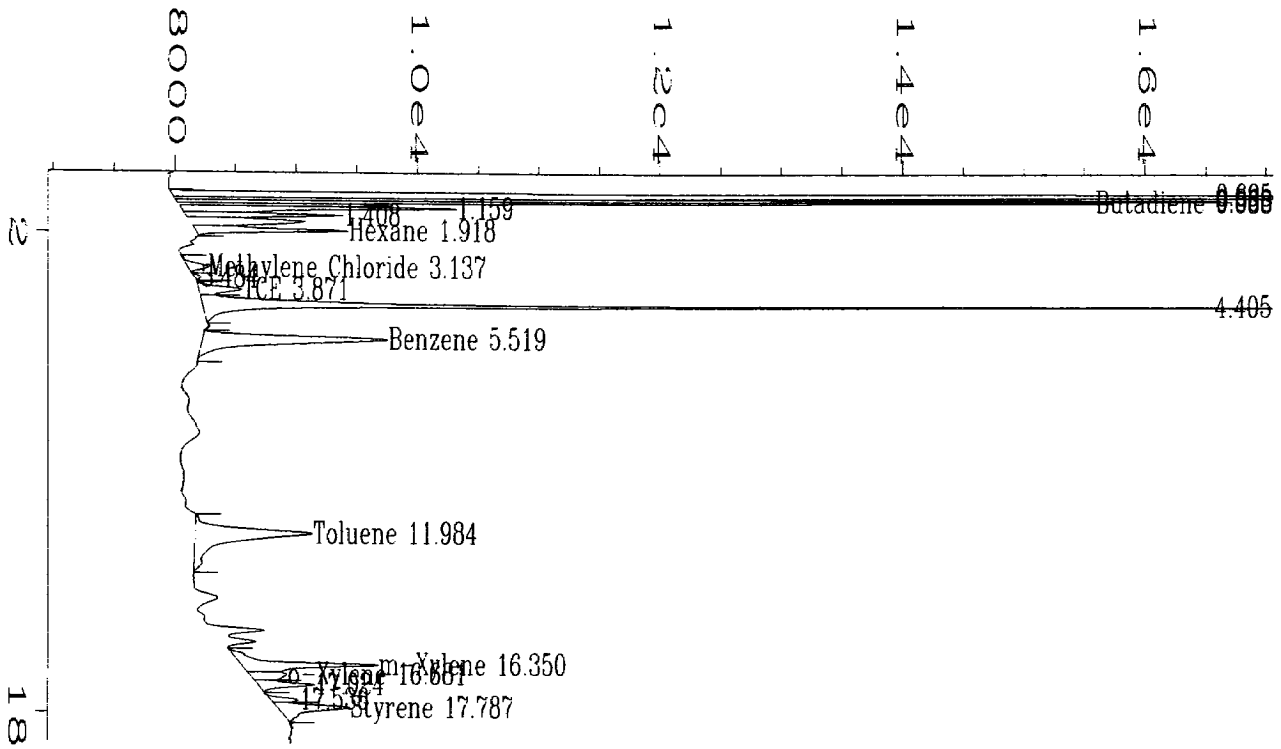
Data File Name	: D:\SOLVAY\DIAG\RUN2_001.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: EP5 Diagnostics	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 28 Apr 95 03:32 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:45 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\DIAG\RUN2_001.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.934	20195	VV	0.060	1	1.149	Butadiene
1.921	3932	BB	0.097	1	0.306	Hexane
3.152	1395	BB	0.153	1	0.875	Methylene Chloride
3.889	2069	BV	0.145	1	0.480	TCE
5.565	16768	BB	0.228	1	0.584	Benzene
7.300	* not found *			1		MEK
11.804	* not found *			1		Acrylonitrile
11.976	15133	BB	0.288	1	0.892	Toluene
15.601	* not found *			1		Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.352	10122	BV	0.195	1	0.552	m-Xylene
16.696	3708	VV	0.274	1	0.171	o-Xylene
17.788	2561	VB	0.179	1	0.0775	Styrene

Not all calibrated peaks were found



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External Standard Report

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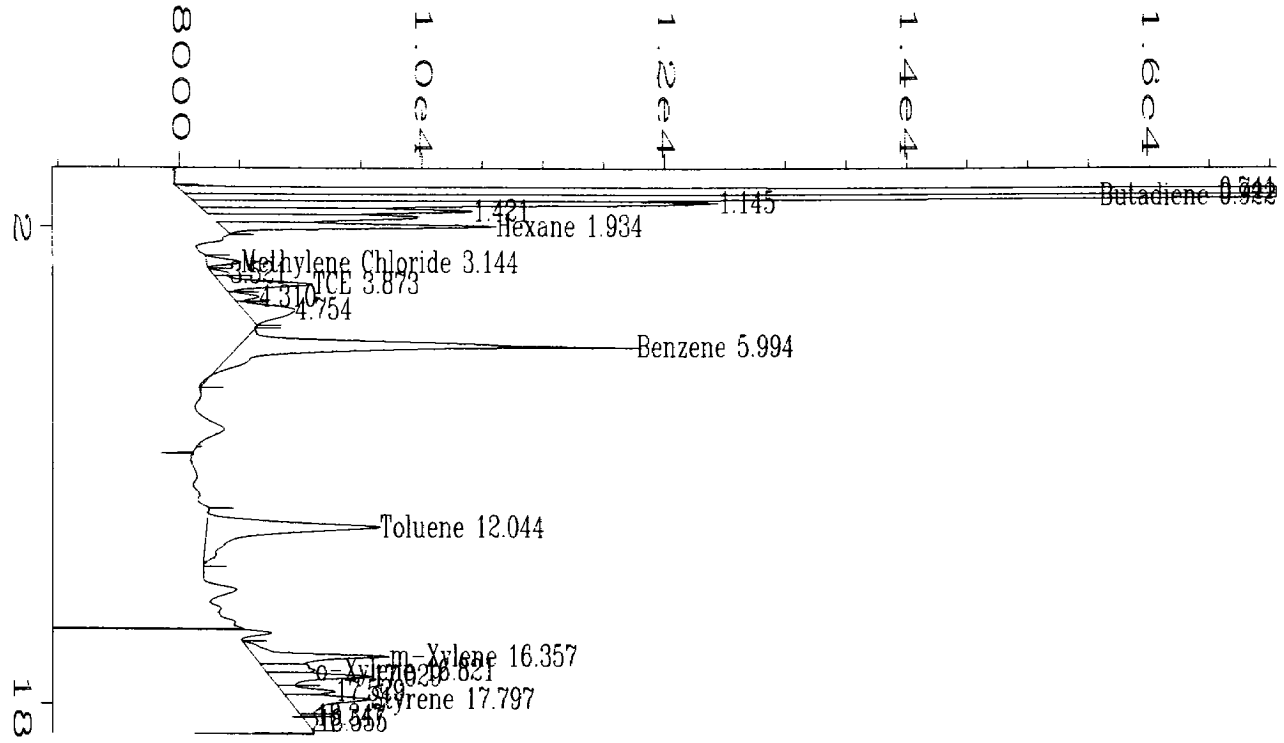
Data File Name	: D:\SOLVAY\DIAG\RUN2_002.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: EP5 Diagnostics	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 28 Apr 95 03:54 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:46 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\DIAG\RUN2_002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.933	32576	VV	0.063	1	1.871	Butadiene
1.918	10649	VB	0.126	1	0.470	Hexane
3.137	2201	BV	0.183	1	1.043	Methylene Chloride
3.871	4738	BV	0.199	1	0.736	TCE
5.519	27003	BB	0.265	1	0.878	Benzene
7.300	* not found *			1		MEK
11.804	* not found *			1		Acrylonitrile
11.984	25884	BB	0.362	1	1.420	Toluene
15.601	* not found *			1		Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.350	15350	BV	0.192	1	0.863	m-Xylene
16.681	4641	VV	0.221	1	0.226	o-Xylene
17.787	9359	VB	0.230	1	0.197	Styrene

Not all calibrated peaks were found



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External Standard Report

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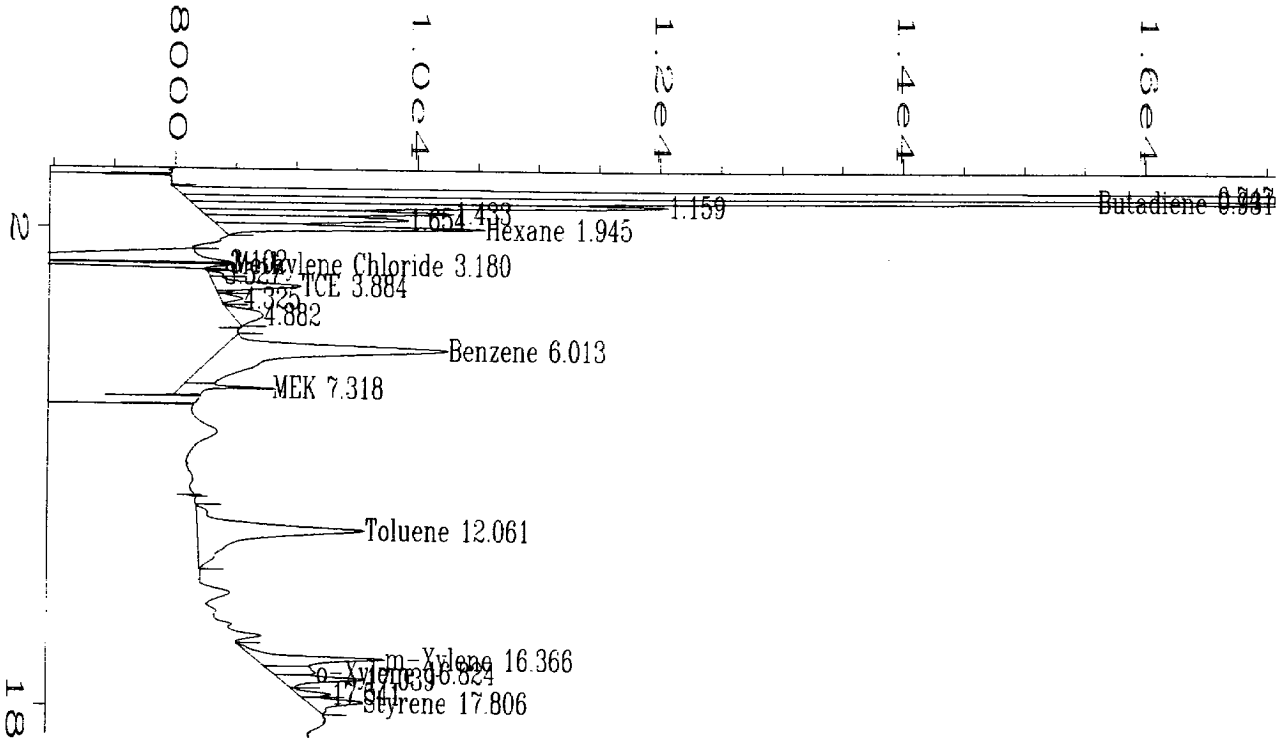
Data File Name	: D:\SOLVAY\DIAG\RUN2_003.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: EP5 Diagnostics	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 28 Apr 95 04:15 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:50 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\DIAG\RUN2_003.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.922	130469	VV	0.108	1	7.577	Butadiene
1.934	23593	VB	0.160	1	0.785	Hexane
3.144	3597	BV	0.198	1	1.333	Methylene Chloride
3.873	11181	VV	0.222	1	1.356	TCE
5.994	52541	BB	0.316	1	1.609	Benzene
7.300	* not found *			1		MEK
11.804	* not found *			1		Acrylonitrile
12.044	38395	BB	0.371	1	2.033	Toluene
15.601	* not found *			1		Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.357	16893	BV	0.213	1	0.955	m-Xylene
16.821	6490	VV	0.212	1	0.336	o-Xylene
17.797	13829	VV	0.289	1	0.276	Styrene

Not all calibrated peaks were found



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External Standard Report

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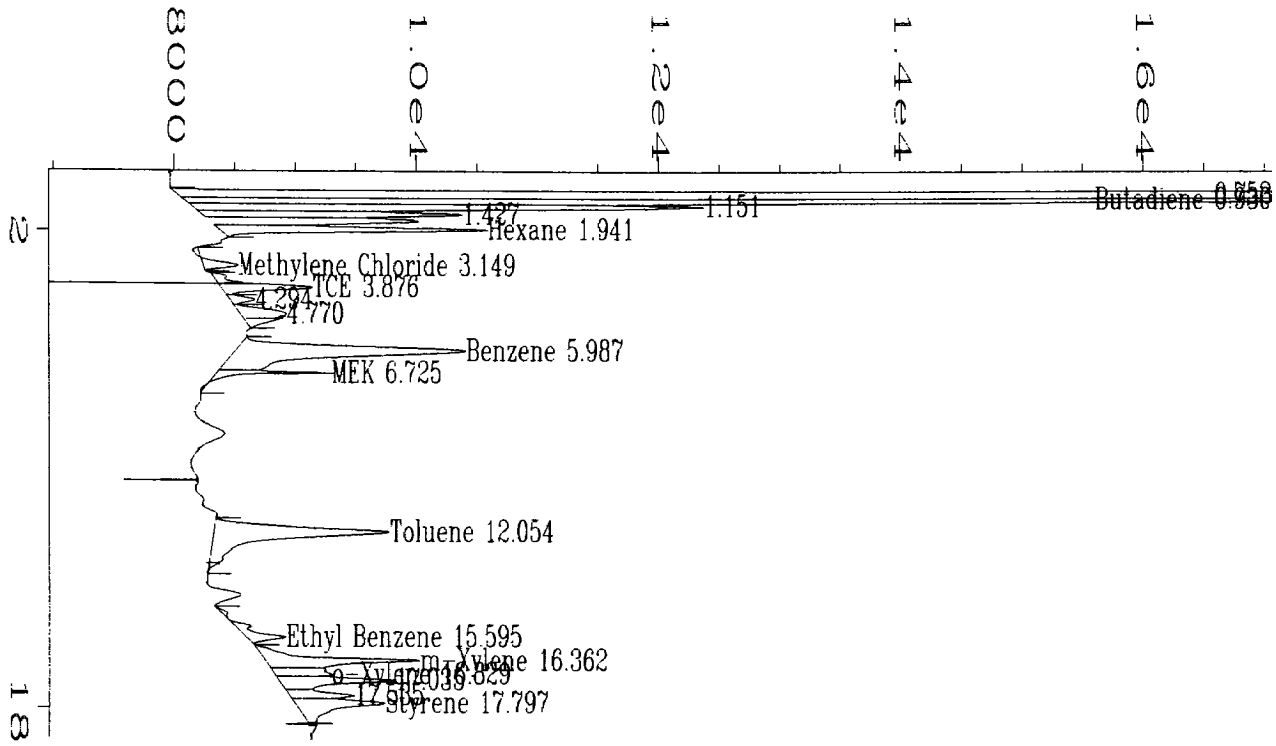
Data File Name : D:\SOLVAY\DIAG\RUN3_001.D
Operator : J. Kaput
Instrument : HP 5890 N
Sample Name : EP5 Diagnostics
Run Time Bar Code:
Acquired on : 28 Apr 95 04:58 PM
Report Created on: 04 May 95 02:51 PM
Last Recalib on : 26 APR 95 06:11 PM
Multiplier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: SOLVAY.MTH
Analysis Method : METHOD.MTH
Sample Amount : 0
ISTD Amount :

Sig. 1 in D:\SOLVAY\DIAG\RUN3_001.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.931	123266	VV	0.106	1	7.158	Butadiene
1.945	22532	VB	0.158	1	0.760	Hexane
3.180	15979	PV	0.093	1	3.910	Methylene Chloride
3.884	11007	VV	0.231	1	1.339	TCE
6.013	60020	BV	0.460	1	1.824	Benzene
7.318	7072	VV	0.125	1	1.030	MEK
11.804	* not found *			1		Acrylonitrile
12.061	43451	BB	0.423	1	2.281	Toluene
15.601	* not found *			1		Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.366	16103	BV	0.211	1	0.908	m-Xylene
16.824	5948	VV	0.215	1	0.304	o-Xylene
17.806	6953	VB	0.226	1	0.155	Styrene

Not all calibrated peaks were found



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External Standard Report

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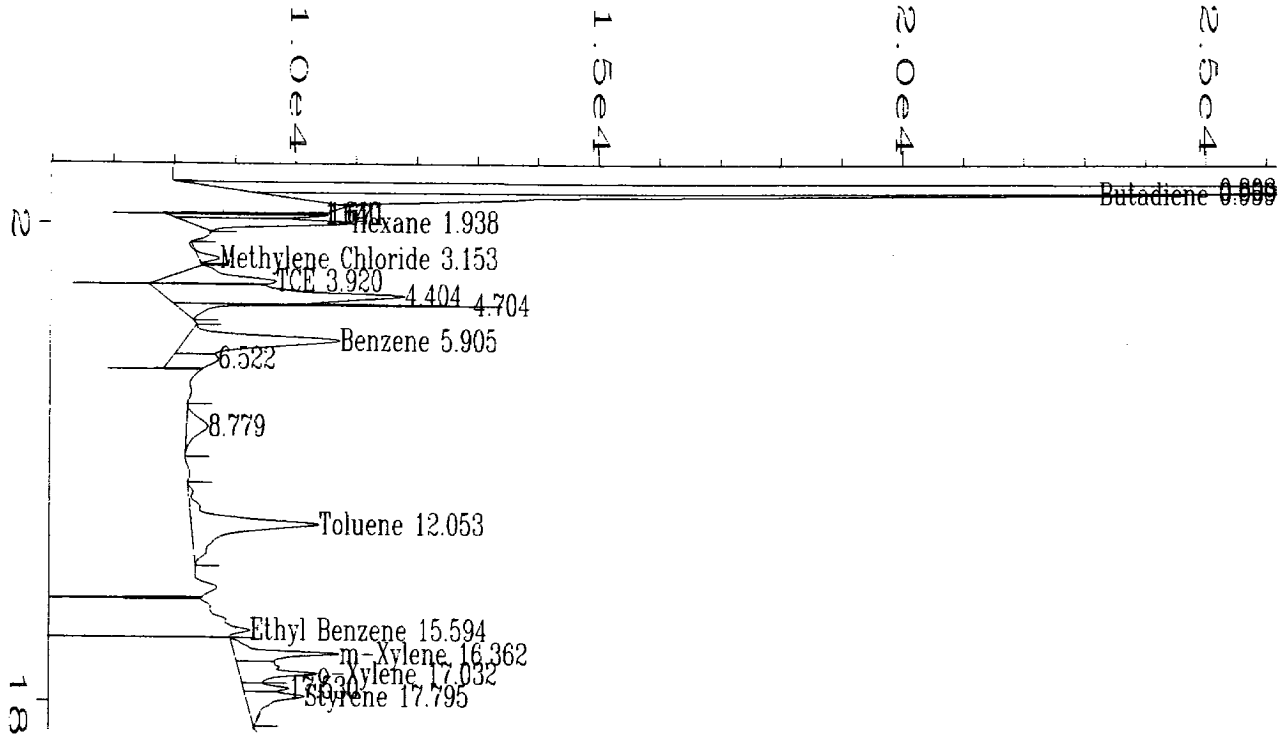
Data File Name	: D:\SOLVAY\DIAG\RUN3_002.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: EP5 Diagnostics	Injection Number	:
Run Time Bar Code:		Sequence Line	:
Acquired on	: 28 Apr 95 05:19 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:52 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\DIAG\RUN3_002.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.930	127222	VV	0.114	1	7.388	Butadiene
1.941	23712	VB	0.166	1	0.788	Hexane
3.149	3059	BV	0.158	1	1.221	Methylene Chloride
3.876	11288	BV	0.227	1	1.366	TCE
5.987	49919	BV	0.393	1	1.534	Benzene
6.725	5140	VB	0.158	1	0.826	MEK
11.804	* not found *			1		Acrylonitrile
12.054	39870	BB	0.381	1	2.106	Toluene
15.595	6570	BBA	0.283	1	0.262	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.362	20552	BV	0.223	1	1.172	m-Xylene
16.829	7083	VV	0.201	1	0.371	o-Xylene
17.797	15770	VV	0.295	1	0.310	Styrene

Not all calibrated peaks were found



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External Standard Report

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Data File Name	: D:\SOLVAY\DIAG\RUN3_003.D		
Operator	: J. Kaput	Page Number	: 1
Instrument	: HP 5890 N	Vial Number	:
Sample Name	: EP5 Diagnostics	Injection Number	:
Run Time Bar Code	:	Sequence Line	:
Acquired on	: 28 Apr 95 05:42 PM	Instrument Method	: SOLVAY.MTH
Report Created on	: 04 May 95 02:52 PM	Analysis Method	: METHOD.MTH
Last Recalib on	: 26 APR 95 06:11 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Sig. 1 in D:\SOLVAY\DIAG\RUN3_003.D

Ret Time	Area	Type	Width	Ref#	ppm	Name
0.959	126788	VV	0.138	1	7.363	Butadiene
1.938	39358	VB	0.224	1	1.170	Hexane
3.153	3941	BV	0.182	1	1.405	Methylene Chloride
3.920	37288	BV	0.279	1	3.867	TCE
5.905	67658	BV	0.396	1	2.042	Benzene
7.300	* not found *			1		MEK
11.804	* not found *			1		Acrylonitrile
12.053	69590	BB	0.445	1	3.564	Toluene
15.594	263686	PBA	0.868	1	11.018	Ethyl Benzene
16.004	* not found *			1		p-Xylene
16.362	28032	BV	0.228	1	1.617	m-Xylene
17.032	29996	VV	0.313	1	1.733	o-Xylene
17.795	23554	VV	0.336	1	0.447	Styrene

Not all calibrated peaks were found

F

FIELD DATA PRINTOUTS

F

Field Data Printout

Location: EP 1&2 Calciner Stack
Test Run: 1
Client: Solvay Minerals, Inc.
Project No: 7473-2
Test Date: 4/25/95
Meter ΔH@: 1.8228
Meter Y_d: 0.9966
Pitot C_p: 0.84
Static P: -0.3
Leak Rate Before: 0.0100
Leak Rate After: 0.0070

Method: 5/202
Testing Type: Particulate
Area (ft^2): 113.10
Filter No: 85185
Thimble No: N/A
Beaker No: N/A

Bar. Press. (in. Hg): 23.58
Actual Moisture (%): 18.0
Nozzle Diameter (D_n): 0.255
O_2 (dry volume %): 14.3
CO_2 (dry volume %): 8.0
Start Time (approx.): 11:45
Stop Time (approx.): 13:27
H_2O (condensate, ml): 188.3
H_2O (silica, g): 16.7

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)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	827.25	(°F)	(°F)	(°F)	($\sqrt{in.\ H_2O}$)	(ft^3)	(%)
1-01	2.5	1.30	2.70	829.74	430	71	69	1.14	2.49	100.9
1-02	5.0	1.30	2.70	832.16	430	71	69	1.14	2.42	98.1
1-03	7.5	1.30	2.70	834.63	430	75	70	1.14	2.47	99.7
1-04	10.0	1.40	2.90	837.16	430	76	70	1.18	2.53	98.3
1-05	12.5	1.20	2.50	839.57	430	77	71	1.10	2.41	100.7
1-06	15.0	0.94	1.90	841.68	428	78	71	0.97	2.11	99.6
2-01	17.5	1.20	2.50	844.06	430	77	72	1.10	2.38	99.5
2-02	20.0	1.20	2.50	846.41	434	78	72	1.10	2.35	98.4
2-03	22.5	1.30	2.70	848.89	434	78	72	1.14	2.48	99.8
2-04	25.0	1.20	2.50	851.26	434	77	72	1.10	2.37	99.3
2-05	27.5	1.10	2.30	853.55	434	76	72	1.05	2.29	100.3
2-06	30.0	0.83	1.70	855.54	430	75	71	0.91	1.99	100.1
LEAK CHECK	30.0			855.73						
3-01	32.5	1.30	2.70	858.09	425	70	69	1.14	2.36	95.5
3-02	35.0	1.30	2.70	860.43	424	71	69	1.14	2.34	94.5
3-03	37.5	1.40	2.90	862.97	423	71	69	1.18	2.54	98.9
3-04	40.0	1.30	2.70	865.42	423	72	69	1.14	2.45	98.8
3-05	42.5	1.10	2.30	867.74	421	72	69	1.05	2.32	101.5
3-06	45.0	0.82	1.70	869.67	419	72	69	0.91	1.93	97.5
4-01	47.5	1.20	2.50	872.05	425	72	69	1.10	2.38	100.0
4-02	50.0	1.20	2.50	874.41	421	73	69	1.10	2.36	98.8
4-03	52.5	1.30	2.70	876.88	420	74	69	1.14	2.47	99.3
4-04	55.0	1.20	2.50	879.26	419	74	69	1.10	2.38	99.5
4-05	57.5	0.94	1.90	881.35	418	74	69	0.97	2.09	98.4
4-06	60.0	0.78	1.60	883.25	417	74	69	0.88	1.90	98.1
Final	60.0	1.17	2.43	55.81	426	72.0		1.08		

Field Data Printout

Location: EP 1&2 Calciner Stack
Test Run: 2
Client: Solvay Minerals, Inc.
Project No: 7473-2
Test Date: 4/25/95
Meter ΔH@: 1.8228
Meter Y_d: 0.9966
Pitot C_p: 0.84
Static P: -0.3
Leak Rate Before: 0.0080
Leak Rate After: 0.0050

Method: 5/202
Testing Type: Particulate
Area (ft^2): 113.10
Filter No: 85183
Thimble No: N/A
Beaker No: N/A

Bar. Press. (in. Hg): 23.58
Actual Moisture (%): 17.9
Nozzle Diameter (D_n): 0.185
O_2 (dry volume %): 14.2
CO_2 (dry volume %): 8.2
Start Time (approx.): 14:19
Stop Time (approx.): 15:54
H_2O (condensate, ml): 147.3
H_2O (silica, g): 8.2

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)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	883.63	(°F)	(°F)	(°F)	($\sqrt{in.\ H_2O}$)	(ft^3)	(%)
4-01	3.5	1.30	0.72	885.53	424	69	68	1.14	1.90	103.7
4-02	7.0	1.20	0.66	887.57	423	70	68	1.10	2.04	115.7*
4-03	10.5	1.20	0.66	889.12	420	70	68	1.10	1.55	87.8*
4-04	14.0	1.10	0.61	890.82	419	71	68	1.05	1.70	100.4
4-05	17.5	0.92	0.51	892.39	418	71	68	0.96	1.57	101.3
4-06	21.0	0.77	0.42	893.80	415	71	68	0.88	1.41	99.3
3-01	24.5	1.30	0.72	895.67	429	71	68	1.14	1.87	102.2
3-02	28.0	1.30	0.72	897.53	428	72	68	1.14	1.86	101.5
3-03	31.5	1.30	0.72	899.39	427	72	67	1.14	1.86	101.5
3-04	35.0	1.30	0.72	901.25	427	73	67	1.14	1.86	101.4
3-05	38.5	1.20	0.66	903.02	424	72	67	1.10	1.77	100.3
3-06	42.0	0.81	0.45	904.52	420	71	67	0.90	1.50	103.4
2-01	45.5	1.30	0.72	906.38	437	68	65	1.14	1.86	102.7
2-02	49.0	1.40	0.77	908.35	440	68	65	1.18	1.97	105.0
2-03	52.5	1.40	0.77	910.22	441	68	65	1.18	1.87	99.7
2-04	57.0	1.30	0.72	912.06	441	67	64	1.14	1.84	79.3*
2-05	59.5	1.10	0.61	913.78	440	67	64	1.05	1.72	145.0*
2-06	63.0	0.79	0.43	915.24	436	67	64	0.89	1.46	103.4
1-01	66.5	1.40	0.77	917.15	433	66	64	1.18	1.91	101.7
1-02	70.0	1.40	0.77	919.04	433	66	64	1.18	1.89	100.6
1-03	73.5	1.40	0.77	920.98	434	66	63	1.18	1.94	103.4
1-04	77.0	1.40	0.77	922.88	433	66	62	1.18	1.90	101.4
1-05	80.5	1.20	0.66	924.63	431	66	62	1.10	1.75	100.7
1-06	84.0	0.94	0.52	926.17	428	66	62	0.97	1.54	99.9
Final	84.0	1.20	0.66	42.54	429	67		1.09		

Field Data Printout

Location: EP 1&2 Calciner Stack
Test Run: 3
Client: Solvay Minerals, Inc.
Project No: 7473-2
Test Date: 4/25/95
Meter ΔH@: 1.8228
Meter Y_d: 0.9966
Pitot C_p: 0.84
Static P: -0.3
Leak Rate Before: 0.0080
Leak Rate After: 0.0020

Method: 5/202
Testing Type: Particulate
Area (ft^2): 113.10
Filter No: 85184
Thimble No: N/A
Beaker No: N/A

Bar. Press. (in. Hg): 23.58
Actual Moisture (%): 18.1
Nozzle Diameter (D_n): 0.185
O_2 (dry volume %): 14.1
CO_2 (dry volume %): 8.2
Start Time (approx.): 16:57
Stop Time (approx.): 18:30
H_2O (condensate, ml): 147.3
H_2O (silica, g): 10.4

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)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	928.22	(°F)	(°F)	(°F)	($\sqrt{in.\ H_2O}$)	(ft^3)	(%)
1-01	3.5	1.40	0.77	930.16	428	63	61	1.18	1.94	103.8
1-02	7.0	1.50	0.80	932.12	429	64	61	1.22	1.96	101.2
1-03	10.5	1.50	0.80	934.05	430	65	61	1.22	1.93	99.7
1-04	14.0	1.40	0.77	935.97	430	66	61	1.18	1.92	102.5
1-05	17.5	1.20	0.66	937.79	430	67	61	1.10	1.82	104.8
1-06	21.0	0.89	0.50	939.30	426	67	62	0.94	1.51	100.7
2-01	24.5	1.30	0.72	941.15	437	66	61	1.14	1.85	102.9
2-02	28.0	1.30	0.72	943.00	438	67	61	1.14	1.85	102.9
2-03	31.5	1.40	0.77	944.89	439	67	61	1.18	1.89	101.3
2-04	35.0	1.30	0.72	946.73	440	67	61	1.14	1.84	102.4
2-05	38.5	1.10	0.61	948.43	438	67	61	1.05	1.70	102.7
2-06	42.0	0.83	0.46	949.90	435	67	61	0.91	1.47	102.1
3-01	45.5	1.30	0.72	951.74	429	66	61	1.14	1.84	101.9
3-02	49.0	1.40	0.77	953.65	427	66	61	1.18	1.91	101.8
3-03	52.5	1.40	0.77	955.56	427	67	61	1.18	1.91	101.7
3-04	57.0	1.30	0.72	957.41	425	67	61	1.14	1.85	79.4*
3-05	59.5	1.10	0.61	959.13	421	67	61	1.05	1.72	144.1*
3-06	63.0	0.78	0.43	960.53	417	67	61	0.88	1.40	99.2
4-01	66.5	1.20	0.66	962.27	424	67	62	1.10	1.74	99.8
4-02	70.0	1.30	0.72	964.13	421	67	62	1.14	1.86	102.3
4-03	73.5	1.20	0.66	965.89	419	68	62	1.10	1.76	100.5
4-04	77.0	1.20	0.66	967.65	419	68	62	1.10	1.76	100.5
4-05	80.5	0.98	0.54	969.26	414	68	62	0.99	1.61	101.4
4-06	84.0	0.69	0.38	970.62	412	68	62	0.83	1.36	102.0
Final	84.0	1.21	0.66	42.40	427	64		1.09		

Field Data Printout

Location: EP-5 Calciner Stack
Test Run: 1
Client: Solvay Minerals, Inc.
Project No: 7473-2
Test Date: 4/28/95
Meter ΔH@: 1.8228
Meter Y_d: 0.9966
Pitot C_p: 0.84
Static P: -0.2
Leak Rate Before: 0.001 cfm @ 15"Hg
Leak Rate After: 0.000 cfm @ 10"Hg

Method: EPA M 2-4
Testing Type: Diagnostic

Area (ft^2): 85.90

Bar. Press. (in. Hg): 23.66
Actual Moisture (%): 36.9

O_2 (dry volume %): 10.4
CO_2 (dry volume %): 12.6
Start Time (approx.): 13:13
Stop Time (approx.): 13:58
H_2O (condensate, ml): 222.0
H_2O (silica, g): 16.3

Traverse Point	Pitot ΔP_s (in. H_2O)	Stack T_s (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Run Time	Sample ΔH (in. H_2O)	Metered (ft^3)	Dry Gas Meter $T_{m\ in}$ (°F)	Dry Gas Meter $T_{m\ out}$ (°F)	Volume (calculated) (ft^3)
				0.0		189.80			
1-01	0.14	308	0.37	5.0	1.80	193.85	68	68	4.05
1-02	0.13	307	0.36	10.0	1.80	197.84	66	67	3.99
1-03	0.10	302	0.32	15.0	1.80	201.89	68	67	4.05
2-01	0.13	305	0.36	20.0	1.80	205.89	72	68	4.00
2-02	0.14	303	0.37	25.0	1.80	209.96	72	68	4.07
2-03	0.12	301	0.35	30.0	1.80	214.00	69	66	4.04
3-01	0.13	303	0.36						
3-02	0.13	299	0.36						
3-03	0.11	296	0.33						
4-01	0.12	298	0.35						
4-02	0.11	296	0.33						
4-03	0.11	295	0.33						
Final	0.35	301		30.0	1.80	24.20	68		

Field Data Printout

Location: EP-5 Calciner Stack
Test Run: 2
Client: Solvay Minerals, Inc.
Project No: 7473-2
Test Date: 4/28/95
Meter ΔH@: 1.8228
Meter Y_d: 0.9966
Pitot C_p: 0.84
Static P: -0.2
Leak Rate Before: 0.002 cfm @ 15"Hg
Leak Rate After: 0.002 cfm @ 8"Hg

Method: EPA M 2-4
Testing Type: Diagonostic
Area (ft^2): 85.90

Bar. Press. (in. Hg): 23.66
Actual Moisture (%): 38.2
O_2 (dry volume %): 11.7
CO_2 (dry volume %): 11.2
Start Time (approx.): 15:32
Stop Time (approx.): 16:02
H_2O (condensate, ml): 240.0
H_2O (silica, g): 10.3

Traverse Point	Pitot ΔP_s (in. H_2O)	Stack T_s (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Run Time	Sample ΔH (in. H_2O)	Metered (ft^3)	Dry Gas Meter $T_{m\ in}$ (°F)	Dry Gas Meter $T_{m\ out}$ (°F)	Volume (calculated) (ft^3)
				0.0		214.21			
1-01	0.14	308	0.37	5.0	1.80	218.24	68	67	4.03
1-02	0.13	308	0.36	10.0	1.80	222.25	71	68	4.01
1-03	0.11	307	0.33	15.0	1.80	226.26	69	66	4.01
2-01	0.13	309	0.36	20.0	1.80	230.25	68	66	3.99
2-02	0.13	308	0.36	25.0	1.80	234.24	70	66	3.99
2-03	0.12	307	0.35	30.0	1.80	238.25	71	67	4.01
3-01	0.14	306	0.37						
3-02	0.14	305	0.37						
3-03	0.11	306	0.33						
4-01	0.14	303	0.37						
4-02	0.13	304	0.36						
4-03	0.11	304	0.33						
Final	0.36	306		30.0	1.80	24.04	68		

Field Data Printout

Location: EP-5 Calciner Stack
Test Run: 3
Client: Solvay Minerals, Inc.
Project No: 7473-2
Test Date: 4/28/95
Meter ΔH@: 1.8228
Meter Y_d: 0.9966
Pitot C_p: 0.84
Static P: -0.2
Leak Rate Before: 0.002 cfm @ 15"Hg
Leak Rate After: 0.002 cfm @ 10"Hg

Method: EPA M 2-4
Testing Type: Diagnostic
Area (ft^2): 85.90

Bar. Press. (in. Hg): 23.66
Actual Moisture (%): 36.0
O_2 (dry volume %): 10.9
CO_2 (dry volume %): 12.1
Start Time (approx.): 16:59
Stop Time (approx.): 17:29
H_2O (condensate, ml): 210.0
H_2O (silica, g): 11.5

Traverse Point	Pitot ΔP_s (in. H_2O)	Stack T_s (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Run Time	Sample ΔH (in. H_2O)	Metered (ft^3)	Dry Gas Meter $T_{m\ in}$ (°F)	Dry Gas Meter $T_{m\ out}$ (°F)	Volume (calculated) (ft^3)
				0.0		238.38			
1-01	0.14	304	0.37	5.0	1.80	242.13	61	60	3.75
1-02	0.13	303	0.36	10.0	1.80	245.80	62	62	3.67
1-03	0.12	300	0.35	15.0	1.80	249.76	63	61	3.96
2-01	0.15	299	0.39	20.0	1.80	253.70	68	63	3.94
2-02	0.12	298	0.35	25.0	1.80	257.64	66	62	3.94
2-03	0.11	297	0.33	30.0	1.80	261.55	65	61	3.91
3-01	0.12	298	0.35						
3-02	0.12	299	0.35						
3-03	0.11	298	0.33						
4-01	0.12	298	0.35						
4-02	0.12	298	0.35						
4-03	0.12	297	0.35						
Final	0.35	299		30.0	1.80	23.17	63		

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack
April 28, 1995

CALIBRATION BIAS 0

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
12:53:22	1.4	1.1	1.2
12:53:37	1.4	0.8	1.2
12:53:52	1.4	0.4	1.2
12:54:07	1.3	0.7	1.2
12:54:22	1.3	0.6	1.2
12:54:37	1.2	0.5	7.8
12:54:52	1.2	0.2	154.1
12:55:07	1.6	0.5	719.2
12:55:22	1.7	0.5	1,192.4
12:55:37	1.4	0.2	1,414.7
12:55:52	1.1	0.2	1,455.5
12:56:07	1.2	0.3	1,460.9
12:56:22	1.1	0.2	1,461.9
12:56:37	1.0	0.2	1,464.5
12:56:52	1.0	0.2	1,464.8
12:57:07	1.0	0.5	1,463.6
12:57:22	1.0	0.2	1,462.9
12:57:37	0.9	0.1	1,460.3
12:57:52	0.9	0.3	1,460.0
12:58:07	1.1	0.3	1,312.0
12:58:22	49.2	0.2	835.2
12:58:37	254.4	0.5	278.7
12:58:52	388.5	0.5	61.0
12:59:07	416.1	0.3	9.8
12:59:22	423.7	0.2	1.2
12:59:37	414.2	0.0	1.2
12:59:52	425.0	0.1	1.2
13:00:07	427.4	0.1	1.2
13:00:22	427.4	0.0	1.2
13:00:37	429.3	0.0	1.2
13:00:52	428.3	0.4	1.2
13:01:07	428.2	1.3	1.2
13:01:22	433.1	1.7	1.2
13:01:37	407.3	1.0	1.2
13:01:52	399.8	0.8	-1.7
13:02:07	400.9	0.7	0.9
13:02:22	400.2	0.5	1.2
13:02:37	394.5	0.3	1.2
13:02:52	397.7	0.2	-1.7
13:03:07	399.9	0.0	-2.4
13:03:22	405.1	-0.2	1.2
13:03:37	418.0	-0.4	-3.3
13:03:52	409.3	-0.7	-0.7
13:04:07	410.4	-0.9	1.2
13:04:22	408.8	-0.8	1.2
13:04:37	412.6	13.3	1.2
13:04:52	404.4	45.4	1.2
13:05:07	410.1	46.0	1.2

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack
April 28, 1995

CALIBRATION BIAS 0

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
13:05:22	401.6	46.0	1.2
13:05:37	275.5	46.1	1.2
13:05:52	82.7	46.0	1.2
13:06:07	16.4	46.1	1.2
13:06:22	4.9	46.1	1.2
13:06:37	3.1	46.1	1.2
13:06:52	2.5	46.1	1.2
13:07:07	2.1	369.1	1.2
13:07:22	1.9	476.0	1.2
13:07:37	1.6	477.4	1.2
13:07:52	1.5	526.9	1.2
13:08:07	1.5	554.4	1.2
13:08:22	1.4	555.4	-1.7
13:08:37	1.3	555.5	-0.4
13:08:52	1.2	556.0	-3.7
13:09:07	1.1	556.5	-2.4
Zero Gas	0.9	0.2	1.2
Cal Gas	428.6	555.6	1,461.1

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack
April 28, 1995

REFERENCE METHOD RUN 1

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
13:12	46.6	243.7	522.8
13:13	49.2	245.6	522.1
13:14	48.9	243.6	514.3
13:15	52.3	247.6	504.5
13:16	55.9	251.0	497.2
13:17	56.4	253.2	498.8
13:18	57.4	253.6	490.9
13:19	56.4	250.6	484.4
13:20	50.4	247.1	476.3
13:21	48.0	246.5	470.4
13:22	49.1	245.0	461.5
13:23	49.4	247.8	459.1
13:24	48.7	248.9	470.8
13:25	47.7	248.4	492.0
13:26	47.2	235.3	498.6
13:27	43.9	217.5	500.1
13:28	45.9	227.2	527.9
13:29	44.5	219.6	534.5
13:30	43.1	208.1	546.5
13:31	40.5	203.7	551.9
13:32	36.4	184.0	560.6
13:33	41.8	189.9	555.6
13:34	41.2	196.9	581.1
13:35	39.6	190.9	568.1
13:36	42.8	192.0	560.8
13:37	44.1	198.4	569.6
13:38	43.0	200.4	600.7
13:39	43.2	210.4	622.6
13:40	43.2	203.4	633.0
13:41	38.6	191.7	620.2
13:42	43.4	187.8	616.5
13:43	37.5	190.7	630.3
13:44	37.9	185.7	674.3
13:45	38.4	188.0	698.0
13:46	41.3	197.7	729.0
13:47	41.3	211.3	777.3
13:48	37.2	207.0	824.3
13:49	39.4	196.8	852.5
13:50	40.0	205.2	841.2
13:51	40.1	210.9	793.3
13:52	38.4	208.9	751.7
13:53	36.1	193.6	733.5
13:54	37.5	185.6	714.9
13:55	38.5	188.3	697.7
13:56	36.8	189.7	689.1
Average	44.0	215.3	598.2

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
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April 28, 1995

CALIBRATION BIAS 1

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
14:50:44	1.2	10.5	1.2
14:50:59	1.2	10.1	1.2
14:51:14	1.4	10.0	1.2
14:51:29	1.3	9.7	1.2
14:51:44	1.2	9.5	1.2
14:51:59	1.3	9.3	1.2
14:52:14	1.8	9.1	1.2
14:52:29	2.7	8.9	1.2
14:52:44	3.6	8.6	1.2
14:52:59	4.1	8.3	1.2
14:53:14	4.1	8.1	1.2
14:53:29	3.7	8.1	1.2
14:53:44	3.0	8.0	1.2
14:53:59	2.4	7.8	1.2
14:54:14	2.1	7.6	1.2
14:54:29	1.8	7.3	5.1
14:54:44	1.6	7.1	186.6
14:54:59	1.6	7.0	836.2
14:55:14	1.4	7.0	1,278.9
14:55:29	1.3	6.9	1,434.8
14:55:44	1.3	6.8	1,457.1
14:55:59	1.2	6.6	1,458.2
14:56:14	1.2	6.4	1,458.7
14:56:29	1.0	6.3	1,460.0
14:56:44	1.0	6.3	1,463.5
14:56:59	1.0	6.2	1,410.7
14:57:14	35.4	6.2	980.0
14:57:29	264.2	6.0	305.2
14:57:44	409.6	5.9	58.8
14:57:59	432.9	5.9	9.0
14:58:14	435.1	6.1	6.1
14:58:29	435.4	5.9	4.2
14:58:44	435.4	5.9	1.2
14:58:59	435.4	5.6	1.2
14:59:14	435.2	5.6	1.2
14:59:29	435.1	5.4	1.2
14:59:44	434.9	46.5	1.2
14:59:59	434.6	60.1	1.2
15:00:14	426.0	60.6	1.2
15:00:29	253.5	61.0	1.2
15:00:44	53.1	61.1	1.2
15:00:59	9.2	61.5	1.2
15:01:14	4.2	61.8	1.2
15:01:29	3.1	491.6	1.2
15:01:44	2.6	580.7	1.2
15:01:59	2.1	585.9	1.2
15:02:14	1.9	589.1	1.2
15:02:29	1.7	594.5	1.2

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack
April 28, 1995

CALIBRATION BIAS 1

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
15:02:44	1.6	597.5	1.2
15:02:59	1.4	598.1	1.2
15:03:14	1.3	600.4	1.2
15:03:29	1.3	602.6	1.2
15:03:44	1.1	604.7	1.2
15:03:59	1.1	608.2	1.2
15:04:14	1.0	610.3	1.2
15:04:29	1.0	612.8	1.2
15:04:44	0.9	614.0	1.2
15:04:59	0.9	616.0	1.2
15:05:14	0.9	618.8	1.2
15:05:29	0.9	620.0	1.2
15:05:44	0.9	623.4	1.2
15:05:59	0.9	625.4	1.2
15:06:14	0.8	627.5	1.2
15:06:29	0.8	630.6	1.2
15:06:44	0.8	625.9	1.2
15:06:59	0.8	619.1	1.2
15:07:14	0.8	619.9	1.2
15:07:29	0.8	619.9	1.2
15:07:44	0.7	622.1	1.2
15:07:59	0.8	622.7	1.2
15:08:14	0.7	623.0	1.2
Zero Gas	1.1	5.8	1.2
Cal Gas	435.4	622.9	1,459.0

SOLVAY MINERALS, INC.
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EP 5 Calciner Stack
April 28, 1995

REFERENCE METHOD RUN 2

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
15:31	40.8	155.2	1,263.7
15:32	37.6	159.0	1,294.0
15:33	42.4	163.1	1,318.8
15:34	42.6	173.2	1,376.3
15:35	44.1	174.3	1,432.6
15:36	42.6	179.9	1,477.2
15:37	42.6	179.3	1,558.3
15:38	42.0	177.5	1,589.0
15:39	41.3	189.2	1,595.7
15:40	42.9	186.9	1,628.4
15:41	43.0	183.4	1,651.1
15:42	42.0	183.9	1,589.8
15:43	42.6	178.0	1,559.0
15:44	43.4	180.5	1,532.3
15:45	42.8	190.0	1,579.7
15:46	44.8	181.8	1,595.7
15:47	44.5	187.0	1,552.6
15:48	44.5	182.6	1,560.8
15:49	43.3	186.1	1,535.7
15:50	43.8	184.3	1,555.9
15:51	44.4	188.6	1,559.1
15:52	44.2	188.3	1,580.3
15:53	43.1	194.8	1,596.7
15:54	43.5	188.3	1,600.9
15:55	43.9	187.1	1,584.3
15:56	43.6	191.3	1,600.5
15:57	43.5	190.8	1,595.2
15:58	43.9	190.6	1,599.3
15:59	43.0	189.2	1,591.3
16:00	44.5	182.9	1,518.3
16:01	45.3	180.9	1,499.3
16:02	42.9	189.3	1,446.9
16:03	43.6	186.9	1,455.6
16:04	43.8	190.3	1,470.2
16:05	43.7	189.9	1,446.6
16:06	44.1	180.9	1,331.9
16:07	44.7	183.0	1,292.6
16:08	43.5	176.8	1,269.8
16:09	44.7	177.3	1,218.6
16:10	42.9	178.7	1,171.6
16:11	44.2	178.6	1,163.7
16:12	39.2	181.5	1,144.7
16:13	35.9	175.2	1,158.3
16:14	33.3	182.8	1,183.2
16:15	33.5	176.8	1,175.5
Average	42.6	182.1	1,455.6

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack
April 28, 1995

CALIBRATION BIAS 2

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
16:24:00	0.8	3.7	1.2
16:24:15	0.7	3.5	1.2
16:24:30	0.7	3.3	1.2
16:24:45	0.7	3.2	1.2
16:25:00	0.7	3.8	1.2
16:25:15	0.2	2.7	1.2
16:25:30	0.5	2.8	1.2
16:25:45	0.7	2.7	177.8
16:26:00	0.8	2.5	800.0
16:26:15	0.7	2.4	1,322.1
16:26:30	0.6	2.2	1,450.8
16:26:45	0.6	2.2	1,464.2
16:27:00	0.6	2.0	1,462.2
16:27:15	0.5	1.8	1,464.2
16:27:30	0.5	1.7	1,462.2
16:27:45	0.5	1.6	1,464.2
16:28:00	0.4	1.5	1,467.4
16:28:15	0.5	1.3	1,469.7
16:28:30	0.5	1.7	1,467.1
16:28:45	0.4	1.2	1,440.9
16:29:00	15.7	1.0	1,105.6
16:29:15	222.2	0.9	410.1
16:29:30	400.8	0.7	67.1
16:29:45	430.2	0.7	12.0
16:30:00	432.4	0.5	3.5
16:30:15	432.5	0.5	1.2
16:30:30	399.5	0.4	3.8
16:30:45	432.3	0.3	1.9
16:31:00	432.4	0.2	1.2
16:31:15	432.5	0.1	1.2
16:31:30	432.4	0.0	1.2
16:31:45	432.2	0.0	1.2
16:32:00	432.3	453.7	1.2
16:32:15	432.0	619.5	1.2
16:32:30	424.0	620.3	1.2
16:32:45	262.9	619.5	1.2
16:33:00	61.6	619.0	1.2
16:33:15	10.6	618.9	1.2
16:33:30	4.2	618.9	1.2
16:33:45	2.9	618.8	1.2
16:34:00	2.5	619.2	1.2
16:34:15	2.1	618.9	1.2
16:34:30	1.8	617.6	1.2
Zero Gas	0.5	0.1	1.2
Cal Gas	432.4	618.9	1,468.1

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
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REFERENCE METHOD RUN 3

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
17:00	35.5	152.6	546.0
17:01	33.4	157.0	544.1
17:02	33.1	157.4	542.3
17:03	34.7	157.8	547.2
17:04	36.9	149.7	553.4
17:05	37.6	155.9	565.3
17:06	36.8	156.6	574.6
17:07	35.2	157.6	577.9
17:08	35.3	155.6	573.6
17:09	36.0	155.9	563.7
17:10	36.9	156.5	568.4
17:11	37.7	158.8	563.2
17:12	44.0	155.1	553.6
17:13	44.3	154.3	550.0
17:14	43.2	154.4	527.8
17:15	42.4	153.9	518.8
17:16	39.4	153.1	509.9
17:17	35.6	150.6	500.7
17:18	36.2	149.0	487.6
17:19	34.6	146.9	483.6
17:20	35.8	142.6	471.8
17:21	36.4	142.4	461.1
17:22	39.6	141.9	453.8
17:23	40.7	140.7	457.4
17:24	39.3	141.7	445.2
17:25	40.0	136.7	435.7
17:26	38.3	142.0	430.3
17:27	39.5	142.1	443.5
17:28	36.8	142.5	455.6
17:29	37.7	141.1	446.0
17:30	38.3	139.7	431.2
17:31	38.2	134.3	427.0
17:32	35.2	141.0	423.4
17:33	35.9	139.0	434.1
17:34	36.4	142.0	443.5
17:35	37.2	140.7	441.1
17:36	37.2	139.4	438.4
17:37	37.7	137.0	431.2
17:38	36.1	139.8	423.5
17:39	36.4	134.8	424.2
17:40	35.3	139.8	422.4
17:41	37.0	136.2	422.4
17:42	35.4	136.5	420.8
17:43	37.4	135.5	410.3
17:44	35.8	135.5	405.2
Average	37.4	146.1	483.4

SOLVAY MINERALS, INC.
CAE Project No: 7473-2
EP 5 Calciner Stack
April 28, 1995

CALIBRATION BIAS 3

Time	NO_x (ppm)	THC (ppm)	CO (ppm)
17:50:48	1.0	4.4	1.2
17:51:03	0.9	4.2	1.2
17:51:18	0.9	4.0	1.2
17:51:33	0.8	3.7	1.2
17:51:48	0.8	3.6	1.2
17:52:03	0.8	3.3	1.2
17:52:18	0.7	3.1	1.2
17:52:33	0.8	3.0	1.9
17:52:48	0.8	2.8	72.8
17:53:03	0.8	2.6	568.4
17:53:18	0.8	2.4	1,177.9
17:53:33	0.7	2.2	1,405.1
17:53:48	0.8	2.1	1,454.3
17:54:03	0.7	2.0	1,460.0
17:54:18	0.7	1.8	1,460.0
17:54:33	0.7	1.7	1,460.0
17:54:48	0.6	1.5	1,462.2
17:55:03	1.1	1.3	1,327.6
17:55:18	83.5	1.2	732.5
17:55:33	324.8	1.0	207.4
17:55:48	288.4	0.9	26.0
17:56:03	424.6	0.7	7.1
17:56:18	432.3	0.7	6.1
17:56:33	433.2	0.5	2.2
17:56:48	433.2	0.5	1.2
17:57:03	433.2	0.3	1.2
17:57:18	433.0	0.2	1.2
17:57:33	433.2	0.1	1.2
17:57:48	433.1	519.7	1.2
17:58:03	433.0	618.9	1.2
17:58:18	423.8	621.0	1.2
17:58:33	256.2	622.1	1.2
17:58:48	56.9	622.3	1.2
17:59:03	9.8	622.5	1.2
17:59:18	4.2	622.7	1.2
17:59:33	3.2	623.1	1.2
17:59:48	2.6	622.7	1.2
Zero Gas	0.7	0.6	1.2
Cal Gas	433.1	622.5	1,460.0

SOLVAY MINERALS
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Run 1 - Short Flame

4/28/95 13:12	30	Methane			Carbon Monoxide		
		RT	AREA	AMT	RT	AREA	AMT
4/28/95 13:11	1	34.22	6144314	218	37.18	15758700	568
4/28/95 13:13	2	34.22	6071617	216	37.18	15554221	560
4/28/95 13:15	3	34.22	5463810	196	37.18	13720320	490
4/28/95 13:17	4	34.22	5304143	190	37.18	12966461	462
4/28/95 13:19	5	34.22	5930739	211	37.18	14107553	505
4/28/95 13:21	6	34.22	5452517	195	37.18	12836005	457
4/28/95 13:23	7	34.22	5527062	198	37.18	13819816	494
4/28/95 13:25	8	34.22	5704044	204	37.18	14460471	519
4/28/95 13:27	9	34.22	5694854	203	37.18	15300605	550
4/28/95 13:29	10	34.22	5483286	196	37.18	15157013	545
4/28/95 13:32	11	34.22	5946094	212	37.18	16537856	597
4/28/95 13:34	12	34.22	5415498	194	37.18	15811363	570
4/28/95 13:36	13	34.22	5721899	204	37.18	16311591	589
4/28/95 13:38	14	34.22	5515161	197	37.1	17603636	638
4/28/95 13:40	15	34.22	5883047	210	37.18	18107120	657
4/28/95 13:42	16	34.22	5462502	196	37.1	18411184	669
4/28/95 13:44	17	34.22	5361810	192	37.18	19463764	709
4/28/95 13:46	18	34.22	5891412	210	37.18	23950536	879
4/28/95 13:48	19	34.22	6099730	217	37.18	24988650	918
4/28/95 13:50	20	34.22	5687943	203	37.18	20426666	745
4/28/95 13:53	21	34.22	5836633	208	37.18	21367028	781
Average				**203**			**614**

SOLVAY MINERALS
CAE Project No: 7473-2
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Run 2 - Medium Flame

4/28/95 15:34	30	Methane			Carbon Monoxide		
		RT	AREA	AMT	RT	AREA	AMT
4/28/95 15:32	1	34.22	6014212	214	37.1	36393332	1351
4/28/95 15:34	2	34.22	6427585	228	37.1	38592632	1435
4/28/95 15:36	3	34.22	7211224	254	37.18	44847724	1672
4/28/95 15:38	4	34.22	7406210	261	37.1	46573532	1738
4/28/95 15:40	5	34.22	7798573	274	37.1	48063868	1794
4/28/95 15:42	6	34.22	7064523	249	37.1	44105276	1644
4/28/95 15:44	7	34.22	6844898	242	37.1	43119900	1607
4/28/95 15:47	8	34.22	7782866	273	37.1	48306296	1803
4/28/95 15:49	9	34.22	6748923	239	37.1	42993804	1602
4/28/95 15:51	10	34.22	6983939	246	37.1	43766192	1631
4/28/95 15:53	11	34.22	7645820	269	37.1	47680504	1780
4/28/95 15:55	12	34.22	7282787	256	37.1	45404312	1693
4/28/95 15:57	13	34.22	6993249	247	37.1	42373540	1578
4/28/95 15:59	14	34.22	7273192	256	37.1	44253352	1650
4/28/95 16:01	15	34.22	6569733	233	37.1	38843144	1444
4/28/95 16:03	16	34.22	7699754	270	37.1	44053080	1642
4/28/95 16:05	17	34.22	7036098	248	37.1	37755560	1403
4/28/95 16:08	18	34.22	6562382	232	37.1	33750328	1251
4/28/95 16:10	19	34.22	6817164	241	37.1	33515088	1242
4/28/95 16:12	20	34.22	7039660	248	37.1	33225300	1231
4/28/95 16:14	21	34.22	7003762	247	37.1	34215184	1269
Average				**249**			**1546**

SOLVAY MINERALS
CAE Project No: 7473-2
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Run 3 - Long Flame

4/28/95 17:01	30	Methane			Carbon Monoxide		
		RT	AREA	AMT	RT	AREA	AMT
4/28/95 16:59	1	34.22	4956632	179	37.1	15226750	548
4/28/95 17:01	2	34.22	4616815	168	37.1	14692640	527
4/28/95 17:03	3	34.22	4559999	166	37.1	15646779	564
4/28/95 17:05	4	34.22	4546123	165	37.1	15596406	562
4/28/95 17:07	5	34.22	4558703	166	37.1	15656520	564
4/28/95 17:10	6	34.22	4767326	173	37.1	16628494	601
4/28/95 17:12	7	34.22	4821296	174	37.1	15922911	574
4/28/95 17:14	8	34.22	4839570	175	37.02	14194332	508
4/28/95 17:16	9	34.22	4546410	165	37.02	13295568	474
4/28/95 17:18	10	34.22	4994923	180	37.02	14081048	504
4/28/95 17:20	11	34.22	4676287	169	37.02	13458878	481
4/28/95 17:22	12	34.22	4950700	179	37.1	13897177	497
4/28/95 17:24	13	34.14	4375058	159	36.94	12016455	426
4/28/95 17:26	14	34.06	4575115	166	36.86	13220171	471
4/28/95 17:28	15	34.14	4338622	158	37.02	11431014	404
4/28/95 17:31	16	34.22	4579812	166	37.02	12113542	429
4/28/95 17:33	17	34.22	4712663	171	37.02	12846076	457
4/28/95 17:35	18	34.22	4496627	163	37.02	12219916	434
4/28/95 17:37	19	34.22	4626966	168	37.02	12290176	436
4/28/95 17:39	20	34.22	4257749	156	37.1	11792561	417
4/28/95 17:41	21	34.22	4338794	158	37.1	11608712	410
4/28/95 17:43	22	34.22	4544039	165	37.1	11889913	421
Average				**168**			**487**

Solvay Minerals, Inc.
CAE Project No: 7473-2
May 6, 1995

Chromatagraphic Data Reduction

Limits of Detection

Compound	(ppm)
Hexane	0.23
Methylene Chloride	0.79
1,1,1-Trichloroethane	0.38
Benzene	0.13
2-Butanone	0.39
Toluene	0.20
Ethylbenzene	0.03
Xylene	0.01
Butadiene	0.03
Styrene	0.05

* LOD's are based on a lowest repeatable area of 1000

EP-5 Diagnostic Summary

Compound	4/28/95 Run 1 Short Flame (ppmwv)	4/28/95 Run 2 Medium Flame (ppmwv)	4/28/95 Run 3 Long Flame (ppmwv)	Average
Hexane	1.23	0.52	0.91	0.89
Methylene Chloride	1.48	1.08	2.18	1.58
Trichloroethane	1.96	0.86	2.19	1.67
Benzene	2.18	1.02	1.80	1.67
2-Butanone	0.45	BDL	0.62	0.36
Toluene	2.66	1.45	2.65	2.25
Ethylbenzene	0.25	BDL	3.76	1.34
Xylene	2.53	1.03	2.03	1.86
Butadiene	10.17	3.53	7.30	7.00
Styrene	0.31	0.19	0.31	0.27

EP-5 Diagnostic
April 28, 1995

Run 1
Short Flame

Compound	13:12 (ppmwv)	13:34 (ppmwv)	13:56 (ppmwv)	Average
Hexane	1.27	1.16	1.27	1.23
Methylene Chloride	1.48	1.45	1.51	1.48
Trichloroethane	2.48	1.71	1.70	1.96
Benzene	2.23	1.95	2.37	2.18
2-Butanone	BDL	0.72	0.62	0.45
Toluene	2.74	2.44	2.79	2.66
Ethylbenzene	0.23	0.25	0.28	0.25
Xylene	2.32	2.37	2.91	2.53
Butadiene	11.97	8.75	9.79	10.17
Styrene	0.21	0.26	0.46	0.31

Run 2
Medium Flame

Compound	15:32 (ppmwv)	15:54 (ppmwv)	16:15 (ppmwv)	Average
Hexane	0.31	0.47	0.79	0.52
Methylene Chloride	0.88	1.04	1.33	1.08
Trichloroethane	0.48	0.74	1.36	0.86
Benzene	0.58	0.88	1.61	1.02
2-Butanone	BDL	BDL	BDL	BDL
Toluene	0.89	1.42	2.03	1.45
Ethylbenzene	BDL	BDL	BDL	BDL
Xylene	0.72	1.09	1.29	1.03
Butadiene	1.15	1.87	7.58	3.53
Styrene	0.08	0.20	0.28	0.19

Run 3
Long Flame

Compound	16:58 (ppmwv)	17:19 (ppmwv)	17:42 (ppmwv)	Average
Hexane	0.76	0.79	1.17	0.91
Methylene Chloride	3.91	1.22	1.41	2.18
Trichloroethane	1.34	1.37	3.87	2.19
Benzene	1.82	1.53	2.04	1.80
2-Butanone	1.03	0.83	BDL	0.62
Toluene	2.28	2.11	3.56	2.65
Ethylbenzene	BDL	0.26	11.02	3.76
Xylene	1.21	1.54	3.35	2.03
Butadiene	7.16	7.39	7.36	7.30
Styrene	0.16	0.31	0.45	0.31

CHAIN OF CUSTODY

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CHAIN OF CUSTODY RECORD

№ 09531

PROJ. NO. 7473
DEPT. NO. 65
PROJECT NAME: SOLVAY
SAMPLERS: (Signature) Steve Feigen

LAB NO.	SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	M-5/202 GRAVAMETRICS, EXTRACTIONS						REMARKS
-01	085180	4/25/95	Ø	FILTER BLANK	1	X						
-02	085185	"	RUN 1	EP-1,2 STACK	1	X						
-03	085183	"	RUN 2	" "	1	X						
-04	085184	"	RUN 3	" "	1	X						
-05		"	Ø	H_2O BLANK	1	X						
-06		"	RUN 1	EP-1,2 F½ H_2O	1	X						
-07		"	" 2	" " "	1	X						
-08		"	" 3	" " "	1	X						
-13		"	" 1	EP-1,2 B½ H_2O	1	X						
-14		"	" 2	" " "	1	X						
-15		"	" 3	" " "	1	X						
-09		"	Ø	$MeCl_2$ BLANK	1	X						
-10		"	RUN 1	EP-1,2 B½ $MeCl_2$	1	X						
-11		"	RUN 2	" " "	1	X						
-12		"	RUN 3	" " "	1	X						

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Steve Feigen	5/1/95				
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by:	Date / Time		
		Robert [illegible]	05-08-95 14:45		

REMARKS:

Clean Air Engineering
500 W. Wood Street
Palatine, IL 60067
708/991-3300

SOLVAY 2016_6_000608

Job #: 7473
Solvay
Run Times

EP-5 4/27/95 Compliance

Run	Start	Stop
1	13:06	14:06
2	14:34	15:34
3	16:25	17:25

EP-1,2 4/28/95 Compliance

Run	Start	Stop
1	08:04	09:04
2	09:42	10:42
3	11:13	12:13

EP-5 4/28/95 Diagnostic

Run	Start	Stop
1	13:11	14:56
2	15:30	16:15
3	16:59	17:44

EP-1,2 4/25/95 Diagnostic M-5/202

Run	Start	Stop
1	11:45	13:27
2	14:19	15:54
3	16:57	18:30

Sort

2nd [illegible]

Job #: 7473 Solvay Minerals

268

25A

Run		EP-1,2 CO (ppm)	4/28/95 THC (ppm)	DSCFM	THC (lb/hr)	Methane (ppm)	Methane (lb/hr)	Non-Methane THC (lb/hr)	mine run	storage ore
8:04 - 9:04	1	433.0	54.7	238076	89.43	0	0	89.43	up to 8:40	8:40 → 10:20
9:48 - 10:48	2	432.3	44.8	237571	73.09	0	0	73.09	10:20 → 11:50	11:50 - 12:15
11:13 - 12:13	3	428.6	37.3	232734	59.62	0	0	59.62		
		✓ close	✓ close			✓	✓	$\bar{x}$ = 74.05		

Run		EP-5 CO (ppm)	4/27/95 THC (ppm)	DSCFM	THC (lb/hr)	Methane (ppm)	Methane (lb/hr)	Non-Methane THC (lb/hr)	
	1	339.3	201.2	41776	57.72	197	20.56	37.17	mine run ore
	2	249.0	146.0	46885	47.01	185	21.67	25.34	
157	3	220.6	122.0	46667	39.10	180	20.98	18.12	storage ore
		↓ alot higher	close			✓		$\bar{x}$ = 26.88	

+ less flame impingement sim

4/28/95

50,000 itemize