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Compliance Tests of the Envirotech Hooded Quench Car No. 103 Operated on the Number 20 Coke Battery Located at the United States Steel Clairton Works

U.S.

File No. 50.74

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Clairton, PA 15025

Project No. 50.74

September 11, 1985

Prepared by:
Dr. R.G. Patterson

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INTRODUCTION

This report covers test work performed by Air Pollution Technology, Inc. (APT) in cooperation with United States Steel Corporation (USSC) and Envirotech Corporation (EVT) on the Envirotech Hooded Quench Car No. 103 (HQC) operating on the No. 20 coke batteries located at the USSC's Clairton Cokeworks. The purposes of these tests were to measure the particulate and visible emissions from the HQC.

The EVT HQC system is designed to capture and remove particulates from the hot gases during coke-pushing operations. The basic HQC System consists of three major components.

1. A self propelled Control Car, which houses all induced draft and gas cleaning equipment. This car carries the Aeronetics Hot Water Scrubber that provides both the draft required to capture the gases at the system inlet and the fine water drops required to collect particulates in the gas stream during the scrubbing process.
2. A One-Spot Hooded Quench Car, which consists of a tilting coke box covered by a fixed hood to contain the gases so that they can be drawn into and through the control car for cleaning. The hood encloses the quench car on three sides and the top, with the side facing the ovens open to receive the coke pushed.
3. Minor modifications, as required, to the existing coke quide to prevent gases from escaping to the atmosphere during the coke push. Wings are added to the face of the coke quide on both sides of the coke discharge opening. The wings align with the open face of the quench car hood when the car is positioned for the push.

The Aeronetics hot water scrubber, considered the "heart" of the system, incorporates a two-phase adjustible jet nozzle in which water is ejected to perform the dual functions of gas

movement and gas scrubbing. The water/vapor combination in the scrubber is referred to as a two-phase phenomenon.

The Aeronetics scrubber directs pressurized hot water to provide the energy for moving large quantities of gas through the scrubbing system. The nozzle's jet ejector effect transfers momentum from the liquid to the gas. Additionally, the jet nozzle atomizes the liquid and accelerates it to velocities of more than 1,000 feet per second, thereby creating a large velocity differential between the drops and the suspended particles in the gas stream. This relative velocity causes inertial impaction between the drops and the particles. As inertial impaction occurs, the particles are deposited on the drops, which are then removed from the gas stream by means of an entrainment separator. The cleaned gas exits into the atmosphere and the particulated liquid flows into a drain.

Recently, EVT made several modifications to the basic HQC system to improve the particle collection efficiency. They are as follows:

1. The effectiveness of the quench car hood was increased by extending the transition duct into the hood so as to cause more symmetrical gas flow within the hood. This increases the efficiency of fugitive emissions capture.
2. The collection efficiency was increased by pre-conditioning the gas prior to entering the Aronetics scrubbers by spraying water into the gas stream. This increases the liquid to gas (L/G) ratio in the scrubber throat.

The particle mass concentration was measured at the outlet of the HQC with an EPA Method 5 sampling train. The visible emissions observations were done simultaneously with the particulate mass concentration measurements at the request of the Allegheny County Health Department Bureau of Air Pollution Control (BOAPC). The compliance test results presented in this report are for tests completed on July 24, 25 and 26, 1985. All tests were completed while the car was receiving and transporting coke from the Number 20 coke battery.

SUMMARY

The following points summarize the results of the compliance tests completed on the EVT Hooded Quench Car No. 103. Three compliance tests were conducted during normal coking conditions.

1. The average particulate mass emission rate was 0.015 lb/ton of coke for the three compliance tests. This coke battery is subject to the LAER Standard which is 0.040 lb/ton of coke.

2. As requested, (Appendix G) visible emission readings were observed simultaneous during the particulate mass emission compliance testing with the test car attached to the HQC system. The test car added additional pressure drop to the system which decreases the gas flow rate and the ability of the HQC system to capture fugitive emissions.

   The approved testing protocol, Appendix F, provides for opacity observation to be made with disconnection of the test car. Such test car disconnection will improve the visible emission performance.

   The visible emission results, based on the above conditions, meets the intent of the Consent Degree visible emission requirements.

OBJECTIVES

The compliance tests reported here were completed under the joint USSC/EVT Compliance Test Program and were observed by the BOAPC. The test work was authorized by United States Steel Corporation and had the following objectives:

1. Measure the particulate mass emissions from the HQC according to the Compliance Test Protocol presented in Appendix F.

2. Observe the visible emissions from the HQC according to the Compliance Test Protocol presented in Appendix F.

3. Compliance test protocol presented in Appendix F complies with the USSC consent decree, as modified, for coke pushing emissions and has been approved by the Allegheny County Health Department, Bureau of Air Pollution Control, Pennsylvania Department of Environmental Resources and the Environmental Protection Agency.

Battery 20 is considered a new source and is subject to the Lowest Achieviable Emission Rate (LAER) standard. Pursuant to the Consent Decree, as modified, the applicable LAER emissions standards for particulates, and as discussed with the regulatory agencies, are as follow:

1. Particulate mass emission less than or equal to 0.04 pounds per ton of coke pushed.

2. Visible emissions during push and travel less than 20 percent.

3. USSC has been informed by BOAPC, as shown in Appendix G, that opacity standards during travel should be less than 20% since USSC uses pushing emission control devices.

APPROACH

1. Carry out particulate mass and visible emission measurements on the HQC system. This involved the following:

   a. Two of the test personnel were on the test car to operate the particulate mass emission sampling apparatus. One of the personnel operated the sampling train control module. The other person measured the gas velocity head and converted that number into a sample train flowrate for the sample train operator. This helped the sample train operator maintain isokinetic sampling conditions. The second person also signaled the start, stop and change from push to travel modes for the sample train operator.
   b. One test person was assigned to measure the visible emissions from the HQC system during the push and travel cycles.
   c. One test person was assigned to ride in the cab of the HQC control car to record the car operating parameters.
   d. All process operating data were supplied by the Clairton Cokeworks Operations personnel.

2. Analyze all samples in a field lab set up in a construction trailer at the test site. The analyses were completed by the sample crew leader.

3. Reduce and analyze the test data.

4. Determine the particulate and visible emission performance of the HQC and compare these results with the LAER emission standards.

TEST PERSONNEL AND OBSERVERS

Following is a list of test personnel and observers:

Field Test Personnel:

Dr. Ronald G. Patterson, Testing Manager
Mr. Bruce C. DaRos, Field Test Crew Leader
Mr. Sherman Smith, Sampling Train Operator
Mr. Cary Milburn, Sampling Train Operator
Mr. Dan Petrovay, Visible Emissions Observer

Allegheny County Board of Air Pollution Control Observers:
Mr. William J. Logan, Air Pollution Control Technician
Mr. Thomas Kelly, Coke Oven Technician
Mr. Clarence Carey, Coke Oven Technician
Mr. Dan Nadzan, Coke Oven Technician

USSC Personnel:
Mr. Joseph Connelly, Project Engineer
Mr. Larry Gainer, Division Superintendent, Gas & Coke
Mr. Roy Weiskircher, Senior Environmental Engineer
Mr. Randy York, Environmental Consultant
Mr. Michael J. McKelvey, Field Construction Manager
Mr. James E. McKoy, BEC Visible Emissions Observer

EVT Personnel:
Mr. Patrick J. Reilly, Vice President and Project Manager
Mr. Ned H. Ford, Field Construction Manager
Mr. Ira Lapof, Field Construction Superintendent
Mr. Lee Trexler, Control Car Operator

Consultants to EVT:
Dr. Seymour Calvert, Environmental Engineering and Testing Consultant
Mr. Frank Lauer, Coking Consultant

TEST SITE AND OPERATING CONDITIONS

Metallurgical grade coke is produced by USSC at the Clairton Works by heating coal in an inert atmosphere at approximately 2,600°F for a period of 18 to 21 hours to drive off volatile compounds and impurities, such as sulfur.

Each coke battery consists of a number of ovens which are charged from the top with a coal mixture. The coal mixture is heated by circulating hot gas through flues which form the walls of the ovens. At the end of the heating cycle the coke is pushed from the oven into a coke quench car which transports the incandescent coke to the quench tower. After quenching, the coke is then transported to a wharf which acts as a surge bin for holding the coke and continously loading it onto a belt for conveyance to the coke storage system.

The EVT HQC system is designed to capture and remove particulates from the hot gases during coke-pushing operations. The basic HQC System consists of three major components as shown in Figure 1.

1. A self propelled Control Car, which houses all induced draft and gas cleaning equipment. This car carries the Aeronetics Hot Water Scrubber that provides both the draft required to capture the gases at the system

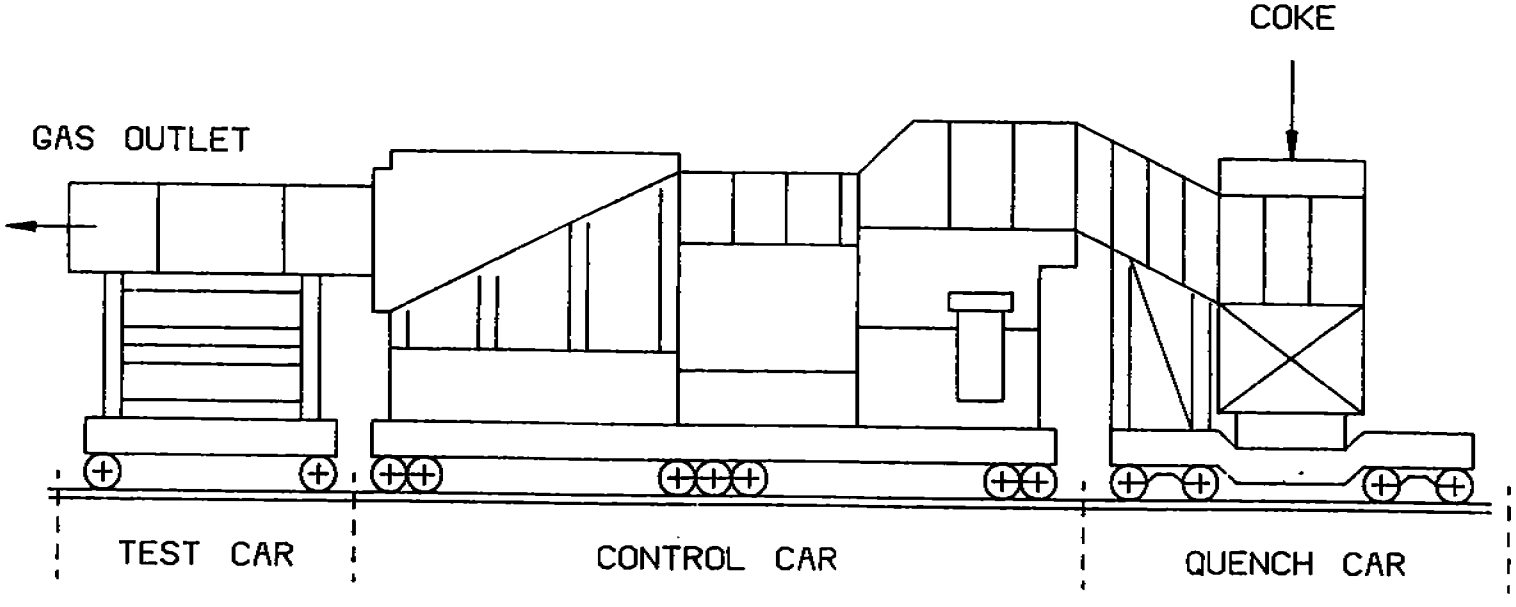

Figure 1. Envirotech Hooded Coke Quench Car System.

inlet and the fine water drops required to collect particulates in the gas stream during the scrubbing process.

2. A One-Spot Hooded Quench Car, which consists of a tilting coke box covered by a fixed hood to contain the gases so that they can be drawn into and through the control car for cleaning. The hood encloses the quench car on three sides and the top, with the side facing the ovens open to receive the coke pushed.
3. Minor modifications, as required, to the existing coke guide to prevent gases from escaping to the atmosphere during the coke push. Wings are added to the face of the coke quide on both sides of the coke discharge opening. The wings align with the open face of the quench car hood when the car is positioned for the push.

The Aeronetics hot water scrubber, considered the "heart" of the system, incorporates a two-phase adjustible jet nozzle in which water is ejected to perform the dual functions of gas movement and gas scrubbing. The flow of the water/vapor combination in the scrubber is referred to as a two-phase phenomenon.

The Aeronetics scrubber directs pressurized hot water to provide the energy for moving large quantities of gas through the scrubbing system. The nozzle's jet ejector effect transfers momentum from the liquid to the gas. Additionally, the jet nozzle atomizes the liquid and accelerates it to velocities of more than 1,000 feet per second, thereby creating a large velocity differential between the drops and the suspended particles in the gas stream. This relative velocity causes inertial impaction between the drops and the particles. As inertial impaction occurs, the particles are deposited on the drops, which are then removed from the gas stream by means of an entrainment separator. The cleaned gas exits into the atmosphere and the particulated liquid flows into a drain.

Recently, EVT made several modifications to the basic HQC system to improve the particle collection efficiency. They are as follow:

1. The effectiveness of the quench car hood was increased by extending the transition duct into the hood so as to cause more symmetrical gas flow within the hood. This increases the efficiency of fugitive emissions capture.
2. The collection efficiency was increased by pre-conditioning the gas prior to entering the Aronetics scrubbers by spraying water into the gas stream. This increases the liquid to gas (L/G) ratio in the scrubber throat.

Process condition data for the HQC System were recorded for each traverse point as shown in Appendix A. Table 1 shows the average data for the HQC system for each of the compliance tests. During this test series the average production rate for coke battery number 20 was 14.5 tons of coke per oven.

TESTS RESULTS

The results from the compliance tests run on the HQC System as described on page 1 are presented in this section:

Test Number	Date	Test Type	Coking Conditions
801	7/24/85	Compliance	Normal
802	7/25/85	"	"
803	7/26/85	"	"

Table 2 summarizes the test conditions for each of the tests. Tables 3 through 5 show the particulate emission results for the compliance tests. Table 5 compares the particulate emission rate in lb/ton of coke pushed to the LAER emission standard for each of the tests. The results of the visible emission observations are summarized in Table 6.

TEST METHODS

The tests results presented in this report were completed according to the Compliance Test Protocol shown in Appendix F. The particulate emission tests were completed with the Method 5 particulate emission sampling system modified as approved for these tests, as shown in Figure 2. The probe, cyclone and filter holder were Teflon lined or coated. Two impinger trains were used in parallel to acommodate the high sample flowrate required to collect a sample volume greater than 30 dscf.

The 24 sampling locations are shown in Figure 3. A cyclonic flow test completed on July 23, 1985 showed an average cyclonic flow angle of 0.2 degrees for all points during push and travel. The results of the cyclonic flow test are shown in Appendix I. All sample analysis was completed in a field laboratory set up in a construction trailer near the test site.

All fugitive visible emission observations were completed simultaneously with the particulate emission tests. The test car was attached during the visible emission observations. This increased the pressure drop that the Aeronetics nozzle had to overcome, which decreased the gas flowrate and the ability of the HQC System to capture fugitive emissions during these tests.

TABLE 1. AVERAGE HQC SYSTEM PROCESS CONDITION DATA

Test Number	801		802		803	
	Push	Travel	Push	Travel	Push	Travel
Nozzle Water Flowrate, gpm	425	120	406	120	420	120
Water Temp, deg F	420	420	420	420	420	420
Water Press, psig	277	268	274	265	278	268
Annubar Vel Head, in. WC						
Scrubber Temp In, deg F	155	219	154	253	154	215
Scrubber Temp Out, deg F	162	158	160	159	162	159
Quench H2O Flowrate, gpm*	400	0	400	0	400	0

* The quench water flowrate was assumed to be 400 gpm from the pump specifications, since there is no flowmeter on this system.

TABLE 2. SUMMARY OF COMPLIANCE TEST CONDITIONS

Test Number	801		802		803	
	Push	Travel	Push	Travel	Push	Travel
Avg Gas Vel, fps	62.2	41.2	66.6	42.1	65.5	43.4
Avg Gas Flow rate, acfm	119987	79491	128400	81112	126242	83734
Avg Gas Flow rate, dscfm	67610	45036	73275	46347	69407	46246
Gas Temp, deg F	162	158	160	159	162	159
Gas Press, in. Hg	29.28	29.28	29.30	29.30	29.15	29.15
Samp. Vol., dscf (corr.)	20.15	8.84	28.25	13.07	25.57	11.96
% Isokinetic	96	104	93	111	95	97
		Total		Total		Total
Samp. Vol., dscf (corr.)		28.99		41.32		37.53
Dry Gas Comp.						
CO2 (vol %)		1.2		1.9		1.9
O2 (vol %)		18.5		18.6		18.9
CO (vol %)		0.0		0.0		0.0
N2 (vol %)		80.3		79.5		79.2
Moisture, vol%						
M-5		32.22		31.56		33.88
Sat.		33.09		33.70		33.55
Mol Wt,						
Dry		28.93		29.05		29.06
Wet		25.41		25.56		25.35
Front-half Part., mg		14.00		55.21		39.88
Back-half Part., mg		1.30		1.05		2.25
Total DER Part, mg		15.30		56.26		42.13

TABLE 3. TOTAL PENNSYLVANIA DER PARTICULATES*

Test Number	Number of Pushes	Part. Conc. gr/dscf	Part. Rate, lbs/hr	Part. Rate, lb/ton coke	Allowable, lb/ton coke
801	24	0.0081	0.43	0.0078	0.0400
802	24	0.0210	1.26	0.0213	0.0400
803	24	0.0173	0.95	0.0163	0.0400
Avg		0.015	0.88	0.015	0.040

* Includes total front-half, plus insoluble back-half

TABLE 4. FRONT-HALF PARTICULATES*

Test Number	Number of Pushes	Part. Conc. gr/dscf	Part. Rate, lbs/hr	Part. Rate, lb/ton coke
801	24	0.0075	0.39	0.0071
802	24	0.0206	1.24	0.0209
803	24	0.0164	0.90	0.0155
Avg		0.015	0.84	0.014

* Includes filter and front-half acetone and water washes

TABLE 5. BACK-HALF PARTICULATES*

Test Number	Number of Pushes	Part. Conc. gr/dscf	Part. Rate, lbs/hr	Part. Rate, lb/ton coke
801	24	0.00069	0.037	0.00066
802	24	0.00039	0.024	0.00040
803	24	0.00093	0.051	0.00087
Avg		0.00067	0.037	0.00064

* Includes 0.22 micron filter catch of impinger solution

TABLE 6. SUMMARY OF VISISBLE EMISSION OBSERVATIONS

Test No.		801		802		803	
Point No.		Opac >20%	Sec >20%	Opac >20%	Sec >20%	Opac >20%	Sec >20%
1.6	P	25	3.2				
	T						
1.5	P					45	9.7
	T						
1.4	P						
	T						
1.3	P						
	T						
1.2	P					30	6.2
	T						
1.1	P						
	T						
2.6	P	20	1.0	20	1.9		
	T						
2.5	P	35	4.1			20	1.6
	T						
2.4	P						
	T						
2.3	P			25	2.4		
	T						
2.2	P						
	T						
2.1	P			20	1.1		
	T						
3.6	P						
	T						
3.5	P					20	1.5
	T						
3.4	P					20	1.0
	T						
3.3	P			35	4.7		
	T						
3.2	P						
	T						
3.1	P						
	T						
4.6	P						
	T						
4.5	P			20	1.3		
	T						
4.4	P						
	T						
4.3	P						
	T						
4.2	P						
	T						
4.1	P						
	T			25	3.1		
No./test		3		6		5	
Sec/test			8.3		14.5		20

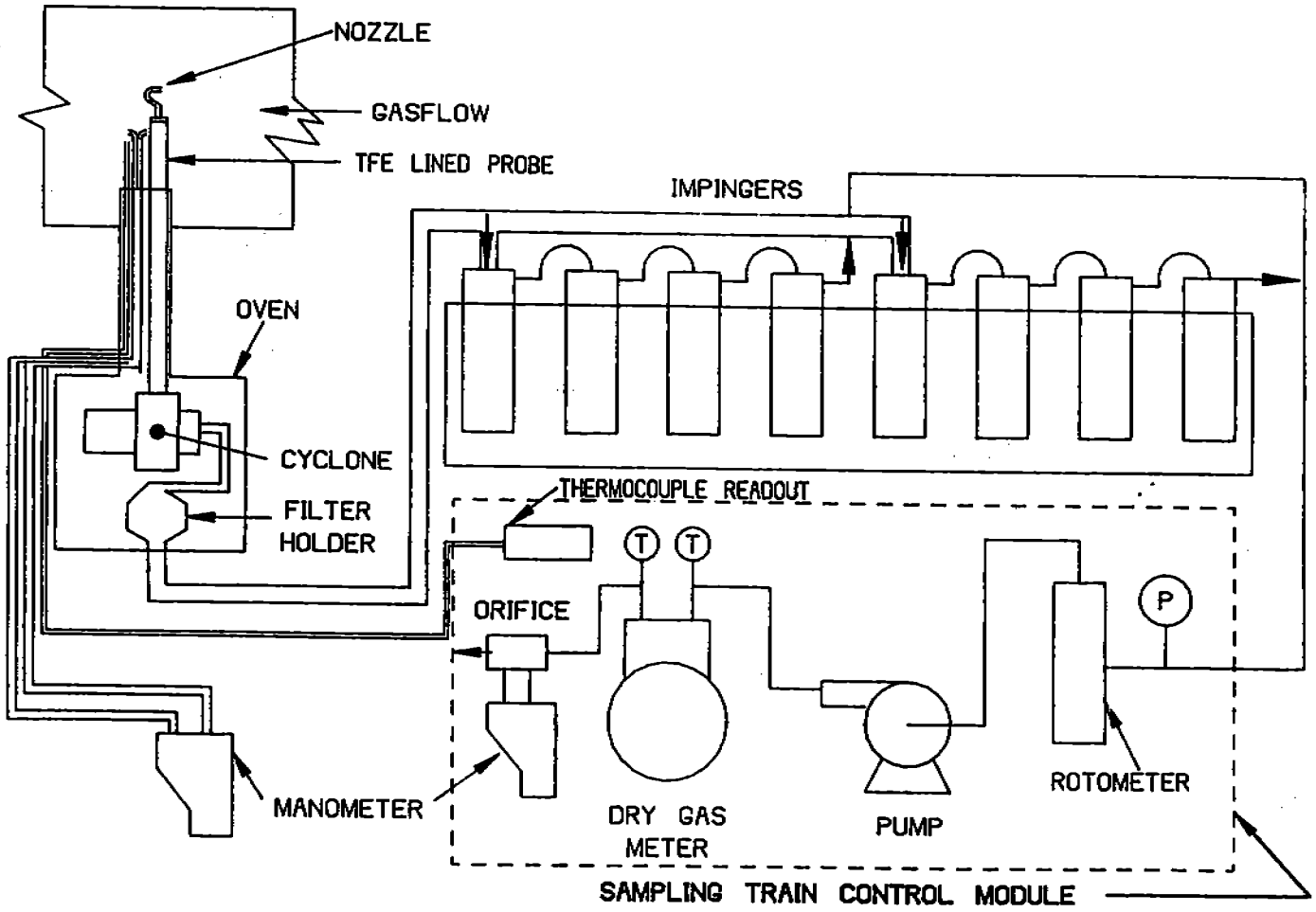

Figure 2. Method 5 Sampling Apparatus.

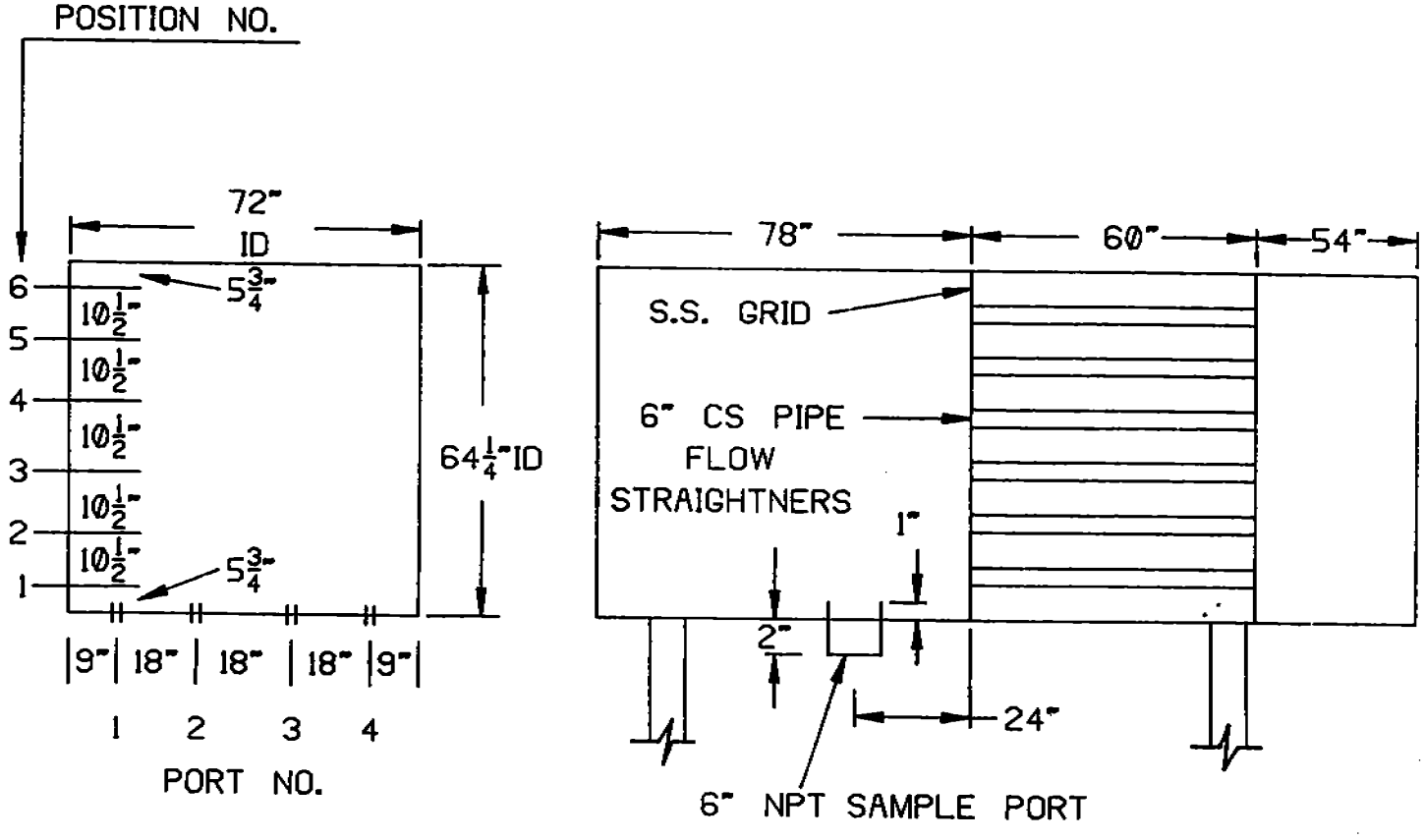

Figure 3. Test Car Duct Sampling Arrangement.

APPENDIX B

SAMPLE TRAIN DATA SHEETS

Plant US STEEL - CLAIRTON, PA
Date 7-24-95
Sample Location HCQS. - TEST CAR
Sample Type M-5
Run Number 8.1 (H-3-3)
Operator SMITH & MILBURN
Ambient Temperature ___
Barometric Pressure ___
Static Pressure, (H_2O) - 0.47 (P)
Filter Number(s) RA102G-054

Leak Check: Initial at 15" Hg, .015 CFM
Final at ___" Hg, ___ CFM
Pitot Leak Check: OK

Impinger Volumes

	Initial	Final	Net Gain
TRAIN A	100	352	252
	100	100	0
	MT	1	1
TRAIN B	100	122	22
	100	100	0
	MT	2	2

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Silica Gel

A	675.3	684.9	___
B	653.0	662.2	___

SASS Condensate ___
Total Volume ___

Probe Length and Type 5 ft TFE
Nozzel Size & I.D. .215
Pitot Coefficient & I.D. 0.825 (S-1)
Assumed Moisture ___
Molecular Weight, Dry, (M_d) ___
Meter Box Number DGT 12/14 MOD
Meter Coefficient ___
α Factor ___
K = ___
$K(Nd)^4$ = ___ x (___)^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)$ [P]

pH = 5.5

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Rotameter / Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
	Init.	148.020												
1.6	1:05	~~148.900~~	1.4	.47	.47	164	275	70°		257	69	69	3.5	~~.35~~
	1:21	149.540	.48	.15	.26	157	283	70		259	67	69	1.0	
1.5	1:47	150.025	.50	.16	.16	163	275	70°		271	71	71	1.0	
	1:41	150.530	.52	.04	.05	161	276	70°		272	73	73	1.0	
1.4	1:10	151.115	.40	.13	.13	162	276	70°	68	275	74	74	1.0	
	1:52	151.375	.15	.04	.04	159	277	70°	71	276	76	76	1.0	
1.3	1:04	152.040	.63	.20	.19	159	276	72°	68	273	78	77	2.0	
	1:30	152.257	.20	.22	.18	157	276	72°	71	272	78	77	2.0	
AVG.														

7602/5/81/Rev 1

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft 3	Velocity Head (Δp), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature of					Gas Meter		Pump Vacuum in Hg	Avg. $\sqrt{\Delta p}$
				Desired	Actual	Stack	Probe	Impinger	Rotameter Organic Module	Oven	In	Out		
		Init. 152.257												
1.2	:57	153.160	1	.32	.37	164	276	75°	16.8	267	80	79	2.5	
	1:40	153.363	.35	.12	.12	160	274	75°	9.1	249	80	77	1.0	
1.1	1:02	154.125	1.7	.57	.55	159	274	74°	21.1	275	82	81	3.0	
	1:47	154.935	.59	.18	.17	156	276	75°	11.6	275	82	82	1.5	
2.6	1:01	155.760	1.5	.51	.50	164	278	76°	19.8	293	85	85	2.0	
	1:22	156.135	.68	.17	.15	162	281	76°	11.1	293	85	85	1.0	
2.5	1:01	156.920	.60	.51	.17/.21	164	269	76°	19.8	284	86	86	2	
	1:30	157.260	.5	.16	.17	160	276	76°	10.7	283	86	86	1.0	
2.4	1:02	158.025	.20	.51	.23/.25	163	269	77°	19.8	255	87	87	2.0	
	1:39	158.400	.45	.16	.14	160	271	77°	10.7	261	87	87	1.0	
2.3	1:01	159.120	1.3	.44	.5/.51	162	270	77°	18.3	263	87	87	2.0	
	1:30	159.470	.7	.15	.09	158	270	77°	10.5	263	87	87	0.5	
2.2	1:04	160.285	.95	.37	.27/.31	160	267	77°	16.8	261	88	88	2.5	
	1:53	160.650	.45	.14	.14	160	273	77°	10.1	261	88	88	0.5	
2.1	1:00	161.750	1	.69	.5/.58	159	272	78°	23.1	264	89	89	5.0	
	(24)			.24	.22	159	272	78°	13.4	264	89	89	1.5	
Avg.														

Run No. 8.1 Date 2-24-85 Sampling Location HCQC - TEST CAR

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft 3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F					Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Init.		Desired	Actual	Stack	Probe	Impinger	~~Organic Module~~ Rdb	Oven	In	Out		
3.6	1:00	163.040	.25	.23	.20	164	271	80°	14.5	239	90	90	2.0	
	1:30 /	163.390	.45	.14	.12	158	269	80°	9.1	224	90	90	0.5	
3.5	1:03	164.130	.63	.28	.22	159	269	80°	12.2	262	91	91	2.0	
	1:34 /	164.365	.35	.12	.12	150	273	80°		222	91	91	0.5	
3.4	1:00	165.270	.95	.31	.24/.2	161	278	80°		266	92	92	2.0	
	1:41 /	165.585	.45	.14	.16	157	275	30°		246	92	92	0.5	
3.3	1:00	166.285	.65	.33	.23	162	269	80°		272	93	93	2.0	
	1.28 /	166.575	.4	.13	.13	157	276	79°		265	93	93	0.5	
3.2	1:01	167.255	.6	.22	.24	162	271	81°		270	94	94	2.0	
	1:33 /	167.570	.2	.08	.08	158	270	81°		270	94	94	0.5	
3.1	1:03	168.415	.9	.33	.32	162	272	80°		269	95	94	2.0	
	2:09 /	168.990	.4	.13	.12	159	276	80°		269	95	94	.05	
4.C	1:00	169.700	.5	.21	.16	160	274	81°		268	95	95	1.0	
	1:34 /	169.950	.3	.13	.10	157	274	81°		268	95	95	0.5	
4.5	1.01	170.185	.50	.14	.26	161	268	82°		269	96	95	.05	
	1:39 /	170.837	.25	.08	.08	156	273	82°		269	96	95	.05	
AVG.														

Run No. 3.1 Date 2-24-65 Sampling Location HCQC - TEST CAR

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F					Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	Organic Module	Oven	In	Out		
	Init.													
4.4	1:03	171.640	1.3	.28	.40	162	270	80°		269	96	95	3.0	
	1:48	172.200	.5	.13	.13	157	266	80°		268	96	95	2.0	
4.3	1:04	173.160	1.5	.51	.46	160	271	80°		268	97	96	4.0	
	1:35	173.570	.65	.21	.15	156	275	80°		268	97	97	0.5	
4.2	1:01	174.530	1.5	.50	.47	162	*172	80°		268	97	97	4.0	
	1:40	174.945	.52	.17	.14	157	*171	80°		268	97	97	1.0	
4.1	1:04	175.710	.85	.32	.27	161	269	80°		269	97	96	2.0	
	1:49	176.190	.59	.13	.14	159	272	80°		268	96	96	1.0	
AVG.	6.5 hr total test time													

Run No. 8.1 Date 7-24-85 Sampling Location HCQC - TEST CAR

* Probe accidentally came out of sample hole

Comments:

DRY MOLECULAR WEIGHT DETERMINATION

PLANT US STEEL CLAIRTON, PA
DATE 2-24-85
SAMPLING TIME (24 hr CLOCK)
SAMPLING LOCATION HCaC #3-3
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS GRAB) INTEGRATED BAG
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE
OPERATOR DWR

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	1.8		1.8		1.8			44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.4		20.2		20.4			32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	20.4		20.2		20.4			28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Durr) 230
4/72

FIELD DATA

Plant US STEEL - CLAIRTON, PA
Date 7-25-85
Sample Location HCQC - TEST CAR
Sample Type M-5
Run Number 8.2
Operator SMITH / MILLIGAN
Ambient Temperature 75°
Barometric Pressure ___
Static Pressure, (H_2O) -.47
Filter Number(s) EA-1026-055
N/A
Leak Check: Initial at .010 in. Hg, .15 CFM
Final at .005 in. Hg, .10 CFM
Pitot Leak Check: OK

Impinger Volumes

	Initial	Final	Net Gain
TRAIN A	100	350	
	100	146	
	M/I	M/I	
TRAIN B	100	180	
	100	107	
	M/I	M/I	
Silica Gel A	660.2	669.5	
B	627.9	640.7	
BASS Condensate			
Total Volume			

Probe Length and Type 5 ft TFE
Nozzel Size & I.D. .317
Pitot Coefficient & I.D. .825
Assumed Moisture ___
Molecular Weight, Dry, (M_d) ___
Meter Box Number ___
Meter Coefficient ___
α Factor ___
K = ___
$K(Nd)^4$ = ___ x (___)^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)$ (P)

pH = 8.2

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Rotometer Orifice Pressure Differential (ΔH), in. H_2O Desired	Actual	Temperature °F Stack	Probe	Impinger	ΔH Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
	Init.	195.835												
1.6	1:08	197.500	1.4	26.0	26.0	162	273	70°	.82	271	75	75	3.0	
	1:39	197.715	.48	14.5	14.5	158	279	70°	.32	270	75	75	0.5	
1.5	1:03	198.645	.63	14.8	16.8	163	276	71°	.40	270	76	75	0.5	
	1:27	198.790	.20	6.7	.11ΔH	161	279	71°	.11	270	76	75	0.5	
1.4	1:00	199.400	.40	13.0	13.0	163	275	71°	.30	270	78	77	2.0	
	1:40	199.730	.15	7.3	.08ΔH	159	277	71°	.08	270	78	77	0.5	
1.3	1:03	200.700	.63	16.8	16.8	163	274	71°	.37	269	79	77	3.0	
	1:38	201.040	.20	8.7	.11ΔH	160	278	71°	.11	269	80	77	0.5	
AVG														

7602/5/81/Rev 1

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Rotameter Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F			ΔH Organic Module		Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger		Oven	In	Out		
		Init. 201.040												
1.2	1:02	202.220	1.1	22.8	22.8	163	276	70°	.66	268	81	81	5.0	
	1:27	202.520	.37	12.7	12.7/10	160	274	70°	.11	269	82	81	1.0	
1.1	1:01	203.825	1.7	28.5	28.5	161	273	70°	.67	274	84	84	5.0	
	1:36	204.360	.50	15.9	15.0	159	271	70°	.20	275	84	84	1.0	
2.6	1:00	205.700	1.5	26.9	26.9	163	274	70°	.84	277	85	85	4.5	
	1:42	206.350	.63	15.3	16.8	159	278	70°	.32	277	86	86	1.0	
2.5	1:00	207.570	1.5	26.9	26.9	162	275	70°	.82	279	86	86	6.5	
	1:25	208.040	.5	14.8	14.8	160	279	70°	.19	280	87	87	1.0	
2.4	1:00	208.380	1.5	26.9	26.9	162	274	71°	.84	279	88	88	6.5	
	1:38	209.840	.5	14.8	14.8	159	277	71°	.19	279	88	88	2.0	
2.3	1:01	210.100	1.3	24.9	24.9	162	274	72°	.76	279	89	89	6.0	
	1:45	211.650	.48	14.5	14.5	160	278	72°	.27	279	89	89	2.0	
2.2	1:02	212.820	1.1	22.8	22.8	160	274	72°	.66	279	90	90	5.0	
	1:29	213.170	.45	13.9	13.9	159	278	72°	.24	279	90	90	2.0	
2.1	1:03	214.590	2.0	31.2	31.2	167	276	70°	1.0	278	90	90	8.5	
	1:35	215.155	.75	18.4	18.4	162	273	70°	.37	278	90	90	3.0	
AVG														

Run No 8-2 Date 7-25-85 Sampling Location HCRC - TEST CAR

Comments

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	ΔH Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
	Init.	215.155												
3.6	1:01	216.410	1.5	17.9	18.8	162	277	70°	.68	279	90	90	6	
	1:52	217.220	.6	14.0	14.0	158	279	70°	.39	279	90	90	3.0	
3.5	1:01	218.340	1.1	19.8	20.8	160	275	71°	.61	278	91	91	5.0	
	1:55	218.770	.38	12.7	12.7	157	280	71°	.13	279	91	91	2.5	
* 3.4	1:??	218.985 Abort	.85	22.7	19.8/22.1	153	274	71°	.54/.65	279	91	91	4.0	
	1:00	220.990	.40	14.0	14.0	152	275	71°	.19	279	91	91	2.0	
	1:40	220.600												
3.3	1:00	221.645	.85	22.7	19.8/21	162	274	72°	.50/.62	280	91	91	4.0	
	1:34	222.100	.45	14.0	14.0	158	281	72°	.20	279	92	92	2.0	
3.3	1:02	223.100	.75	21.7	18.4	163	274	73°	.45	279	92	91	4.0	
	1:41	223.790	.35	13.1	12.7	159	280	73°	.21	279	92	92	2.0	
3.2	1:01	224.700	.63	17.7	17.0	162	277	74°	.39	279	92	92	3.5	
	1:42	225.085	.27	10.4	10.4	159	274	74°	.15	279	92	92	1.0	
4.6	1:02	226.080	.97	21.6	21.6/20	163	277	76°	.59/.51	279	92	92	4.0	
3.1	1:54	226.775	.40	13.0	13.0	160	277	76°	.17	279	92	92	1.0	
4.5	1:01	227.775	.75	17.1	22.7/84	161	276	76°	.62/.44	279	92	92	4.0	
4.6	1:54	228.440	.40	13.1	13.1	158	276	76°	.26	278	92	92	1.0	
AVG.														

Run No. 8.2 Date 7-25-85 Sampling Location HCQC - TEST CAR

Comments: * No push - too late to abort (Aborted 1st try in 15 sec. ok) will retest point at EVT request

Page ___ of ___

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (Δp_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F					Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta p}$
				Desired	Actual	Stack	Probe	Impinger	ΔH Organic Module	Oven	In	Out		
	Init.	228.440												
4.9	1:07	229.150	.30	14.0	17.1/10.0	163	277	77°	.16	280	93	93	1.0	
	1:33	229.440	.25	10.0	10.0	163	280	77°	.16	280	93	93	1.0	
4.3	1:55	230.125	1.5	19.8	26.9	160	279	77°	.82	278	93	93	1.0	
	1:30	230.880	.45	13.1	14.8	159	279	77°	.19	278	93	93	1.0	
4.3	1:01	232.190	1.7	26.4	28.5	163	277	77°	.82/.92	280	94	93	7.0	
	1:43	232.775	.65	17.1	17.1	158	279	77°	.26	280	94	94	3.0	
4.2	1:00	233.925	1.5	26.7	26.7	159	274	76°	.83	280	94	94	6.5	
	1:29	234.450	.6	15.1	16.0	159	277	77°	.36	280	94	94	3.0	
4.1	:58	235.380	.9	21.1	21.0	163	275		.55	278	94	94	5.0	
	1:38	235.905	.5	13.1	14.8	160	276		.18	278	94	94	2.0	
AUG.														

Run No. 8.2 Date 7-25-85 Sampling Location HCRC - TEST CAR

Comments:

DRY MOLECULAR WEIGHT DETERMINATION

PLANT USS - SCAIRTON, PA

DATE 7-25-85

SAMPLING TIME (24-hr CLOCK) _____

SAMPLING LOCATION ACID H-3-5

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS GRAB) INTEGRATED BAG

ANALYTICAL METHOD ORSAT

AMBIENT TEMPERATURE ~ 80 °F

OPERATOR [illegible]

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	1.8		2.0		2.0			44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.4		20.6		20.6			32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	20.4		20.6		20.6			28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4.72

FIELD DATA

Plant US STEEL - CLAIRTON, PA
Date 1-26-85
Sample Location HCQC - TEST CAR
Sample Type M-5
Run Number 8.3
Operator Smith / Milburn
Ambient Temperature 83°
Barometric Pressure 29.19
Static Pressure, (H_2O) -0.5
Filter Number(s) RA1026-0056

Leak Check: Initial at .015" Hg, .15 CFM
Final at .020" Hg, .15 CFM
Pitot Leak Check: ok

Impinger Volumes

	Initial	Final	Net Gain
TRAIN A	100	410	
	100	102	
	n/r	0	
TRAIN B	100	126	
	100	103	
	n/r	0	
Silica Gel			
A	667.6	675.5	
B	643.3	654.7	
SASS Condensate			
Total Volume			

Probe Length and Type 5 ft TFE
Nozzel Size & I.D. .317
Pitot Coefficient & I.D. .825
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number
Meter Coefficient
α Factor
K =
$K(Nd)^4$ = ___ x (___)^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

pH = 3.0 bump contact

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft 3	Velocity Head (ΔP_s), in. H_2O	Rotameter ~~Orifice Pressure Differential (ΔH), in. H_2O~~ Desired	Actual	Temperature °F Stack	Probe	Impinger	ΔH ~~Organic Module~~	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Init. 278.700												
1.6	1:00	279.910	1.4	26.0	26.0	164	269	69°	.78	278	77	77	6.0	
	1:40 :40	280.465	.38	14.5	12.7	161	276	69°	.12	277	78	77	2.0	
1.5	:57	281.275	.50	14.8	14.8	161	271	71°	.29/.34	280	80	80	3.0	
	1:28 :31	281.585	.20	6.7 .07	.11AH	162	270	71°	.14	280	81	86	0.5	
1.4	:56	282.270	.38	13.0	13.0	163	268	71°	.26	281	82	81	3.0	
	1:35 :39	282.570	.13	7.3	.07AH	161	273	72°	.07	281	82	82	0.5	
1.3	:56	283.400	.63	16.8	16.8	164	269	72°	.35	281	83	82	3.0	
	1:41 :45	283.360	.20	8.7	.11AH	160	271	72°	.11	280	84	83	1.0	
AVG.														

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Comments:

Page ___ of ___

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Rotameter Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F					Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	ΔH ~~Organic Module~~	Oven	In	Out		
		Init. 283.860												
1.2	1:01	284.880	1.1	22.8	22.8	166	270	71°	.63	276	85	85	4.5	
	1:40 \ :39	285.310	.48	12.7	14.5	162	270	71°	.35	276	86	85	2.0	
1.1	:59	286.595	1.7	28.5	26.9/28.5	164	268	70°	.94/.96	274	86	86	6.0	
	1:28 \ :29	287.155	.90	15.9	18.0	160	272	70°	.36	274	87	87	2.0	
2.6	:55	288.320	1.5	26.9	26.9	162	271	70°	.87	276	88	87	6.0	
	1:38 \ :43	289.030	.85	15.3	14.8/18	158	270	70°	.32	276	88	88	3.0	
2.5	:58	290.200	1.5	26.9	26.9	163	271	71°	.86	274	88	88	6.0	
	1:24 \ :26	290.620	1.0	14.8	16.8/22.8	160	270	71°	.63	272	84	88	4.5	
2.4	56 \	291.840	1.7	26.9	26.9/23.5	163	269	71°	.89	269	89	89	6.0	
	1:36 \ :40	292.430	.5	14.8	14.8	160	273	71°	.25	269	89	89	3.0	
2.3	:55	293.690	.75	24.9	31.2	163	271	71°	.99	269	90	90	8.0	
	1:40 \ :45	294.340	.48	14.5	14.5	160	271	71°	.22	269	90	90	3.0	
2.2	:57	295.500	1.5	22.8	22.8/26.5	161	272	70°	.82	269	90	90	5.0	
	1:25 \ :28	295.955	1.0	13.9	14.8/22.8	155	272	70°	.52	269	91	91	3.0	
2.1	:58	297.300	2.0	31.2	31.2	162	269	70°	1.0	267	91	91	8.5	
	1:29 \ :31	297.835	.75	18.4	18.4	160	270	70°	.45	267	91	91	5.0	

Run No. 8.3 Date 1-26-85 Sampling Location HCQS - TEST CAR

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft 3	Velocity Head (ΔP_s), in. H_2O	Rotameter ~~Orifice Pressure Differential~~ (ΔH), in. H_2O		Temperature °F					Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	ΔH ~~Organic Module~~	Oven	In	Out		
		Init. 297.875												
3.6	:55	298.800	.70	12.9	12.8/12.9	162	268	70°	.40	270	91	91	3.5	
	1:46 / :51	299.400	.45	14.0	13.9	158	273	70°	.17	270	91	91	2.0	
3.5	:53	300.340	.85	19.8	19.8	164	271	70°	.50	267	91	91	4.5	
	1:24 / :31	300.650	.38	12.7	12.7	160	270	70°	.14	269	92	91	1.5	
3.4	:55	301.585	.75	22.7	19.8/18.4	160	271	73°	.43	268	92	92	4.0	
	1:38 / :43	302.065	.40	14.0	14.0	156	268	73°	.21	268	92	92	2.0	
3.3	:57	302.980	.75	21.7	21.7/18.4	160	271	73°	.44	268	92	92	4.0	
	1:40 / :43	303.435	.40	13.1	13.1	158	271	73°	.17	268	92	92	2.0	
3.2	:57	304.310	.69	17.7	17.7	160	270	75°	.43	268	93	93	3.5	
	1:34 / :37	304.645	.27	10.4	10.4	158	272	75°	.14	268	93	93	1.5	
3.1	:55	305.610	.85	21.6	21.6/19.8	162	270	75°	.58	270	94	94	5.0	
	1:33 / :38	306.085	.40	13.0	13.0	158	269	75°	.16	269	94	94	2.0	
4.6	:55	306.440	.65	17.1	17.1	160	269	76°	.38	271	94	94	3.0	
	1:41 / :46	307.415	.40	13.1	13.1	158	272	76°	.25	271	95	95	2.5	
4.5	:55	308.235	.65	14.0	17.1	160	270	76°	.28	271	95	95	2.0	
	1:34 / :39	308.625	.25	10.0	13.1/10	159	272	76°	.13	270	96	95	0.5	

Run No. 8.3 Date 7-26-85 Sampling Location ~~HCQC~~ - TEST CAR

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Rotameter ~~Orifice Pressure Differential~~ (ΔH), ~~in. H_2O~~		Temperature °F					Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	ΔH ~~Organic Module~~	Oven	In	Out		
		Init. 308.625												
4.4	.57	309.630	1.0	19.8	21.6	161	269	76°	.56	270	95	95	4.5	
	1:37 \ :40	310.050	.40	13.1	13.1	158	275	76°	.15	270	96	95	2.0	
4.3	.58	311.240	1.5	26.9	26.7	158	268	75°	.81	269	96	96	6.0	
	1:47 \ :49	311.965	.65	17.1	17.1	159	274	75°	.36	269	96	96	3.0	
4.2	:58	313.260	1.5	26.7	26.7	158	270	~~26~~ 76°	.88	269	96	96	6.0	
	1:45 \ :47	313.835	.53	15.1	15.1	158	269	76°	.28	269	96	96	3.0	
4.1	:55	314.760	1.0	21.1	21.6	162	269	75°	.54	269	96	96	5.0	
	1:38 \ :43	315.280	.45	13.1	14.0	158	267	75°	.16	270	96	96	2.0	

Run No. 8.3 Date 7-26-85 Sampling Location HCQC - TESTCOR

Comments:

NOMOGRAPH DATA FORM (English Units)

PLANT US STEEL - CLAIRTON, PA DATE 7-26-85 8.3

SAMPLING LOCATION H-3-3 HCQC - TEST CAR

	Test No.	
Calibrated pressure differential across orifice, in H_2O	Delta H @	
Average meter temperature (ambient + 20°F, °F*	$t_{m\ avg}$	
Percent moisture in gas stream by volume % *	B_{wo}	33.6
Barometric pressure in. Hg	P_b	29.19
Stack gauge pressure, in. H_2O	Static Pressure	-0.5
Ratio of static pressure to meter pressure	P_s/P_m	N/A
Average stack temperature, °F*	$t_{s\ avg}$	161
Average velocity head, in. H_2O* expressed as $\sqrt{\Delta P}$	Delta p avg	TWP 1.01 TWT 0.47
Maximum velocity head, in. H_2O*	Delta p max	2.00
C factor	C factor	
Calculated nozzle diameter, in.	N_z dia.	0.317
Actual nozzle diameter, in.*	N_z dia.	0.317
Reference Delta p, in. H_2O*	Delta p avg	N/A
Filter number	F#	RA102G-056
S-tube correction factor Fs	Fs	0.825
Final Dry Gas Meter Reading (CF)	FDGMR	315.280
Sample volume (CF)	CF	30.58
Start time	Time start	09:00A
Stop time	Time stop	3:30P
Max. vacuum (inches Hg)	Max. vac	8.5

Recorded by B.C. Dale

Calculated by T.T. Logan 7-31-85

DRY MOLECULAR WEIGHT DETERMINATION

PLANT US STEEL - CLAIRTON, PA
DATE 2-26-85 8.3
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION HCQC - TEST CAR
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS, GRAB) INTEGRATED BAG
ANALYTICAL METHOD ORSAT
AMBIENT TEMPERATURE
OPERATOR DeRos/Milbourn

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	2.0		1.8		1.8			44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.8		20.8		20.8			32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	20.8		20.8		20.8			28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4 72

APPENDIX E

DATA REDUCTION

	Point No.	Oven No.	Start Time	Sample Time sec Total	Sample Time sec DGM Start	Gas Metr ft3	Rotometer	Orifice del P in. WC
						148.020		
P	1.6	A-5	9:56	121	65	149.900		0.47
T					56	149.540		0.26
P	1.5	B-5	10:13	101	47	150.025		0.16
T					54	150.530		0.05
P	1.4	C-5	10:29	112	70	151.115		0.13
T					42	151.375		0.04
P	1.3	A-7	10:43	90	64	152.040	16.8	0.19
T					26	152.257	9.1	0.18
P	1.2	B-7	10:56	100	57	153.160	16.8	0.37
T					43	153.363	9.1	0.12
P	1.1	C-7	11:15	107	62	154.125	21.1	0.55
T					45	154.935	11.6	0.17
P	2.6	A-11	12:11	82	61	155.400	19.8	0.50
T					21	156.135	11.1	0.15
P	2.5	B-1	12:23	90	61	156.920	19.8	0.17
T					29	157.260	10.7	0.17
P	2.4	C-11	12:35	99	62	158.025	19.8	0.24
T					37	158.400	10.7	0.14
P	2.3	A-13	12:53	90	61	159.120	18.3	0.33
T					29	159.470	10.5	0.09
P	2.2	B-13	1:05	92	64	160.285	16.8	0.27
T					28	160.650	10.1	0.14
P	2.1	C-13	1:19	84	60	161.750	23.1	0.55
T					24	162.000	13.4	0.22
P	3.6	A-15	1:32	90	60	163.040	13.0	0.20
T					30	163.390	10.1	0.12
P	3.5	B-15	1:46	94	63	164.130	14.5	0.22
T					31	164.365	9.1	0.12
P	3.4	C-15	2:00	101	60	165.270	16.7	0.24
T					41	165.585	10.1	0.16
P	3.3	A-17	2:15	88	60	166.285	15.9	0.23
T					28	166.575	9.4	0.13
P	3.2	B-17	2:33	93	61	167.255	12.9	0.24
T					32	167.570	7.4	0.08
P	3.1	C-17	2:56	129	63	168.415	15.9	0.32
T					66	168.990	9.4	0.12
P	4.6	A-19	3:08	94	60	169.700	12.5	0.16
T					34	169.950	9.4	0.10
P	4.5	B-19	3:21	100	61	170.485	10.1	0.26
T					39	170.837	7.1	0.08
P	4.4	C-19	3:36	108	63	171.640	14.5	0.40
T					45	172.200	9.4	0.13
P	4.3	A-21	3:50	95	64	173.160	19.8	0.46
T					31	173.570	12.6	0.15
P	4.2	B-21	4:03	100	61	174.530	19.7	0.47
T					39	174.945	11.0	0.14
P	4.1	C-21	4:16	109	64	175.710	15.5	0.25
T					45	176.190	9.4	0.14
Total		(Time in minutes)			39.48	28.17		
Push					24.57	19.573	File: DAT	801
Travel					14.92	8.597	Page 2 of 8	

	Point No.	Temperature, deg F						
		Stack	Probe	Oven	Imping A	Imping B	GM In	GM Out
P	1.6	164	275	257	70	70	69	69
T		157	283	259	70	70	69	69
P	1.5	163	275	271	70	70	71	71
T		161	276	272	70	70	73	73
P	1.4	162	276	275	70	70	74	74
T		159	277	276	70	70	76	76
P	1.3	159	278	273	72	72	78	77
T		157	278	272	72	72	78	77
P	1.2	164	276	268	75	75	80	79
T		160	274	249	75	75	80	79
P	1.1	159	274	275	74	74	82	81
T		156	276	275	75	75	82	82
P	2.6	164	278	293	76	76	85	85
T		162	281	293	76	76	85	85
P	2.5	164	269	284	76	76	86	86
T		160	276	283	76	76	86	86
P	2.4	163	269	255	77	77	87	87
T		160	271	261	77	77	87	87
P	2.3	162	270	263	77	77	87	87
T		158	270	263	77	77	87	87
P	2.2	160	267	261	77	77	88	88
T		160	273	261	77	77	88	88
P	2.1	159	272	264	78	78	89	89
T		159	272	264	78	78	89	89
P	3.6	162	271	239	80	80	90	90
T		158	269	224	80	80	90	90
P	3.5	159	269	262	80	80	91	91
T		156	273	222	80	80	91	91
P	3.4	161	273	266	80	80	92	92
T		157	275	246	80	80	92	92
P	3.3	162	269	272	80	80	93	93
T		157	276	265	80	79	93	93
P	3.2	162	271	270	81	81	94	94
T		158	270	270	81	81	94	94
P	3.1	162	272	269	80	80	95	94
T		159	276	269	80	80	95	94
P	4.6	160	274	268	81	81	95	95
T		157	274	268	81	81	95	95
P	4.5	161	268	269	82	82	96	95
T		156	273	269	82	82	96	95
P	4.4	162	270	269	80	80	96	95
T		157	276	268	80	80	96	96
P	4.3	160	271	268	80	80	97	96
T		156	275	268	80	80	97	96
P	4.2	162	172	268	80	80	97	96
T		157	171	268	80	80	97	97
P	4.1	161	269	268	80	80	97	97
T		159	272	268	80	80	96	96

P TW Avg 162
T TW Avg 158

	Point No.	Pump Vac in Hg	Vel Head in H2O	Sqrt del P	Duct Vel fps	Sep P In in H2O	Opacity > 20%	Seconds > 20%
P	1.6	3.5	1.40	1.18	76.42		25	3.2
T		1.0	0.48	0.69	44.50			
P	1.5	1.0	0.50	0.71	45.64			
T		1.0	0.13	0.36	23.23			
P	1.4	1.0	0.40	0.63	40.78			
T		1.0	0.15	0.39	24.92			
P	1.3	2.0	0.63	0.79	51.06			
T		2.0	0.20	0.45	28.72			
P	1.2	2.5	1.10	1.05	67.74			
T		1.0	0.38	0.62	39.69			
P	1.1	3.0	1.70	1.30	83.88			
T		1.5	0.59	0.77	49.29			
P	2.6	2.0	1.50	1.22	79.11		20	1.0
T		1.0	0.68	0.82	53.18			
P	2.5	2.0	0.60	0.77	50.03		35	4.1
T		1.0	0.50	0.71	45.53			
P	2.4	2.0	0.70	0.84	54.00			
T		1.0	0.45	0.67	43.19			
P	2.3	2.0	1.30	1.14	73.53			
T		0.5	0.70	0.84	53.78			
P	2.2	2.5	0.95	0.97	62.75			
T		0.5	0.45	0.67	43.19			
P	2.1	5.0	1.75	1.32	85.10			
T		1.5	0.75	0.87	55.71			
P	3.6	2.0	0.75	0.87	55.85			
T		0.5	0.45	0.67	43.12			
P	3.5	2.0	0.63	0.79	51.06			
T		0.5	0.38	0.62	39.56			
P	3.4	2.0	0.95	0.97	62.80			
T		0.5	0.45	0.67	43.08			
P	3.3	2.0	0.65	0.81	51.99			
T		0.5	0.40	0.63	40.62			
P	3.2	2.0	0.69	0.83	53.57			
T		0.5	0.27	0.52	33.40			
P	3.1	2.0	0.95	0.97	62.85			
T		0.5	0.40	0.63	40.69			
P	4.6	1.0	0.55	0.74	47.75			
T		0.5	0.30	0.55	35.18			
P	4.5	0.5	0.50	0.71	45.56			
T		0.5	0.25	0.50	32.09			
P	4.4	3.0	1.30	1.14	73.53			
T		2.0	0.50	0.71	45.42			
P	4.3	4.0	1.50	1.22	78.85			
T		0.5	0.65	0.81	51.74			
P	4.2	4.0	1.50	1.22	78.98			
T		1.0	0.52	0.72	46.31			
P	4.1	2.0	0.85	0.92	59.41			
T		1.0	0.59	0.77	49.41			
P TW Avg				0.97				
T TW Avg				0.64				

	Point No.	Separator P, in. WC	Annubar in. WC	Tank T deg F	Jet Flow gpm	Jet P psig	Jet Temp deg F	Gas T In deg F
P	1.6			432	450	260	420	200
T				432	120	280	420	210
P	1.5			432	450	280	420	154
T				432	120	260	420	182
P	1.4			432	468	280	420	154
T				432	120	280	420	154
P	1.3			432	440	280	420	140
T				432	120	270	420	182
P	1.2			432	420	280	420	154
T				432	120	270	420	238
P	1.1			432	420	270	420	154
T				432	120	260	420	252
P	2.6			432	420	260	420	154
T				432	120	260	420	224
P	2.5			432	420	270	420	140
T				432	120	270	420	210
P	2.4			432	420	280	420	154
T				432	120	270	420	210
P	2.3			432	420	280	420	154
T				432	120	270	420	238
P	2.2			432	420	280	420	154
T				432	120	270	420	210
P	2.1			432	420	280	420	154
T				432	120	270	420	238
P	3.6			432	420	280	420	154
T				432	120	270	420	224
P	3.5			432	420	270	420	154
T				432	120	260	420	224
P	3.4			432	420	280	420	154
T				432	120	270	420	224
P	3.3			432	420	280	420	154
T				432	120	260	420	224
P	3.2			432	420	280	420	154
T				432	120	270	420	22
P	3.1			432	420	270	420	154
T				432	120	260	420	308
P	4.6			432	420	280	420	154
T				432	120	270	420	224
P	4.5			432	420	280	420	154
T				432	120	270	420	238
P	4.4			432	420	280	420	154
T				432	120	270	420	252
P	4.3			432	420	280	420	154
T				432	120	270	420	224
P	4.2			432	420	280	420	154
T				432	120	270	420	224
P	4.1			432	420	280	420	154
T				432	120	270	420	224
P TW Avg			0.00	432	425	277	420	155
T TW Avg			0.00		120	268	420	219

LABORATORY DATA

Orsat Analysis
Operator - DaRos

Run	1		2		3		Avg
Gas	Act %	Net %	Act %	Net %	Act %	Net %	Net %
CO2	1.8		1.8	1.8	1.8	1.8	1.2
O2	20.4	18.6	20.2	18.4	20.4	18.6	18.5
CO	20.4	0.0	20.2	0.0	20.4	0.0	0.0
N2	100.0	79.6	100.0	79.8	100.0	79.6	80.3
Molecular Weight, Dry			28.93				

Particulate Analysis

Front-half Filter Dry Catch, mg	3.70
Blank Filter Catch, mg	0.00
Front-half Aqueous Wash, mg	
Filterable	3.50
Non-filterable	2.35
Front-half Acetone Wash, mg	4.45
Impinger Catch, mg	
Filterable	1.30
Non-filterable	212.70
Back-half Acetone rinse, mg	16.55
Total Front-half Filterable, mg	7.20
Total Front-half Nonfilterable, mg	6.80
Total Front-half, mg	14.00
Total Back-half Filterable, mg	1.30
Total Pennsylvania DER Mass, mg	15.30
Total Back-half Solubles, mg	229.25

CALCULATIONS

Standard Temp, deg F	68
Standard Press, in Hg	29.92
Barometric Press, in Hg	29.31
Stack Press, in Hg	29.28
Vol of H2O Std, dscf	13.782
M-5 Stack Moist. Content, %	32.22
Sat Stack Moist. Content, %	33.09
Stack Moist. Cont. Used, %	32.22
Molecular Weight, Dry	28.93
Molecular Weight, Wet	25.41
Nozzle Dia, in	0.273
X-Area of Stack, ft2	32.125

	Push	Travel	Total
Time-avg Stack Temp, deg F	162	158	160
Meter Volume Corr, ft3	20.253	8.891	29.144
Meter Volume Std, dscf	20.145	8.844	28.989
Vol of H2O Std, dscf	9.578	4.205	13.782
Sample Time, min	24.57	14.92	39.48
Stack Vel, fps	62.25	41.24	
Percent Isokinetic, %	96	104	
Stack Gas Vol, acfm	119987	79491	
Stack Gas Vol, dscfm	67610	45036	
Stack Gas Density, lb/ft3	0.0549	0.0552	
DER Part. Emission Conc., gr/dscf		0.0081	
DER Part. Emission Rate, lb/ton coke		0.0078	
DER Part. Emission Rate, lb/hr		0.43	
Front-half Part. Conc., gr/dscf		0.0075	
Front-half Part. Rate, lb/ton coke		0.0071	
Front-half Part. Rate, lb/hr		0.39	
Back-half Filt. Conc., gr/dscf		0.0007	
Back-half Filt. Rate, lb/ton coke		0.0007	
Back-half Filt. Rate, lb/hr		0.04	
Back-half Soluble Conc., gr/dscf		0.1220	
Back-half Soluble Rate, lb/ton coke		0.1169	
Back-half Soluble Rate, lb/hr		6.44	

DUCT VELOCITIES AT SAMPLING PLANE

Push

Position	1	2	3	4
6	76	79	56	48
5	46	50	51	46
4	41	54	63	74
3	51	74	52	79
2	68	63	54	79
1	84	85	63	59

Position

Travel

Position	1	2	3	4
6	44	53	43	35
5	23	46	40	32
4	25	43	43	45
3	29	54	41	52
2	40	43	33	46
1	49	56	41	49

Position

FIELD DATA

Plant	USS - Clairton, PA
Date	7-25-85
Car No.	H-3-3
Battery No.	20
Sample Location	HCQC - Test Car
Sample Type	M-5
Run Number	8.2
Operator	Smith & Milburn
No. of Ovens Tested	24
No. of Ovens Tested/hr	4.1
Coke Prd'n Rate, tons/oven	14.5
Ambient Temp, deg F	75
Barometric Pressure, in Hg	29.33
Static Pressure, in H2O	-0.47
Stack Area, ft2	32.125
Filter Type	RA934AH
Top Filter Number	RA102G-055
Bottom Filter Number	N/A
Probe Length & Type	5 ft - TFE Lined
Nozzle Size	0.317
Pitot Coefficient	0.825
Meter Box Number	APT 12 LG Mod
DGM Coeff's A1	0.0025
A2	1.0253
A3	0.0079
Orfice Coeff's B	0.4754
A	0.3949
Cal Press, in Hg	30

	in Hg	CFM
Leak Check Initial	15	0.010
Final	10	0.005

Water Volume:

Location	Initial	Final	Net Gain
Imp A1	100	350	250
Imp A2	100	146	46
Imp A3	0	0	0
Sil Gel A	660.2	669.5	9.3
Imp B1	100	180	80
Imp B2	100	107	7
Imp B3	0	0	0
Sil Gel B	627.9	640.4	12.5
Total Volume			404.8

Combined Impinger pH 3.5

	Point No.	Oven No.	Start Time	Sample Time sec Total	DGM Start	Gas Metr ft3	Rotometer	Orifice del P in. WC
						195.835		
P	1.6	C-15		99	68	197.500	26.0	.82
T					31	197.715	14.5	0.32
P	1.5	A-17		87	63	198.645	16.8	0.40
T					24	198.790		0.11
P	1.4	B-17	9:30	100	60	199.400	13.0	0.30
T					40	199.730		0.08
P	1.3	C-17	9:37	98	63	200.700	16.8	0.37
T					35	201.040		0.11
P	1.2	A-19	9:49	87	62	202.220	22.8	0.66
T					25	202.525	12.7	0.11
P	1.1	B-19	10:05	96	61	203.825	28.5	0.67
T					35	204.360	15.0	0.20
P	2.6	C-19	10:20	102	60	205.700	26.9	0.84
T					42	206.350	16.8	0.32
P	2.5	A-21	10:37	85	60	207.570	26.9	0.82
T					25	208.040	14.8	0.19
P	2.4	B-21	10:45	98	60	208.380	26.9	0.84
T					38	209.840	14.8	0.19
P	2.3	C-21	10:57	105	61	211.100	24.9	0.76
T					44	211.650	14.5	0.27
P	2.2	A-23	11:10	89	62	212.820	22.8	0.66
T					27	213.170	13.9	0.24
P	2.1	B-23		95	63	214.590	31.2	1.00
T					32	215.155	18.4	0.37
P	3.6	C-23	11:38	112	61	216.410	22.8	0.63
T					51	217.220	18.0	0.39
P	3.5	B-25	12:10	95	61	218.340	22.8	0.61
T					34	218.730	12.7	0.13
P	3.4	A-27	12:35	94	60	221.645	19.8	0.62
T					34	222.100	14.0	0.20
P	3.3	C-27		101	62	223.100	18.4	0.45
T					39	223.790	12.7	0.21
P	3.2	A-29	1:25	102	61	224.700	17.0	0.39
T					41	225.085	10.4	0.15
P	3.1	B-29	1:34	114	62	226.080	21.6	0.59
T					52	226.775	13.0	0.17
P	4.6	C-29		114	61	227.775	22.7	0.62
T					53	228.440	13.1	0.26
P	4.5	A-2		93	67	229.150	10.0	0.16
T					26	229.440	10.0	0.16
P	4.4	B-2	2:15	90	35	230.125	26.9	0.82
T					55	230.880	14.8	0.19
P	4.3	C-2		103	61	232.190	28.5	0.92
T					42	232.775	17.1	0.26
P	4.2	A-4	2:40	89	60	233.925	26.7	0.83
T					29	234.450	16.0	0.36
P	4.1	B-4	2:53	98	58	235.380	21.0	0.55
T					40	235.905	14.8	0.18
Total	(Time in minutes)				39.10	40.07		
Push					24.20	27.385	File: DAT	802
Travel					14.90	12.685	Page 2 of 8	

	Point No.	Temperature, deg F						
		Stack	Probe	Oven	Imping A	Imping B	GM In	GM Out
P	1.6	162	273	271	70	70	75	75
T		158	279	270	70	70	75	75
P	1.5	163	276	270	71	71	76	75
T		161	279	270	71	71	76	75
P	1.4	163	275	270	71	71	78	77
T		159	277	270	71	71	78	77
P	1.3	163	274	269	71	71	79	79
T		160	278	269	71	71	80	79
P	1.2	163	276	268	70	70	81	81
T		160	274	269	70	70	82	81
P	1.1	161	273	274	70	70	84	84
T		159	271	275	70	70	84	84
P	2.6	163	274	277	70	70	85	85
T		159	278	277	70	70	86	86
P	2.5	162	275	279	70	70	86	86
T		160	279	280	70	70	87	87
P	2.4	162	274	279	71	71	88	88
T		159	277	279	71	71	88	88
P	2.3	162	274	279	72	72	89	89
T		160	278	279	72	72	89	89
P	2.2	160	274	279	72	72	90	90
T		159	278	279	72	72	90	90
P	2.1	167	276	278	70	70	90	90
T		162	273	278	70	70	90	90
P	3.6	162	277	279	70	70	90	90
T		158	279	279	70	70	90	90
P	3.5	160	275	278	71	71	91	91
T		157	280	279	71	71	91	91
P	3.4	162	274	280	72	72	91	91
T		158	281	279	72	72	92	92
P	3.3	163	274	279	73	73	92	91
T		159	280	279	73	73	92	92
P	3.2	162	277	279	74	74	92	92
T		159	274	279	74	74	92	92
P	3.1	162	277	279	76	76	92	92
T		160	277	279	76	76	92	92
P	4.6	161	276	279	76	76	92	92
T		158	276	278	76	76	92	92
P	4.5	163	277	280	77	77	93	93
T		163	280	280	77	77	93	93
P	4.4	160	279	278	77	77	93	93
T		159	279	278	77	77	93	93
P	4.3	163	277	280	77	77	94	93
T		158	279	280	77	77	94	94
P	4.2	159	274	280	76	76	94	94
T		159	277	280	77	77	94	94
P	4.1	163	275	278	77	77	94	94
T		160	276	278	77	77	94	94

P TW Avg	160
T TW Avg	159

	Point No.	Pump Vac in Hg	Vel Head in H2O	Sqrt del P	Duct Vel fps	Sep P In in H2O	Opacity > 20%	Seconds > 20%
P	1.6	3.0	1.40	1.18	76.05			
T		0.5	0.48	0.69	44.39			
P	1.5	0.5	0.63	0.79	51.06			
T		0.5	0.20	0.45	28.72			
P	1.4	2.0	0.40	0.63	40.68			
T		0.5	0.15	0.39	24.83			
P	1.3	3.0	0.63	0.79	51.06			
T		0.5	0.20	0.45	28.70			
P	1.2	5.0	1.10	1.05	67.47			
T		1.0	0.37	0.61	39.03			
P	1.1	5.0	1.70	1.30	83.74			
T		1.0	0.50	0.71	45.34			
P	2.6	4.5	1.50	1.22	78.78		20	1.9
T		1.0	0.63	0.79	50.89			
P	2.5	6.5	1.50	1.22	78.72			
T		1.0	0.50	0.71	45.38			
P	2.4	6.5	1.50	1.22	78.72			
T		2.0	0.50	0.71	45.34			
P	2.3	6.0	1.30	1.14	73.28		25	2.4
T		2.0	0.48	0.69	44.46			
P	2.2	5.0	1.10	1.05	67.30			
T		2.0	0.45	0.67	43.01			
P	2.1	8.5	2.00	1.41	91.26		20	1.1
T		3.0	0.75	0.87	55.66			
P	3.6	5.0	1.50	1.22	78.72			
T		3.0	0.60	0.77	49.63			
P	3.5	5.0	1.10	1.05	67.30			
T		2.5	0.38	0.62	39.46			
P	3.4	4.0	0.85	0.92	59.26			
T		2.0	0.45	0.67	42.98			
P	3.3	4.0	0.75	0.87	55.71		35	4.7
T		2.0	0.35	0.59	37.93			
P	3.2	3.5	0.65	0.81	51.82			
T		1.0	0.27	0.52	33.32			
P	3.1	4.0	0.97	0.98	63.30			
T		1.0	0.40	0.63	40.59			
P	4.6	4.0	0.75	0.87	55.62			
T		1.0	0.40	0.63	40.52			
P	4.5	1.0	0.30	0.55	35.23		20	1.3
T		1.0	0.25	0.50	32.16			
P	4.4	1.0	1.50	1.22	78.59			
T		1.0	0.45	0.67	43.01			
P	4.3	7.0	1.70	1.30	83.87			
T		3.0	0.65	0.81	51.65			
P	4.2	6.5	1.50	1.22	78.53			
T		3.0	0.60	0.77	49.67			
P	4.1	5.0	0.96	0.98	63.03			
T		2.0	0.52	0.72	46.27		25	3.1
P TW Avg				1.04				
T TW Avg				0.66				

	Point No.	Separator P, in. WC	Annubar in. WC	Tank T deg F	Jet Flow gpm	Jet P psig	Jet Temp deg F	Gas T In deg F
P	1.6			432	420	260	420	154
T					120	260	420	224
P	1.5			432	420	280	420	154
T					120	270	420	210
P	1.4			432	420	280	420	154
T					120	270	420	238
P	1.3			432	420	280	420	154
T					120	270	420	238
P	1.2			432	420	280	420	154
T					120	270	420	196
P	1.1			432	420	280	420	154
T					120	270	420	210
P	2.6			432	420	280	420	154
T					120	270	420	238
P	2.5			432	420	280	420	154
T					120	270	420	210
P	2.4			432	420	280	420	154
T					120	270	420	210
P	2.3			432	420	280	420	154
T					120	270	420	238
P	2.2			432	420	280	420	154
T					120	270	420	224
P	2.1			432	420	280	420	154
T					120	270	420	238
P	3.6			432	420	280	420	154
T					120	270	420	308
P	3.5			432	420	260	420	154
T					120	260	420	224
P	3.4			432	420	270	420	154
T					120	260	420	238
P	3.3			432	420	270	420	154
T					120	260	420	308
P	3.2			432	420	270	420	154
T					120	260	420	280
P	3.1			432	420	270	420	154
T					120	260	420	336
P	4.6			432	420	270	420	154
T					120	260	420	336
P	4.5			432	120	270	420	154
T					120	260	420	224
P	4.4			432	420	270	420	154
T					120	260	420	224
P	4.3			432	420	270	420	154
T					120	260	420	238
P	4.2			432	420	270	420	154
T					120	260	420	252
P	4.1			432	420	270	420	154
T					120	260	420	280
P TW Avg			0.00	432	406	274	420	154
T TW Avg			0.00		120	265	420	253

LABORATORY DATA

Orsat Analysis
Operator - DaRos

Run	1		2		3		Avg
Gas	Act %	Net %	Act %	Net %	Act %	Net %	Net %
CO2	1.8	1.8	2.0	2.0	2.0	2.0	1.9
O2	20.4	18.6	20.6	18.6	20.6	18.6	18.6
CO	20.4	0.0	20.6	0.0	20.6	0.0	0.0
N2	100.0	79.6	100.0	79.4	100.0	79.4	79.5
Molecular Weight, Dry			29.05				

Particulate Analysis

Front-half Filter Dry Catch, mg	8.55
Blank Filter Catch, mg	0.00
Front-half Aqueous Wash, mg	
Filterable	10.65
Non-filterable	22.57
Front-half Acetone Wash, mg	13.44
Impinger Catch, mg	
Filterable	1.05
Non-filterable	289.10
Back-half Acetone rinse, mg	13.85
Total Front-half Filterable, mg	19.20
Total Front-half Nonfilterable, mg	36.01
Total Front-half, mg	55.21
Total Back-half Filterable, mg	1.05
Total Pennsylvania DER Mass, mg	56.26
Total Back-half Solubles, mg	302.95

CALCULATIONS

Standard Temp, deg F	68
Standard Press, in Hg	29.92
Barometric Press, in Hg	29.33
Stack Press, in Hg	29.30
Vol of H2O Std, dscf	19.054
M-5 Stack Moist. Content, %	31.56
Sat Stack Moist. Content, %	33.70
Stack Moist. Cont. Used, %	31.56
Molecular Weight, Dry	29.05
Molecular Weight, Wet	25.56
Nozzle Dia, in	0.317
X-Area of Stack, ft2	32.125

	Push	Travel	Total
Time-avg Stack Temp, deg F	160	159	161
Meter Volume Corr, ft3	28.383	13.128	41.512
Meter Volume Std, dscf	28.252	13.068	41.319
Vol of H2O Std, dscf	13.028	6.026	19.054
Sample Time, min	24.20	14.90	39.10
Stack Vel, fps	66.61	42.08	
Percent Isokinetic, %	93	111	
Stack Gas Vol, acfm	128400	81112	
Stack Gas Vol, dscfm	73275	46347	
Stack Gas Density, lb/ft3	0.0554	0.0554	
DER Part. Emission Conc., gr/dscf		0.0210	
DER Part. Emission Rate, lb/ton coke		0.0213	
DER Part. Emission Rate, lb/hr		1.26	
Front-half Part. Conc., gr/dscf		0.0206	
Front-half Part. Rate, lb/ton coke		0.0209	
Front-half Part. Rate, lb/hr		1.24	
Back-half Filt. Conc., gr/dscf		0.0004	
Back-half Filt. Rate, lb/ton coke		0.0004	
Back-half Filt. Rate, lb/hr		0.02	
Back-half Soluble Conc., gr/dscf		0.1131	
Back-half Soluble Rate, lb/ton coke		0.1144	
Back-half Soluble Rate, lb/hr		6.80	

DUCT VELOCITIES AT SAMPLING PLANE

Push

Position	1	2	3	4
6	76	79	79	56
5	51	79	67	35
4	41	79	59	79
3	51	73	56	84
2	67	67	52	79
1	84	91	63	63

Position

Travel

Position	1	2	3	4
6	44	51	50	41
5	29	45	39	32
4	25	45	43	43
3	29	44	38	52
2	39	43	33	50
1	45	56	41	46

Position

FIELD DATA

Plant		USS - Clairton, PA
Date		7-26-85
Car No.		H-3-3
Battery No.		20
Sample Location		HCQC - Test Car
Sample Type		M-5
Run Number		8.3
Operator		Smith & Milburn
No. of Ovens Tested		24
No. of Ovens Tested/hr		4.0
Coke Prd'n Rate, tons/oven		14.5
Ambient Temp, deg F		83
Barometric Pressure, in Hg		29.19
Static Pressure, in H2O		-0.5
Stack Area, ft2		32.125
Filter Type		RA934AH
Top Filter Number		RA102G-0056
Bottom Filter Number		n/a
Probe Length & Type		5 ft - TFE Lined
Nozzle Size		0.317
Pitot Coefficient		0.825
Meter Box Number		APT 14 LG Mod
DGM Coeff's	A1	0.0025
	A2	1.0253
	A3	0.0079
Orfice Coeff's	B	0.4754
	A	0.3949
Cal Press, in Hg		29.65
		30

	in Hg	CFM
Leak Check Initial	15	0.015
Final	15	0.020

Water Volume:

Location	Initial	Final	Net Gain
Imp A1	100	410	310
Imp A2	100	102	2
Imp A3	0	0	0
Sil Gel A	667.6	674.8	7.2
Imp B1	100	176	76
Imp B2	100	103	3
Imp B3	0	0	0
Sil Gel B	644.3	654.7	10.4
Total Volume			408.6

Combined Impinger pH 3.0

	Point No.	Oven No.	Start Time	Sample Time sec Total	DGM Start	Gas Metr ft3	Rotometer	Orifice del P in. WC
						278.700		
P	1.6	C-2	9:01	100	60	279.910	26.0	0.78
T					40	280.465	12.7	0.12
P	1.5	A-4	9:23	88	57	281.275	15.4	0.32
T					31	281.585		0.14
P	1.4	B-4	9:38	95	56	282.270	13.0	0.26
T					39	282.570		0.07
P	1.3	C-4	9:50	101	56	283.400	16.8	0.35
T					45	283.860		0.11
P	1.2	A-6	10:07	87	61	284.880	22.8	0.63
T					39	285.310	14.5	0.35
P	1.1	B-6	10:25	94	59	286.595	27.7	0.95
T					29	287.155	18.0	0.36
P	2.6	C-6	10:48	98	55	288.320	26.9	0.87
T					43	289.030	16.4	0.32
P	2.5	A-8	11:02	84	58	290.200	26.9	0.86
T					26	290.620	19.8	0.63
P	2.4	B-8	11:15	96	56	291.840	27.7	0.89
T					40	292.430	14.8	0.25
P	2.3	C-8	11:29	100	55	293.690	31.2	0.99
T					45	294.340	14.5	0.22
P	2.2	A-10	11:49	85	57	295.500	24.8	0.82
T					28	295.955	18.8	0.52
P	2.1	B-10	12:10	89	58	297.300	31.2	1.00
T					31	297.835	18.4	0.45
P	3.6	C-10	12:23	106	55	298.800	20.4	0.40
T					51	299.400	13.9	0.17
P	3.5	A-12	12:35	84	53	300.340	19.8	0.50
T					31	300.650	12.7	0.14
P	3.4	B-12	12:52	98	55	301.585	19.1	0.43
T					43	302.065	14.0	0.21
P	3.3	C-12	1:05	100	57	302.980	20.0	0.44
T					43	303.435	13.1	0.17
P	3.2	A-14	1:20	94	57	304.310	17.7	0.43
T					37	304.645	10.4	0.14
P	3.1	B-14	1:33	93	55	305.670	20.5	0.58
T					38	306.085	13.0	0.16
P	4.6	C-14	1:46	101	55	306.940	17.1	0.38
T					46	307.415	13.1	0.25
P	4.5	A-16	2:07	94	55	308.235	17.1	0.28
T					39	308.625	11.6	0.13
P	4.4	B-16	2:24	97	57	309.630	21.6	0.56
T					40	310.050	13.1	0.15
P	4.3	C-16	2:36	107	58	311.240	26.7	0.81
T					49	311.965	17.1	0.36
P	4.2	A-18	2:50	105	58	313.260	26.7	0.88
T					47	313.835	15.1	0.28
P	4.1	B-18	3:01	98	55	314.760	21.6	0.54
T					43	315.280	14.0	0.16
Total		(Time in minutes)			38.35	36.58		
Push					22.63	24.905	File: DAT	803
Travel					15.72	11.675	Page 2 of 8	

	Point No.	Temperature, deg F						
		Stack	Probe	Oven	Imping A	Imping B	GM In	GM Out
P	1.6	164	269	278	69	69	77	77
T		161	276	277	69	69	78	77
P	1.5	161	271	280	71	71	80	80
T		162	270	280	71	71	81	80
P	1.4	163	268	281	71	71	82	81
T		161	273	281	72	72	82	82
P	1.3	164	269	281	72	72	83	82
T		160	271	280	72	72	84	83
P	1.2	166	270	276	71	71	85	85
T		162	270	276	71	71	86	85
P	1.1	164	268	274	70	70	86	86
T		160	272	274	70	70	87	87
P	2.6	162	271	276	70	70	87	87
T		158	270	276	70	70	88	88
P	2.5	163	271	274	71	71	88	88
T		160	270	272	71	71	89	88
P	2.4	163	269	269	71	71	89	89
T		160	273	269	71	71	89	89
P	2.3	163	271	269	71	71	90	90
T		160	271	269	71	71	90	90
P	2.2	161	272	269	70	70	90	90
T		155	272	269	70	70	91	91
P	2.1	162	269	267	70	70	91	91
T		160	270	267	70	70	91	91
P	3.6	162	268	270	70	70	91	91
T		158	273	270	70	70	91	91
P	3.5	164	271	267	70	70	91	91
T		160	270	269	70	70	92	91
P	3.4	160	271	268	73	73	92	92
T		156	268	268	73	73	92	92
P	3.3	160	271	268	73	73	92	92
T		158	271	268	73	73	92	92
P	3.2	160	270	268	75	75	93	93
T		158	272	268	75	75	93	93
P	3.1	162	270	270	75	75	94	94
T		158	269	269	75	75	94	94
P	4.6	160	269	271	76	76	94	94
T		158	272	271	76	76	95	95
P	4.5	160	270	271	76	76	95	95
T		159	272	270	76	76	96	95
P	4.4	161	269	270	76	76	95	95
T		158	275	270	76	76	96	95
P	4.3	158	268	269	75	75	96	96
T		159	274	269	75	75	96	96
P	4.2	158	270	269	76	76	96	96
T		158	269	269	76	76	96	96
P	4.1	162	269	269	75	75	96	96
T		158	267	270	75	75	96	96

P TW Avg 162
T TW Avg 159

	Point No.	Pump Vac in Hg	Vel Head in H2O	Sqrt del P	Duct Vel fps	Sep P In in H2O	Opacity > 20%	Seconds > 20%
P	1.6	6.0	1.40	1.18	76.69			
T		2.0	0.38	0.62	39.86			
P	1.5	3.0	0.50	0.71	45.72		45	9.7
T		0.5	0.20	0.45	28.94			
P	1.4	3.0	0.38	0.62	39.92			
T		0.5	0.13	0.36	23.31			
P	1.3	3.0	0.63	0.79	51.44			
T		1.0	0.20	0.45	28.89			
P	1.2	4.5	1.10	1.05	68.08		30	6.2
T		2.0	0.48	0.69	44.83			
P	1.1	6.0	1.70	1.30	84.50			
T		2.0	0.90	0.95	61.29			
P	2.6	6.0	1.50	1.22	79.25			
T		3.0	0.85	0.92	59.47			
P	2.5	6.0	1.50	1.22	79.31		20	1.6
T		4.5	1.00	1.00	64.60			
P	2.4	6.0	1.70	1.30	84.44			
T		3.0	0.50	0.71	45.68			
P	2.3	8.0	0.75	0.87	56.08			
T		3.0	0.48	0.69	44.76			
P	2.2	5.0	1.50	1.22	79.19			
T		3.0	1.00	1.00	64.34			
P	2.1	8.5	2.00	1.41	91.51			
T		5.0	0.75	0.87	55.95			
P	3.6	3.5	0.70	0.84	54.14			
T		2.0	0.45	0.67	43.27			
P	3.5	4.5	0.85	0.92	59.75		20	1.5
T		1.5	0.38	0.62	39.82			
P	3.4	4.0	0.75	0.87	55.95		20	1.0
T		2.0	0.40	0.63	40.73			
P	3.3	4.0	0.75	0.87	55.95			
T		2.0	0.40	0.63	40.79			
P	3.2	3.5	0.69	0.83	53.66			
T		1.5	0.27	0.52	33.52			
P	3.1	5.0	0.85	0.92	59.66			
T		2.0	0.40	0.63	40.79			
P	4.6	3.0	0.65	0.81	52.09			
T		2.5	0.40	0.63	40.79			
P	4.5	3.0	0.65	0.81	52.09			
T		0.5	0.25	0.50	32.28			
P	4.4	4.5	1.00	1.00	64.66			
T		2.0	0.40	0.63	40.79			
P	4.3	6.0	1.50	1.22	79.00			
T		3.0	0.65	0.81	52.04			
P	4.2	6.0	1.50	1.22	79.00			
T		3.0	0.53	0.73	46.96			
P	4.1	5.0	1.00	1.00	64.71			
T		2.0	0.45	0.67	43.27			
P TW Avg				1.01				
T TW Avg				0.67				

	Point No.	Separator P, in. WC	Annubar in. WC	Tank T deg F	Jet Flow gpm	Jet P psig	Jet Temp deg F	Gas T In deg F
P	1.6			432	420	280	420	154
T				432	120	270	420	210
P	1.5			432	420	280	420	154
T				432	120	270	420	210
P	1.4			432	420	280	420	154
T				432	120	270	420	210
P	1.3			432	420	280	420	154
T				432	120	270	420	210
P	1.2			432	420	280	420	154
T				432	120	270	420	196
P	1.1			432	420	280	420	154
T				432	120	270	420	196
P	2.6			432	420	280	420	154
T				432	120	270	420	210
P	2.5			432	420	280	420	154
T				432	120	270	420	210
P	2.4			432	420	280	420	154
T				432	120	270	420	224
P	2.3			432	420	280	420	154
T				432	120	270	420	224
P	2.2			432	420	260	420	154
T				432	120	250	420	196
P	2.1			432	420	280	420	154
T				432	120	270	420	210
P	3.6			432	420	280	420	154
T				432	120	270	420	252
P	3.5			432	420	280	420	154
T				432	120	270	420	210
P	3.4			432	420	270	420	154
T				432	120	260	420	224
P	3.3			432	420	270	420	154
T				432	120	260	420	210
P	3.2			432	420	280	420	154
T				432	120	270	420	224
P	3.1			432	420	280	420	154
T				432	120	270	420	210
P	4.6			432	420	280	420	154
T				432	120	270	420	210
P	4.5			432	420	280	420	154
T				432	120	270	420	224
P	4.4			432	420	280	420	154
T				432	120	270	420	210
P	4.3			432	420	280	420	154
T				432	120	270	420	224
P	4.2			432	420	280	420	154
T				432	120	270	420	224
P	4.1			432	420	280	420	154
T				432	120	270	420	210
P TW Avg			0.00	432	420	278	420	154
T TW Avg			0.00		120	268	420	215

LABORATORY DATA

Orsat Analysis
Operator - DaRos

Run	1		2		3		Avg
Gas	Act %	Net %	Act %	Net %	Act %	Net %	Net %
CO2	2.0	2.0	1.8	1.8	1.8	1.8	1.9
O2	20.8	18.8	20.8	19.0	20.8	19.0	18.9
CO	20.8	0.0	20.8	0.0	20.8	0.0	0.0
N2		79.2		79.2		79.2	79.2
Molecular Weight, Dry			29.06				

Particulate Analysis

Front-half Filter Dry Catch, mg	10.65
Blank Filter Catch, mg	0.00
Front-half Aqueous Wash, mg	
Filterable	7.35
Non-filterable	16.54
Front-half Acetone Wash, mg	5.34
Impinger Catch, mg	
Filterable	2.25
Non-filterable	328.00
Back-half Acetone rinse, mg	7.06
Total Front-half Filterable, mg	18.00
Total Front-half Nonfilterable, mg	21.88
Total Front-half, mg	39.88
Total Back-half Filterable, mg	2.25
Total Pennsylvania DER Mass, mg	42.13
Total Back-half Solubles, mg	335.06

CALCULATIONS

Standard Temp, deg F	68
Standard Press, in Hg	29.92
Barometric Press, in Hg	29.19
Stack Press, in Hg	29.15
Vol of H2O Std, dscf	19.233
M-5 Stack Moist. Content, %	33.88
Sat Stack Moist. Content, %	33.55
Stack Moist. Cont. Used, %	33.55
Molecular Weight, Dry	29.06
Molecular Weight, Wet	25.35
Nozzle Dia, in	0.317
X-Area of Stack, ft2	32.125

	Push	Travel	Total
Time-avg Stack Temp, deg F	162	159	161
Meter Volume Corr, ft3	25.808	12.078	37.886
Meter Volume Std, dscf	25.566	11.965	37.531
Vol of H2O Std, dscf	12.908	6.041	18.949
Sample Time, min	22.63	15.72	38.35
Stack Vel, fps	65.50	43.44	
Percent Isokinetic, %	95	97	
Stack Gas Vol, acfm	126242	83734	
Stack Gas Vol, dscfm	69407	46246	
Stack Gas Density, lb/ft3	0.0545	0.0547	
DER Part. Emission Conc., gr/dscf		0.0173	
DER Part. Emission Rate, lb/ton coke		0.0163	
DER Part. Emission Rate, lb/hr		0.95	
Front-half Part. Conc., gr/dscf		0.0164	
Front-half Part. Rate, lb/ton coke		0.0155	
Front-half Part. Rate, lb/hr		0.90	
Back-half Filt. Conc., gr/dscf		0.0009	
Back-half Filt. Rate, lb/ton coke		0.0009	
Back-half Filt. Rate, lb/hr		0.05	
Back-half Soluble Conc., gr/dscf		0.1378	
Back-half Soluble Rate, lb/ton coke		0.1300	
Back-half Soluble Rate, lb/hr		7.54	

DUCT VELOCITIES AT SAMPLING PLANE

Push

Position	1	2	3	4
6	77	79	54	52
5	46	79	60	52
4	40	84	56	65
3	51	56	56	79
2	68	79	54	79
1	85	92	60	65

Position

Travel

Position	1	2	3	4
6	40	59	43	41
5	29	65	40	32
4	23	46	41	41
3	29	45	41	52
2	45	64	34	47
1	61	56	41	43

Position