Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Compliance Tests of the Envirotech Hooded Quench Car No. 102 Operated on the Number 7, 8 and 9 Coke Batteries Located at the United States Steel Clairton Works

File No. 50.74

Compliance Tests of the Envirotech Hooded Quench Car No. 102 Operated on the Number 7, 8 and 9 Coke Batteries Located at the United States Steel Clairton Works

Clairton, PA 15025

Project No. 50.74

October 28, 1985

Prepared by:
Dr. R.G. Patterson

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File 50.74

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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. 102 (HQC) operating on the No. 7, 8 and 9 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 October 1, 2 and 3, 1985. All tests were completed while the car was receiving and transporting coke from the Number 7, 8 and 9 coke batteries.

SUMMARY

The following points summarize the results of the compliance tests completed on the EVT Hooded Quench Car No. 102. Three compliance tests were conducted during normal coking conditions.

1. The average particulate mass emission rate was 0.028 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.

Batteries 7, 8 and 9 are considered a new source and are 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.

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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

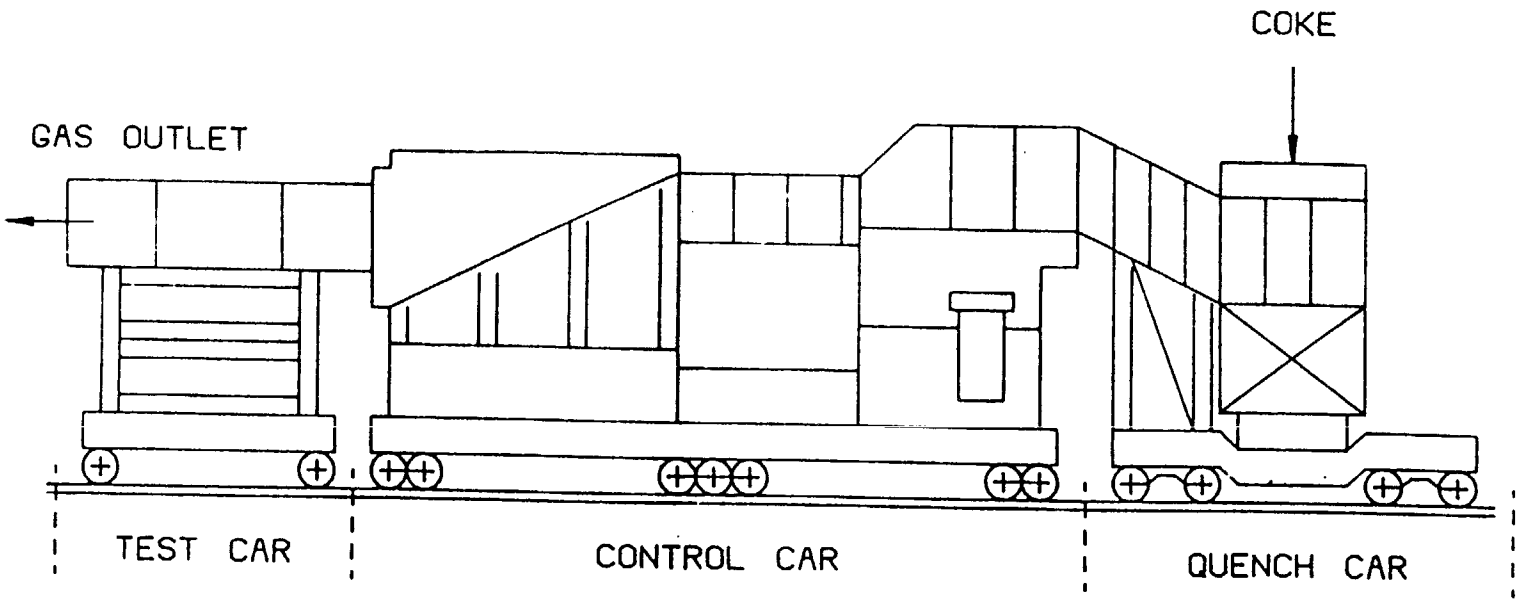

Figure 1. Envirotech Hooded Coke Quench Car System.

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.
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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 batteries number 7, 8 and 9 was 11 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
1201	10/1/85	Compliance	Normal
1202	10/2/85	"	"
1203	10/3/85	"	"

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.

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TABLE 1. AVERAGE HQC SYSTEM PROCESS CONDITION DATA

Test Number	1201		1202		1203	
	Push	Travel	Push	Travel	Push	Travel
Nozzle Water Flowrate, gpm	430	130	450	180	450	180
Water Temp, deg F	408	408	407	406	403	404
Water Press, psig	276	273	279	275	275	269
Annubar Vel Head, in. WC	0.0	0.0	0.0	0.0	0.0	0.0
Scrubber Temp In, deg F	0	0	0	0	0	0
Scrubber Temp Out, deg F	157	151	158	151	157	149
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	1201		1202		1203	
	Push	Travel	Push	Travel	Push	Travel
Avg Gas Vel, fps	63.8	35.1	73.2	40.8	70.4	45.4
Avg Gas Flow rate, acfm	122945	67640	141011	78639	135726	87527
Avg Gas Flow rate, dscfm	73607	40878	84167	47452	81815	53475
Gas Temp, deg F	157	151	158	151	157	149
Gas Press, in. Hg	29.29	29.29	29.38	29.38	29.31	29.31
Samp. Vol., dscf (corr.)	18.11	10.55	19.93	12.20	20.18	13.33
% Isokinetic	92	97	88	106	91	97
		Total		Total		Total
Samp. Vol., dscf (corr.)		28.65		32.13		33.51
Dry Gas Comp.						
CO2 (vol %)		0.8		0.8		0.8
O2 (vol %)		20.0		20.0		20.0
CO (vol %)		0.0		0.0		0.0
N2 (vol %)		79.2		79.2		79.2
Moisture, vol%						
M-5		29.23		32.19		28.34
Sat.		28.54		28.87		28.05
Mol Wt,						
Dry		28.93		28.93		28.93
Wet		25.81		25.77		25.86
Front-half Part., mg		69.91		57.78		34.62
Back-half Part., mg		0.80		0.01		0.00
Total DER Part, mg		70.71		57.79		34.62

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
1201	24	0.0381	4.11	0.0370	0.0400
1202	24	0.0278	3.69	0.0302	0.0400
1203	24	0.0159	2.08	0.0182	0.0400
Avg		0.027	3.29	0.028	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
1201	24	0.0377	4.06	0.0365
1202	24	0.0277	3.69	0.0302
1203	24	0.0159	2.08	0.0182
Avg		0.027	3.28	0.028

* 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
1201	24	0.00043	0.046	0.00042
1202	24	.00000	0.001	0.00001
1203	24	0.00000	0.000	0.00000
Avg		0.00015	0.016	0.00014

* Includes 0.22 micron filter catch of impinger solution

TABLE 6. SUMMARY OF VISISBLE EMISSION OBSERVATIONS

Test No.	1201		1202		1203	
Point No.	Opac >20%	Sec >20%	Opac >20%	Sec >20%	Opac >20%	Sec >20%
1.6 P						
T						
1.5 P						
T						
1.4 P						
T						
1.3 P						
T						
1.2 P						
T					25	2.6
1.1 P						
T						
2.6 P						
T						
2.5 P						
T						
2.4 P						
T						
2.3 P						
T						
2.2 P						
T						
2.1 P						
T						
3.6 P						
T						
3.5 P						
T					40	4.2
3.4 P						
T						
3.3 P						
T						
3.2 P						
T						
3.1 P						
T						
4.6 P						
T						
4.5 P						
T						
4.4 P						
T						
4.3 P						
T					75	9.2
4.2 P					35	7.3
T						
4.1 P						
T						
No./test	0		0		4	
Sec/test		0		0		23.34

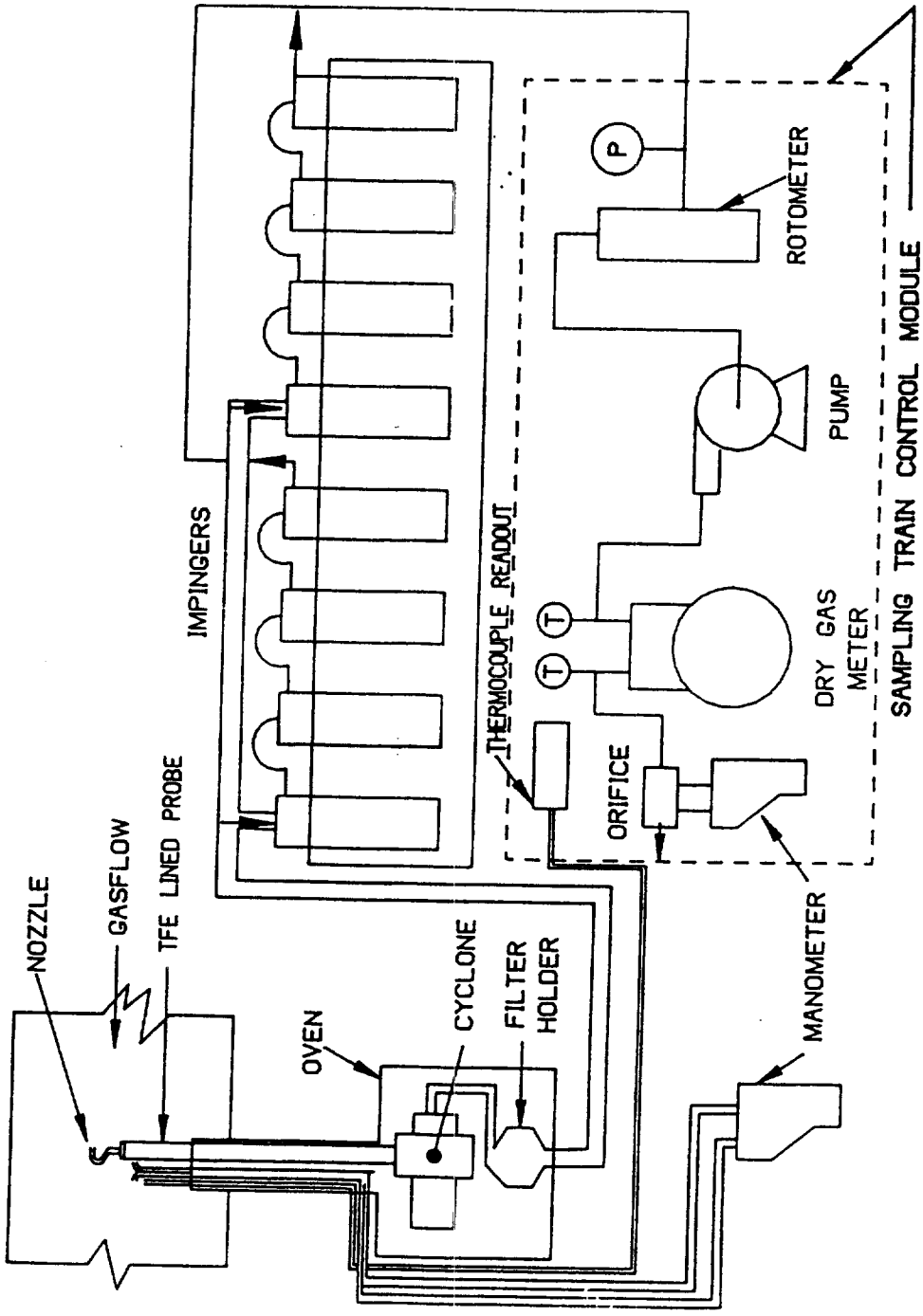

Figure 2. Method 5 Sampling Apparatus.

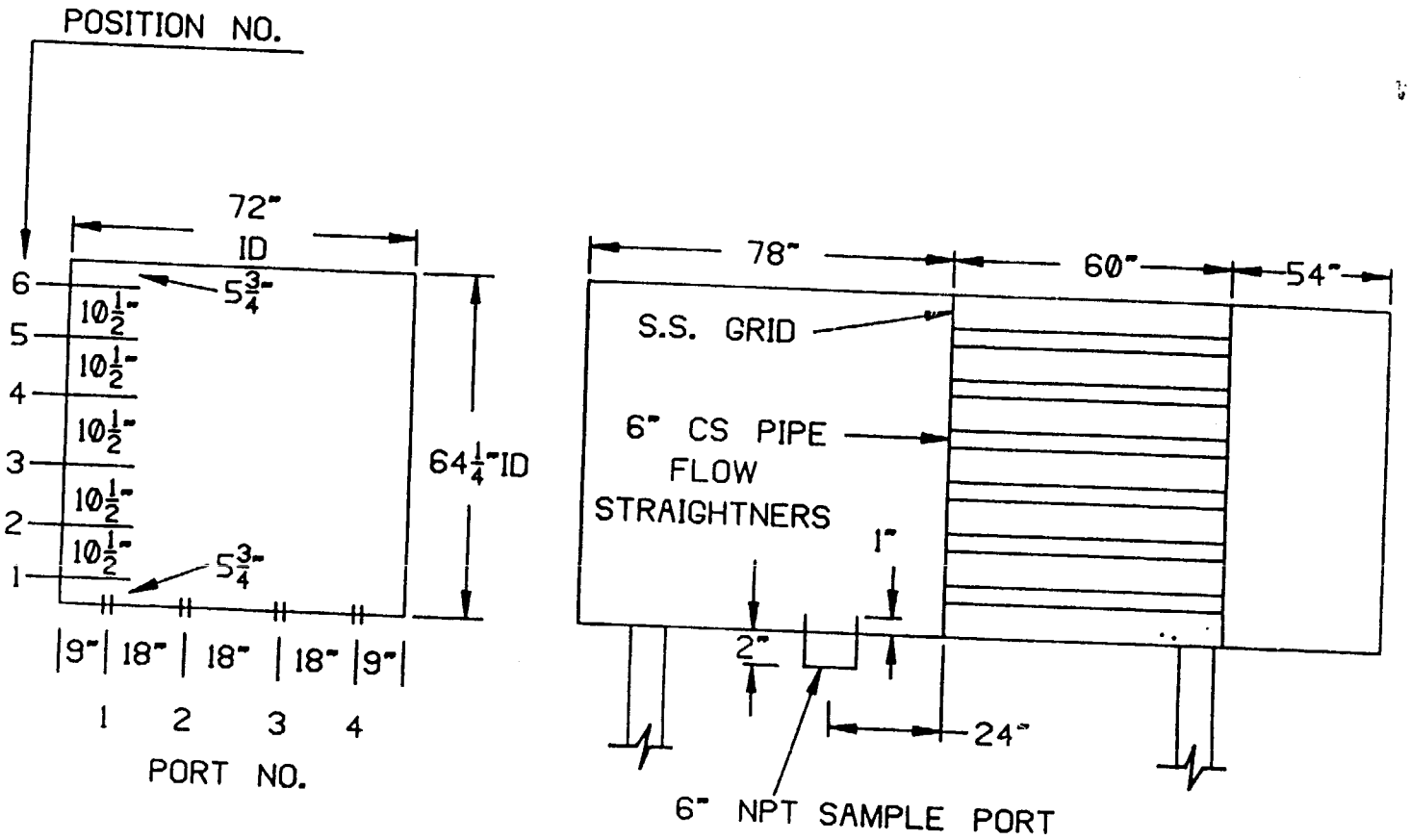

Figure 3. Test Car Duct Sampling Arrangement.

APPENDIX B

SAMPLE TRAIN DATA SHEETS

Plant US STEEL - CLAIRTON, PA
Date 10-1-85
Sample Location HCQC - TEST CAR
Sample Type M-5
Run Number 12.1
Operator SMITH & MILBURN
Ambient Temperature ~~70°~~ ≈50°F
Barometric Pressure 29.36 @ 12N
Static Pressure, (H_2O) -9 @ #2.3
Filter Number(s) RA1026-078
N/A

Leak Check: Initial at 15 " Hg, .002 CFM
Final at 15 " Hg, .002 CFM
Pitot Leak Check: ok

Impinger Volume

	Initial	Final	Net Gain
TRAIN A	100	330	230
	100	100	0
	M/T	M/T	0
TRAIN B	100	110	10
	100	100	0
	M/T	M/T	0

Silica Gel

A	639.8	646.7	
B	~~669.7~~ 669.7	675.2	

SASS Condensate N/A
Total Volume

Probe Length and Type 5 ft TFE
Nozzel Size & I.D. .217
Pitot Coefficient & I.D. .825 (1-BENT)
Assumed Moisture %
Molecular Weight, Dry, (M_d)
Meter Box Number ABT 14 LG (MDA)
Meter Coefficient
α Factor
K =
$K(N_d)^4$ = ___ x (___)^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)$ (P)

Traverse Point Number	Sampling Time, min / Clock Time (24-hr) Clock	Gas Meter Reading (V_m), ft 3	Velocity Head (Δp), in. H_2O	Rotometer Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta p}$
		Init. 235.430												
1.6	:49 / 855	236.670	1.2	24.8	34.8	158	274	66°	1.10	259	71	70	10"	
	1:45 / :56	237.350	.40		13.7	150	274	66°	.27	261	71	70	2.5"	
1.5	:40 / 902	237.920	.50		15.4	155	274	64°	.29	268	71	70	3	
	1:22 / :42	238.345	.20		n/a	149	273	64°	.12	269	71	70	1.5"	
1.4	:39 / 909	238.955	.60		17.1	156	274	62°	.35	270	71	70	3"	
	1:37 / :58	239.505	.25		10.4	150	274	62°	.14	272	71	70	2"	
1.3	:41 / 915	240.130	.70		18.6	156	274	60°	.37	274	71	70	3"	
	1:01 / :20	240.340	.25		10.4	151	273	60°	.14	274	71	70	2"	
AVG.														

Comments: At point 1.6 - accidentally tested push at 34.8 instead of 24.8 - too dark to see rotometer clearly

7602/5/81/Rev 1
REV 2 7-85

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		Temperature °F			Orifice ΔH		Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Init.		Desired	Actual	Stack	Probe	Impinger		Oven	In	Out		
1.2	920	240.040	.90		21.3	159	274	58°	.48	273	71	70	3"	
	1:11 :49	241.580	.30		11.6	152	273	58°	.18	273	71	70	2"	
1.1	1:30 927	242.365	1.2		24.8	155	272	58°	.65	274	71	70	5"	
	1:41 :12	242.540	.40		13.7	150	274	58°	.25	274	71	70	2"	
2.6	:53 938	243.365	1.2		24.8	156	273	58°	.68	277	71	70	5.5"	
	1:40 :40	243.835	.40		13.7	153	275	58°	.23	277	71	70	2.5"	
2.5	1:20 944	244.560	1.0		22.5	159	272	58°	.57	277	71	70	5"	
	1:39 :58	245.280	.40		13.7	152	275	58°	.24	276	71	70	2.5"	
2.4	1:00 950	246.140	1.5		28.0	154	274	58°	.85	275	71	70	7"	
	1:19 :20	246.425	.45		14.6	149	273	58°	.27	275	71	70	2.5"	
2.3	1:40 956	247.270	1.5		28.0	160	274	58°	.85	276	71	71	7"	
	1:25 :45	247.840	.40		13.7	152	272	58°	.25	276	71	71	2.5"	
2.2	1:36 1002	248.560	1.5		28.0	154	272	58°	.83	274	71	71	7"	
	1:52 :16	248.800	.45		14.6	150	274	58°	.27	274	71	71	2.5"	
2.1	1:33 1007	249.525	1.5		28.0	158	274	56°	.85	273	71	71	7"	
	1:40 1:07	250.455	.50		15.4	150	272	56°	.32	273	71	71	3"	
AVG.														

REV 2 7-85

Run No. 2.1 Date 10-1-85 Sampling Location HCQC - TEST CAR

US STEEL - CLAIRTON, PA

Comments:

Traverse Point Number	Sampling Time, min / (24-hr) Clock	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Orifice Δ H Desired	Orifice Δ H Actual	Temperature °F: Stack	Probe	Impinger	Orifice Δ H	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Initial												
3.6	:39 / 1013	251.230	1.2		2.8	157	273	56°	.69	274	71	71		
	1:16 / :39	251.640	.25		10.4	150	273	56°	.14	274	71	71	1.5"	
3.5	:25 :39 / 1019	252.260	.90		20.0	159	272	54°	.48	273	71	71	4"	
	:56 1:33 :54	252.635	.20		N/A	153	274	54°	.12	273	70	71	1.5"	
3.4	:38 / 1025	253.230	.70		18.6	156	274	54°	.40	272	71	71	3.5"	
	:56 :18	253.375	.15		N/A	152	273	54°	.09	272	71	71	1.5"	
3.3	:41 / 1030	254.010	.70		18.6	159	272	54°	.40	273	70	71	3.5"	
	:26 :45	254.375	.15		N/A	155	274	54°	.09	273	70	71	1.5"	
3.2	:39 / 1037	255.030	.80		20.0	154	272	54°	.46	271	70	71	4"	
	:40 :08	255.410	.15		N/A	153	274	54°	.09	271	71	71	1.5"	
3.1	:35 / 1042	255.700	1.0		22.5	158	273	54°	.59	271	71	71	4.5"	
	1:39 :08	256.250	.20		N/A	151	274	54°	.12	271	71	71	1.5"	
4.6	:39 / 1045	256.925	.80	20.0	~~22.5~~	157	274	54°	.48	271	70	70		
	1:35 :32	257.315	.30		11.6	150	273	54°	.15	273	70	70	1.5"	
4.5	:41 / 1055	257.980	.70	18.6	20.0	161	274	54°	.40	272	70	71	4"	
	1:35 :54	258.525	.25		10.4	152	273	54°	.14	272	70	71	1.5"	
Avg.														

REV 2 7-85

Run No. 12.1 Date 10-1-85 Sampling Location HCQC - TEST CAR

US STEEL - CLAIRTON, PA

Comments:

Traverse Point Number	Sampling Time, min	Clock Time (24-hr) Clock	Gas Meter Reading (V_m), ft.^{3}	Velocity Head (ΔP_s), in. H_2O	Rotometer Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
			Init.												
4.4	:36	1100	259.215	1.0		22.5	159	274	54°	.56	272	70	70	5"	
	:56	:20	259.455	.40		13.7	152	273	54°	.25	272	70	71	2"	
4.3	:40	1106	260.325	1.5		28.0	156	273	54°	.84	273	70	70	7"	
	1:23	:43	260.860	.40		13.7	151	274	54°	.24	272	70	70	2"	
4.2	:41	1113	261.670	1.2		24.8	154	272	54°	.69	271	70	70	6"	
	:51	:10	261.805	.35		12.7	151	274	54°	.23	271	70	70	2"	
4.1	:40	1119	262.530	1.0		22.5	158	273	54°	.57	271	70	70	5	
	1:38	:58	263.200	.35		12.7	151	272	54°	.22	271	70	70	2.5"	
		purge	278.200												
AVG.															

RC 7-85

Run No. 12.1

Date 10-1-85

Sampling Location HCQC - TEST CAR
US STEEL - CLARITON, PA

Comments:

FIELD DATA

Plant US STEEL - CLAIRTON, PA
Date 10-2-85
Sample Location HCQC - TEST CAR
Sample Type M-5
Run Number 12.2
Operator SMITH & MULBURN
Ambient Temperature 70° to 65°
Barometric Pressure 29.45 @ 8:00 PM
Static Pressure, (H_2O) -.9" H_2O (3.5)
Filter Number(s) RA1026-079
N/A

Leak Check: Initial at 27" Hg, .002 CFM
Final at ~~17~~" Hg, ~~0~~ CFM
Pitot Leak Check: OK

Impinger Volumes

	Initial	Final	Net Gain
TRAIN A	100	325	225
	100	115	15
	M/I	2	2
TRAIN B	100	165	65
	100	102	2
	M/I	0	0

Silica Gel

A	645.2	655.0	
B	675.2	682.9	

SASS Condensate
Total Volume 309

Probe Length and Type 5 ft TFE
Nozzel Size & I.D. .317
Pitot Coefficient & I.D. .825 (1-BENT)
Assumed Moisture %
Molecular Weight, Dry, (M_d)
Meter Box Number APT 14 26 (MOD)
Meter Coefficient
α Factor
K =
$K(Nd)^4$ = ___ = (___)^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)$ (P)

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 Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Init. 278.915												
1.6	:39 / 443	279.680	1.0	24.8	22.5	158	273	62°	.61	273	74	73	5"	
	1:33 / :54	280.385	.40	13.7	13.7	152	275	62°	.26	273	74	73	2.5"	
1.5	:39 / 447	280.915	.50	15.4	15.4	160	275	60°	.31	273	74	73	3"	
	1:13 / :34	281.245	.25	9.2	10.4	158	273	60°	.12	273	75	73	2"	
1.4	:37 / 454	281.800	.70	17.1	18.6	159	275	60°	.40	272	75	73	3.5"	
	1:27 / :50	282.355	.30	10.4	11.6	151	273	60°	.19	272	75	73	2"	
1.3	:40 / 459	283.080	1.0	18.6	22.5	156	273	60°	.57	273	75	74	5"	
	:58 / :18	283.280	.30	10.4	11.6	151	275	60°	.20	272	75	74		
AVG.														

7602/5/A1/Rev 1
REV 2 7-85

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³ Init.	Velocity Head (ΔP_s), In. H_2O	Rotometer Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum In. Hg	Avg. $\sqrt{\Delta P}$
1.7	1:39 – 504	284.120	1.5	21.3	28.0	159	272	60°	.86	271	76	74	7"	
	1:23 – :44	284.610	.30	11.6	11.6	151	275	60°	.20	271	76	74	2"	
1.1	:39 – 509	285.500	1.7	24.8	29.9	156	272	60°	.95	271	76	75	8"	
	:44 – :10	285.650	.50	13.7	15.4	150	274	60°	.33	272	76	75		
2.6	:39 – 514	286.590	2.0	24.8	32.6	159	274	60°	1.1	273	76	76	9"	
	1:39 – 1:00	287.460	.50	13.7	15.4	152	273	58°	.35	273	76	76	3"	
2.5	:39 – 520	288.315	1.5	22.5	25.0	156	273	60°	.86	272	77	76	7"	
	1:15 – :36	288.750	.35	13.7	12.7	150	274	60°	.23	272	77	76	2"	
2.4	:39 – 623	289.665	2.0	28.0	32.6	158	275	60°	1.0	272	79	79	8.5	
	1:20 – 1:41:38	290.210	.40	14.6	13.7	151	274	60°	.27	273	79	79	2.5"	
2.3	:39 – 629	291.150	1.7	28.0	29.9	155	274	58°	.96	271	79	78	8.0	
	1:06 – :27	291.490	.40	13.7	13.7	150	273	58°	.20	271	79	79		
2.2	:40 – 636	292.360	1.5	28.0	28.0	159	273	58°	.86	271	79	78	7.5	
	1:45 – 1:05	293.195	.40	14.6	13.7	151	274	58°	.27	271	79	79	2.5	
2.1	:41 – 641	294.105	1.5	28.0	28.0	157	274	58°	.86	271	79	78	7.5	
	1:14 – :33	294.570	.50	15.4	15.4	150	273	58°	.29	272	79	78	3"	
AUG.														

REV. 7-85

Run No. 12.2 Date 10-2-85 Sampling Location HSRC - TEST CAR

US STEEL - CLAIRTON, PA

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	Rotometer		Temperature °F							Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out		
~~2.1~~	:38 647	Init. 295.405	1.5	28.0	28.0	159	273	58°	.86	272	78	78	7.5	
3.6	1:26 :48	296.025	.40	10.4	13.7	152	273	58°	.26	272	78	78	2.5	
~~3.5~~	:41 653	296.020	2.0	20.0	32.6	157	274	58°	1.1	272	78	78	9.0	
3.5	:54 :13	296.850	.60	9.2	17.1	151	272	58°	.38	272	78	78		
~~3.5~~	:39 651	297.960	.90	18.6	21.3	160	274	58°	.54	272	78	78	5.0	
3.4	1:18 :39	298.420	.35	9.2	12.7	152	274	58°	.22	272	78	78	2.0	
~~3.4~~	:44 702	299.130	.90	18.6	21.3	155	274	58°	.54	272	78	78	5.0	
3.3	:44 ~~8~~	299.130	—	9.2	NT									
~~3.3~~	:41 709	299.975	1.0	20.0	22.5	157	273	58°	.60	272	78	78	5.0	
3.2	1:33 :52	300.650	.40	9.2	13.7	151	274	58°	.26	272	77	77	3.0	
~~3.2~~	:40 714	301.430	1.5	22.5	28.0	158	272	58°	.85	272	78	78	7.0	
3.1	1:09 :29	301.975	.60	9.2	17.1	150	274	58°	.35	272	77	78		
~~3.1~~	:39 720	302.710	1.0	20.0	22.5	159	272	58°	.61	271	77	77	5.0	
4.6	1:26 :47	303.385	.50	11.6	15.4	151	274	58°	.33	271	77	77	3.0	
~~4.6~~	:39 726	304.065	.80	18.6	20.0	158	273	58°	.50	272	77	77	4.5	
4.5	:52 :13	304.215	.30	10.4	11.6	149	274	58°	.20	272	77	77		
AVG.														

Run No. 12.2 Date 10-2 85 Sampling Location HEGC - TEST CAR

AT point 3.1 scrubber was shut down during travel US STEEL - CLAIRTON, PA

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	Rotometer Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Init.												
4.4	:40 730	304.135	1.7	22.5	24.8	162	273	58°	.96	272	77	77	9.0	
	1:19 :34	305.755	.60	13.7	17.1	151	274	58°	.37	272	77	77	3.5	
4.3	:42 736	306.335	1.7	28.0	29.9	159	272	58°	.98	272	77	77	8.5	
	:49 :07	306.850	.50	13.7	15.4	152	274	58°	.20	272	76	77	—	
4.2	:40 742	307.770	1.7	24.8	24.9	158	274	56°	.97	272	76	76	8.0	
	1:39 :59	308.620	.50	12.7	15.4	151	272	56°	.34	272	76	76	3.0	
4.1	:39 749	309.410	1.2	22.5	24.8	156	273	56°	.72	272	76	76	6.0	
	1:16 :37	309.945	.50	12.7	15.4	148	274	56°	.33	271	76	76	3.0	
		Purge To:	324.945											
AVG.														

Rev. 7-85

Run No. 12.2 Date 10-2-85 Sampling Location HSRC - TEST GAS
US STEEL - CLAIRTON, PA

Comments:

Plant US STEEL - CLAIRTON PA
Date 10-3-85
Sample Location HCQC - TEST CAR
Sample Type M-5
Run Number 12.3
Operator SMITH & MILBURN
Ambient Temperature 60°
Barometric Pressure 29.38 @ 9AM
Static Pressure, (H_2O) -.9 @ 2.3
Filter Number(s) RA1026-080
N/A

Leak Check: Initial at 17" Hg, .002 CFM
Final at 23" Hg, .004 CFM
Pitot Leak Check: ok

Impinger Volume

	Initial	Final	Net Gain
TRAIN A	100	260	160
	100	108	8
	M/T	0	Ø
TRAIN B	100	200	100
	100	102	2
	M/T	Ø	Ø 270

Silica Gel

N	616.8	621.Ø
E	645.6	655.Ø

SASS Condensate N/A
Total Volume

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

Traverse Point Number	Sampling Time, min	Clock Time (24-hr) Clock	Gas Meter Reading (V_m), ft³	Velocity Head (ΔP_s), in. H_2O	Rotometer Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice Δ H	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
			Init. 339.690												
1.6	:40	827	340.580	1.5	22.5	28.0	162	274	50°	.85	262	59	59	7"	
	1:26	:46	341.275	.50	13.7	15.4	151	275	50°	.38	262	59	59	3"	
1.5	:40	833	341.900	.70	15.4	18.6	154	274	52°	.40	268	59	59	3"	
	:51	:11	342.010	.25	10.4	10.4	147	275	52°	.16	269	59	59	1.5"	
1.4	:41	838	342.580	.50	18.6	15.4	157	274	52°	.32	270	59	59	3"	
	1:39	:58	343.155	.25	11.6	10.4	148	275	52°	.20	270	59	59	1.5"	
1.3	:41	844	343.840	.80	22.5	20.0	154	272	52°	.49	272	59	59	4"	
	1:21	:40	344.400	.30	11.6	15.4	147	275	52°	.34	272	59	59	2"	
AVG.															

7602/5/81/Rev 1
REV 2 7-85

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³ Init.	Velocity Head (ΔP_s), in. H_2O	Rotometer Desired	Rotometer Actual	Temperature °F Stack	Probe	Impinger	Orifice ΔH	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
1.2	:40 849	345.150	1.0	28.0	22.5	164	272	52°	.58	272	59	59	5"	
	1:33 :53	345.895	.50	11.6	15.4	150	274	52°	.34	272	60	59	3"	
1.1	:40 856	346.790	1.5	29.9	28.0	154	272	52°	.86	272	60	59	7"	
	1:00 :20	347.120	.70	15.4	18.6	147	273	52°	.46	272	60	59		
2.6	:40 901	348.025	1.5	32.6	28.0	159	273	52°	.86	273	61	60	7"	
	1:27 :47	348.770	.60	15.4	17.1	150	273	52°	.39	273	61	60	3"	
2.5	:39 909	349.640	1.5	28.0	28.0	156	273	52°	.86	274	62	61	7"	
	1:34 :55	350.505	.60	12.7	17.1	146	274	52°	.39	274	62	61	3"	
2.4	:39 917	351.350	1.5	32.6	28.0	153	273	52°	.86	274	62	61	7"	
	:52 :12	351.565	.60	13.7	17.1	148	273	52°	.42	274	62	61	3"	
2.3	:40 922	352.975	1.7	29.9	24.9	158	274	52°	.96	274	63	62	8"	
	1:21 :41	353.140	.60	13.7	17.1	149	273	52°	.36	274	63	62	4"	
2.2	:39 927	353.850	1.0	28.0	22.5	158	273	52°	.58	273	63	62	5"	
	1:02 :53	354.675	.60	13.7	17.1	149	273	52°	.38	273	63	62	3"	
2.1	:41 934	355.650	1.7	28.0	29.9	156	273	52°	.97	272	64	63	8"	
	1:01 :20	355.975	.70	15.4	18.6	148	272	52°	.45	272	64	63		
AVG														

REV 2. 7-85

Run No. 12.3 Date 10-3-85 Sampling Location HCRC - TEST CAR

US STEEL - CLARITON, PA

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	Reference ΔP		Temperature °F			Orifice ΔH		Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		Init.		Desired	Actual	Stack	Probe	Impinger		Oven	In	Out		
3.6	:42 / 939	356.920	1.5	28.0	28.0	157	273	52°	.86	274	64	63	7"	
	1:25 / :43	357.530	.50	13.7	15.4	149	273	52°	.36	274	65	63	3"	
3.5	:40 / 945	358.420	1.5	32.6	28.0	157	273	52°	.85	273	65	64	7"	
	:52 / :12	358.600	.60	17.1	17.1	152	274	52°	.38	273	65	64		
3.4	:39 / 950	359.460	1.5	21.3	28.0	159	274	52°	.85	273	66	64	7"	
	1:36 / :57	360.335	.60	17.7	17.1	148	272	52°	.39	272	66	64	3"	
3.3	:41 / 958	361.040	.80	21.3	20.	154	273	52°	.48	273	66	65	4"	
	1:18 / :37	361.570	.50		15.4	148	274	52°	.28	273	66	65		
3.2	:39 / 1004	362.300	1.0	22.5	22.5	161	273	52°	.58	272	66	66	5"	
	1:31 / :52	362.945	.40	13.7	13.7	153	273	52°	.25	272	66	66	2.5"	
3.1	:39 / 1010	363.785	1.5	28.6	28.0	158	273	52°	.86	272	67	66	7"	
	1:00 / :21	364.095	.50	17.1	15.4	150	273	52°	.33	272	67	66	—	
4.6	:40 / 1015	364.760	.80	22.5	20.0	159	272	52°	.47	272	67	66	4"	
	1:22 / :42	365.200	.25	15.4	10.4	151	274	52°	.16	272	67	67	2"	
4.5	:41 / 1021	365.900	.80	20.0	20.0	155	274		.47	273	68	67		
	:51 / :10	366.020	.30	11.6	11.6	150	273		.22	273	68	67		
AVG.														

REV 2 7-85

Run No. 12.3 Date 10-3-85 Sampling Location HCRC - TEST CAR

U.S. STEEL - CLAIRTON, PA

Comments:

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft³	Velocity Head (Δp), in. H_2O	Rotameter		Temperature °F			Orifice ΔH	Oven	Gas Meter		Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger			In	Out		
	Init.	366.810												
4.4	:37 1026		1.5	29.9	28.0	158	274	54°	.85	273	68	67	7"	
	1:37 1:50	367.700	.80	17.1	15.4	148	274	54°	.32	273	68	67	3"	
4.3	:40 1032	368.640	1.7	29.9	29.9	160	272	54°	.96	272	69	68	8"	
	1:18 :38	369.260	.70	15.4	18.6	149	274	54°	.43	272	69	68	3.5	
4.2	:40 1039	370.200	1.7	29.9	29.9	158	274	54°	.94	272	69	68	8"	
	1:32 :52	371.065	.70	15.4	18.6	152	273	54°	.44	272	69	68	4"	
4.1	:41 1045	371.845	1.0		22.5	158	272	54°	.59	272	69	69	5"	
	1:04 :23	372.125	.70	15.4	13.7	150	274	54°	.24	272	69	69	—	
		Avrg 387.000												
AUG.														

REV 2 7-85

Run No. 12.3 Date 10-3-85 Sampling Location PERC-TEST CAR STEEL-CLAIRTON, PA

Comments:

APPENDIX E

DATA REDUCTION

EVT Coke Quench Car Tests RGP06.27.85 File: DAT 1201

FIELD DATA

Plant	USS - Clairton, PA
Date	10-01-85
Car No.	H-3-2
Battery No.	7,8 & 9
Sample Location	HCQC - Test Car
Sample Type	M-5
Run Number	12.1
Operator	Smith & Milburn
No. of Ovens Tested	24
No. of Ovens Tested/hr	10.1
Coke Prd'n Rate, tons/oven	11
Ambient Temp, deg F	50
Barometric Pressure, in Hg	29.36
Static Pressure, in H2O	-0.9
Stack Area, ft2	32.125
Filter Type	RA934AH
Top Filter Number	RA102G-078
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	30

	in Hg	CFM
Leak Check Initial	15	0.002
Final	15	0.002

Water Volume:

Location	Initial	Final	Net Gain
Imp A1	100	330	230
Imp A2	100	100	0
Imp A3	0	0	0
Sil Gel A	639.8	645.7	5.9
Imp B1	100	110	10
Imp B2	100	100	0
Imp B3	0	0	0
Sil Gel B	669.7	675.2	5.5
Total Volume			251.4

Combined Impinger pH 3.5

	Point No.	Oven No.	Start Time	Sample Time sec Total	Sample Time sec DGM	Gas Metr ft3 Start	Rotometer	Orifice del P in. WC
						235.430		
P	1.6	A-14/9	8:57	105	49	236.670	34.8	1.10
T					56	237.350	13.7	0.27
P	1.5	B-14/8	9:02	82	40	237.920	15.4	0.29
T					42	238.345	<10	0.12
P	1.4	B-14/9	9:09	97	39	238.955	17.1	0.35
T					58	239.505	10.4	0.14
P	1.3	A-14/7	9:15	61	41	240.130	18.6	0.37
T					20	240.340	10.4	0.14
P	1.2	A-14/8	9:20	90	41	241.040	21.3	0.48
T					49	241.580	11.6	0.18
P	1.1	B-14/7	9:27	53	41	242.365	24.8	0.65
T					12	242.540	13.7	0.25
P	2.6	B-16/8	9:38	80	40	243.365	24.8	0.68
T					40	243.835	13.7	0.23
P	2.5	B-16/9	9:44	97	39	244.560	22.5	0.57
T					58	245.280	13.7	0.24
P	2.4	A-16/7	9:50	59	39	246.140	28.0	0.85
T					20	246.425	14.6	0.27
P	2.3	A-16/8	9:56	85	40	247.270	28.0	0.85
T					45	247.840	13.7	0.25
P	2.2	B-16/7	10:02	52	36	248.560	28.0	0.83
T					16	248.800	14.6	0.27
P	2.1	A-18/9	10:07	100	33	249.525	28.0	0.85
T					67	250.455	15.4	0.32
P	3.6	B-18/8	10:13	78	39	251.230	24.8	0.69
T					39	251.640	10.4	0.14
P	3.5	B-18/9	10:19	93	39	252.260	20.0	0.48
T					54	252.635	<10	0.12
P	3.4	A-18/7	10:25	56	38	253.230	18.6	0.40
T					18	253.375	<10	0.09
P	3.3	A-18/8	10:30	86	41	254.010	18.6	0.40
T					45	254.375	<10	0.09
P	3.2	B-18/7	10:37	47	39	255.030	20.0	0.46
T					8	255.110	<10	0.09
P	3.1	A-20/9	10:42	99	31	255.700	22.5	0.59
T					68	256.250	<10	0.12
P	4.6	B-20/8	10:48	75	39	256.925	20.0	0.48
T					36	257.315	11.6	0.15
P	4.5	B-20/9	10:55	95	41	257.980	18.6	0.40
T					54	258.525	10.4	0.14
P	4.4	A-20/7	11:00	56	36	259.215	22.5	0.56
T					20	259.455	13.7	0.25
P	4.3	A-20/8	11:06	83	40	260.325	28.0	0.84
T					43	260.860	13.7	0.24
P	4.2	B-20/7	11:13	51	41	261.670	24.8	0.69
T					10	261.805	12.7	0.23
P	4.1	A-22/9	11:19	98	40	262.530	22.5	0.57
T					58	263.200	12.7	0.22
	Total	(Time in minutes)			31.30	27.77		
	Push				15.70	17.535	File: DAT	1201
	Travel				15.60	10.235	Page 2 of 8	

	Point No.	Temperature, deg F						
		Stack	Probe	Oven	Imping A	Imping B	GM In	GM Out
P	1.6	158	274	259	66	66	71	70
T		150	274	261	66	66	71	70
P	1.5	155	274	268	64	64	71	70
T		149	273	269	64	64	71	70
P	1.4	156	274	270	62	62	71	70
T		150	274	272	62	62	71	70
P	1.3	156	274	274	60	60	71	70
T		151	273	274	60	60	71	70
P	1.2	159	274	273	58	58	71	70
T		152	273	273	58	58	71	70
P	1.1	155	272	274	58	58	71	70
T		150	274	274	58	58	71	70
P	2.6	156	273	277	58	58	71	70
T		153	275	277	58	58	71	70
P	2.5	159	272	277	58	58	71	70
T		152	275	276	58	58	71	70
P	2.4	154	274	275	58	58	71	70
T		149	273	275	58	58	71	70
P	2.3	160	274	276	58	58	71	71
T		152	272	276	58	58	71	71
P	2.2	154	272	274	58	58	71	71
T		150	274	274	58	58	71	71
P	2.1	158	274	273	56	56	71	71
T		150	272	273	56	56	71	71
P	3.6	157	273	274	56	56	71	71
T		150	273	274	56	56	71	71
P	3.5	159	272	273	54	54	71	71
T		153	274	273	54	54	70	71
P	3.4	156	274	272	54	54	71	71
T		152	273	272	54	54	71	71
P	3.3	159	272	273	54	54	70	71
T		155	274	273	54	54	70	71
P	3.2	154	272	271	54	54	70	71
T		153	274	271	54	54	71	71
P	3.1	158	273	271	54	54	71	71
T		151	274	271	54	54	71	71
P	4.6	157	274	271	54	54	70	70
T		150	273	273	54	54	70	70
P	4.5	161	274	272	54	54	70	71
T		152	273	272	54	54	70	71
P	4.4	159	274	272	54	54	70	70
T		152	273	272	54	54	70	71
P	4.3	156	273	273	54	54	70	70
T		151	274	272	54	54	70	70
P	4.2	154	272	271	54	54	70	70
T		151	274	271	54	54	70	70
P	4.1	158	273	271	54	54	70	70
T		151	272	271	54	54	70	70

P TW Avg 157
T TW Avg 151

	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	10.0	1.20	1.10	69.85		0	0.0
T		2.5	0.40	0.63	40.07		0	0.0
P	1.5	3.0	0.50	0.71	44.98		0	0.0
T		1.5	0.20	0.45	28.31		0	0.0
P	1.4	3.0	0.60	0.77	49.31		0	0.0
T		2.0	0.25	0.50	31.68		0	0.0
P	1.3	3.0	0.70	0.84	53.26		0	0.0
T		2.0	0.25	0.50	31.70		0	0.0
P	1.2	3.0	0.90	0.95	60.54		0	0.0
T		2.0	0.30	0.55	34.76		0	0.0
P	1.1	5.0	1.20	1.10	69.68		0	0.0
T		2.0	0.40	0.63	40.07		0	0.0
P	2.6	5.5	1.20	1.10	69.74		0	0.0
T		2.5	0.40	0.63	40.17		0	0.0
P	2.5	5.0	1.00	1.00	63.82		0	0.0
T		2.5	0.40	0.63	40.13		0	0.0
P	2.4	7.0	1.50	1.22	77.84		0	0.0
T		2.5	0.45	0.67	42.46		0	0.0
P	2.3	7.0	1.50	1.22	78.22		0	0.0
T		2.5	0.40	0.63	40.13		0	0.0
P	2.2	7.0	1.50	1.22	77.84		0	0.0
T		2.5	0.45	0.67	42.50		0	0.0
P	2.1	7.0	1.50	1.22	78.10		0	0.0
T		3.0	0.50	0.71	44.80		0	0.0
P	3.6		1.20	1.10	69.80		0	0.0
T		1.5	0.25	0.50	31.68		0	0.0
P	3.5	4.0	0.80	0.89	57.08		0	0.0
T		1.5	0.20	0.45	28.40		0	0.0
P	3.4	3.5	0.70	0.84	53.26		0	0.0
T		1.5	0.15	0.39	24.58		0	0.0
P	3.3	3.5	0.70	0.84	53.39		0	0.0
T		1.5	0.15	0.39	24.64		0	0.0
P	3.2	4.0	0.80	0.89	56.85		0	0.0
T		1.5	0.15	0.39	24.60		0	0.0
P	3.1	4.5	1.00	1.00	63.77		0	0.0
T		1.5	0.20	0.45	28.36		0	0.0
P	4.6		0.80	0.89	56.99		0	0.0
T		1.5	0.30	0.55	34.70		0	0.0
P	4.5	4.0	0.70	0.84	53.48		0	0.0
T		1.5	0.25	0.50	31.73		0	0.0
P	4.4	5.0	1.00	1.00	63.82		0	0.0
T		2.0	0.40	0.63	40.13		0	0.0
P	4.3	7.0	1.50	1.22	77.97		0	0.0
T		2.0	0.40	0.63	40.10		0	0.0
P	4.2	6.0	1.20	1.10	69.63		0	0.0
T		2.0	0.35	0.59	37.51		0	0.0
P	4.1	5.0	1.00	1.00	63.77		0	0.0
T		2.5	0.35	0.59	37.51		0	0.0
P	TW Avg			1.00				
T	TW Avg			0.55				

	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			456	430	275	408	
T				456	130	270	408	
P	1.5			456	430	270	408	
T				456	130	265	408	
P	1.4			456	430	275	408	
T				456	130	270	408	
P	1.3			456	430	270	408	
T				456	130	265	408	
P	1.2			456	430	275	408	
T				456	130	275	408	
P	1.1			456	430	270	408	
T				456	130	265	408	
P	2.6			456	430	275	408	
T				456	130	270	408	
P	2.5			456	430	280	408	
T				456	130	275	408	
P	2.4			456	430	275	408	
T				456	130	270	408	
P	2.3			456	430	280	408	
T				456	130	275	408	
P	2.2			456	430	275	408	
T				456	130	270	408	
P	2.1			456	430	280	408	
T				456	130	275	408	
P	3.6			456	430	275	408	
T				456	130	270	408	
P	3.5			456	430	280	408	
T				456	130	275	408	
P	3.4			456	430	275	408	
T				456	130	270	408	
P	3.3			456	430	280	408	
T				456	130	275	408	
P	3.2			456	430	275	408	
T				456	130	275	408	
P	3.1			456	430	280	408	
T				456	130	275	408	
P	4.6			456	430	275	408	
T				456	130	270	408	
P	4.5			456	430	280	408	
T				456	130	275	408	
P	4.4			456	430	275	408	
T				456	130	270	408	
P	4.3			456	430	280	408	
T				456	130	275	408	
P	4.2			456	430	275	408	
T				456	130	270	408	
P	4.1			456	430	280	408	
T				456	130	275	408	
P TW Avg			0.00	456	430	276	408	0
T TW Avg			0.00		130	273	408	0

LABORATORY DATA

Orsat Analysis
Operator - Milburn

Run	1		2		3		Avg
Gas	Act %	Net %	Act %	Net %	Act %	Net %	Net %
CO2	0.8	0.8	0.8	0.8	0.8	0.8	0.8
O2	20.8	20.0	20.8	20.0	20.8	20.0	20.0
CO	20.8	0.0	20.8	0.0	20.8	0.0	0.0
N2	100.0	79.2	100.0	79.2	100.0	79.2	79.2
Molecular Weight, Dry			28.93				

Particulate Analysis

Front-half Filter Dry Catch, mg	27.60
Blank Filter Catch, mg	0.00
Front-half Aqueous Wash, mg	
Filterable	17.10
Non-filterable	7.24
Front-half Acetone Wash, mg	17.97
Impinger Catch, mg	
Filterable	0.80
Non-filterable	124.07
Back-half Acetone rinse, mg	0.95
Total Front-half Filterable, mg	44.70
Total Front-half Nonfilterable, mg	25.21
Total Front-half, mg	69.91
Total Back-half Filterable, mg	0.80
Total Pennsylvania DER Mass, mg	70.71
Total Back-half Solubles, mg	125.02

CALCULATIONS

Standard Temp, deg F	68
Standard Press, in Hg	29.92
Barometric Press, in Hg	29.36
Stack Press, in Hg	29.29
Vol of H2O Std, dscf	11.833
M-5 Stack Moist. Content, %	29.23
Sat Stack Moist. Content, %	28.54
Stack Moist. Cont. Used, %	28.54
Molecular Weight, Dry	28.93
Molecular Weight, Wet	25.81
Nozzle Dia, in	0.317
X-Area of Stack, ft2	32.125

	Push	Travel	Total
Time-avg Stack Temp, deg F	157	151	154
Meter Volume Corr, ft3	18.173	10.586	28.759
Meter Volume Std, dscf	18.107	10.548	28.654
Vol of H2O Std, dscf	7.232	4.213	11.445
Sample Time, min	15.70	15.60	31.30
Stack Vel, fps	63.78	35.09	
Percent Isokinetic, %	92	97	
Stack Gas Vol, acfm	122945	67640	
Stack Gas Vol, dscfm	73607	40878	
Stack Gas Density, lb/ft3	0.0562	0.0567	
DER Part. Emission Conc., gr/dscf		0.0381	
DER Part. Emission Rate, lb/ton coke		0.0370	
DER Part. Emission Rate, lb/hr		4.11	
Front-half Part. Conc., gr/dscf		0.0377	
Front-half Part. Rate, lb/ton coke		0.0365	
Front-half Part. Rate, lb/hr		4.06	
Back-half Filt. Conc., gr/dscf		0.0004	
Back-half Filt. Rate, lb/ton coke		0.0004	
Back-half Filt. Rate, lb/hr		0.05	
Back-half Soluble Conc., gr/dscf		0.0673	
Back-half Soluble Rate, lb/ton coke		0.0653	
Back-half Soluble Rate, lb/hr		7.26	

DUCT VELOCITIES AT SAMPLING PLANE

Push

Position	1	2	3	4
6	70	70	70	57
5	45	64	57	53
4	49	78	53	64
3	53	78	53	78
2	61	78	57	70
1	70	78	64	64

Position

Travel

Position	1	2	3	4
6	40	40	32	35
5	28	40	28	32
4	32	42	25	40
3	32	40	25	40
2	35	42	25	38
1	40	45	28	38

Position

EVT Coke Quench Car Tests RGP06.27.85 File: DAT 1202

FIELD DATA

Plant	USS - Clairton, PA
Date	10-02-85
Car No.	H-3-2
Battery No.	7,8 & 9
Sample Location	HCQC - Test Car
Sample Type	M-5
Run Number	12.2
Operator	Smith & Milburn
No. of Ovens Tested	24
No. of Ovens Tested/hr	11.1
Coke Prd'n Rate, tons/oven	11
Ambient Temp, deg F	65
Barometric Pressure, in Hg	29.45
Static Pressure, in H2O	-0.9
Stack Area, ft2	32.125
Filter Type	RA934AH
Top Filter Number	RA102G-079
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	30

	in Hg	CFM
Leak Check Initial	27	0.002
Final	17	0.000

Water Volume:

Location	Initial	Final	Net Gain
Imp A1	100	325	225
Imp A2	100	115	15
Imp A3	0	2	2
Sil Gel A	645.7	653	7.3
Imp B1	100	165	65
Imp B2	100	102	2
Imp B3	0	0	0
Sil Gel B	675.2	682.9	7.7
Total Volume			324

Combined Impinger pH 3.8

	Point No.	Oven No.	Start Time	Sample Time sec Total	Sample Time sec DGM Start	Gas Metr ft3	Rotometer	Orifice del P in. WC
						278.915		
P	1.6	A-23/9	4:43	93	39	279.680	22.5	0.61
T					54	280.385	13.7	0.26
P	1.5	B-23/8	4:47	73	39	280.915	15.4	0.31
T					34	281.245	10.4	0.12
P	1.4	B-23/9	4:54	87	37	281.800	18.6	0.40
T					50	282.355	11.6	0.19
P	1.3	A-23/7	4:59	58	40	283.080	22.5	0.57
T					18	283.280	11.6	0.20
P	1.2	A-23/8	5:04	83	39	284.120	28.0	0.86
T					44	284.610	11.6	0.20
P	1.1	B-23/7	5:09	49	39	285.500	29.9	0.95
T					10	285.650	15.4	0.33
P	2.6	A-25/9	5:14	99	39	286.590	32.6	1.10
T					60	287.460	15.4	0.35
P	2.5	B-25/8	5:20	75	39	288.315	28.0	0.86
T					36	288.750	12.7	0.23
P	2.4	A-27/8	6:23	80	39	289.665	32.6	1.00
T					41	290.210	13.7	0.27
P	2.3	B-27/7	6:29	66	39	291.150	29.9	0.96
T					27	291.490	13.7	0.20
P	2.2	A-29/9	6:36	105	40	292.360	28.0	0.86
T					65	293.195	13.7	0.27
P	2.1	B-29/8	6:41	74	41	294.105	28.0	0.86
T					33	294.570	15.4	0.29
P	3.6	B-29/9	6:47	86	38	295.405	28.0	0.86
T					48	296.025	13.7	0.26
P	3.5	A-29/7	6:53	54	41	297.020	32.6	1.10
T					13	297.250	17.1	0.38
P	3.4	A-29/8	6:57	78	39	297.960	21.3	0.54
T					39	298.420	12.7	0.22
P	3.3	B-29/7	7:02	44	44	299.130	21.3	0.54
T					0	299.130		
P	3.2	A-31/9	7:09	93	41	299.975	22.5	0.60
T					52	300.650	13.7	0.26
P	3.1	B-31/8	7:14	69	40	301.430	28.0	0.85
T					29	301.975	17.1	0.35
P	4.6	B-31/9	7:20	86	39	302.710	22.5	0.61
T					47	303.385	15.4	0.33
P	4.5	A-31/7	7:26	52	39	304.065	20.0	0.50
T					13	304.215	11.6	0.20
P	4.4	A-31/8	7:30	79	40	305.135	29.9	0.96
T					39	305.755	17.1	0.37
P	4.3	B-31/7	7:36	49	42	306.335	29.9	0.98
T					7	306.850	15.4	0.20
P	4.2	A-2/9	7:42	99	40	307.770	29.9	0.97
T					59	308.620	15.4	0.34
P	4.1	B-2/8	7:49	76	39	309.410	24.8	0.72
T					37	309.945	15.4	0.33
Total		(Time in minutes)			30.12	31.03		
Push					15.87	19.235	File: DAT	1202
Travel					14.25	11.795	Page 2 of 8	

	Point No.	Temperature, deg F						
		Stack	Probe	Oven	Imping A	Imping B	GM In	GM Out
P	1.6	158	273	273	62	62	74	73
T		152	275	273	62	62	74	73
P	1.5	160	275	273	60	60	74	73
T		158	273	273	60	60	75	73
P	1.4	159	275	272	60	60	75	73
T		151	273	272	60	60	75	73
P	1.3	156	273	273	60	60	75	74
T		151	275	272	60	60	75	74
P	1.2	159	272	271	60	60	76	74
T		151	275	271	60	60	76	74
P	1.1	156	272	271	60	60	76	75
T		150	274	272	60	60	76	75
P	2.6	159	274	273	60	60	76	76
T		152	273	273	58	58	76	76
P	2.5	156	273	272	60	60	77	76
T		150	274	272	60	60	77	76
P	2.4	158	275	272	60	60	79	79
T		151	274	273	60	60	79	79
P	2.3	155	274	271	58	58	79	78
T		150	273	271	58	58	79	79
P	2.2	159	273	271	58	58	79	78
T		151	274	271	58	58	79	79
P	2.1	157	274	271	58	58	79	78
T		150	273	272	58	58	79	78
P	3.6	159	273	272	58	58	78	78
T		152	273	272	58	58	78	78
P	3.5	157	274	272	58	58	78	78
T		151	272	272	58	58	78	78
P	3.4	160	274	272	58	58	78	78
T		152	274	272	58	58	78	78
P	3.3	155	274	272	58	58	78	78
T								
P	3.2	157	273	272	58	58	78	78
T		151	274	272	58	58	77	77
P	3.1	158	272	272	58	58	78	78
T		150	274	272	58	58	77	78
P	4.6	159	272	271	58	58	77	77
T		151	274	271	58	58	77	77
P	4.5	158	273	272	58	58	77	77
T		149	274	272	58	58	77	77
P	4.4	162	373	272	58	58	77	77
T		151	274	272	58	58	77	77
P	4.3	159	272	272	58	58	77	77
T		152	274	272	56	56	76	77
P	4.2	158	274	272	56	56	76	76
T		151	272	272	56	56	76	76
P	4.1	156	273	272	56	56	76	76
T		148	274	271	56	56	76	76

P TW Avg 158
T TW Avg 151

	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	5.0	1.00	1.00	63.71		0	0.0
T		2.5	0.40	0.63	40.10		0	0.0
P	1.5	3.0	0.50	0.71	45.12		0	0.0
T		2.0	0.25	0.50	31.86		0	0.0
P	1.4	3.5	0.70	0.84	53.35		0	0.0
T		2.0	0.30	0.55	34.70		0	0.0
P	1.3	5.0	1.00	1.00	63.61		0	0.0
T			0.30	0.55	34.70		0	0.0
P	1.2	7.0	1.50	1.22	78.10		0	0.0
T		2.0	0.30	0.55	34.70		0	0.0
P	1.1	8.0	1.70	1.30	82.94		0	0.0
T			0.50	0.71	44.76		0	0.0
P	2.6	9.0	2.00	1.41	90.18		0	0.0
T		3.0	0.50	0.71	44.83		0	0.0
P	2.5	7.0	1.50	1.22	77.91		0	0.0
T		2.0	0.35	0.59	37.45		0	0.0
P	2.4	8.5	2.00	1.41	90.10		0	0.0
T		2.5	0.40	0.63	40.07		0	0.0
P	2.3	8.0	1.70	1.30	82.87		0	0.0
T			0.40	0.63	40.03		0	0.0
P	2.2	7.5	1.50	1.22	78.10		0	0.0
T		2.5	0.40	0.63	40.07		0	0.0
P	2.1	7.5	1.50	1.22	77.97		0	0.0
T		3.0	0.40	0.63	40.03		0	0.0
P	3.6	7.5	1.50	1.22	78.10		0	0.0
T		2.5	0.40	0.63	40.10		0	0.0
P	3.5	9.0	2.00	1.41	90.03		0	0.0
T			0.60	0.77	49.07		0	0.0
P	3.4	5.0	0.90	0.95	60.54		0	0.0
T		2.0	0.35	0.59	37.51		0	0.0
P	3.3	5.0	0.90	0.95	60.30		0	0.0
T				0.00	0.00		0	0.0
P	3.2	5.0	1.00	1.00	63.66		0	0.0
T		3.0	0.40	0.63	40.07		0	0.0
P	3.1	7.0	1.50	1.22	78.03		0	0.0
T			0.60	0.77	49.03		0	0.0
P	4.6	5.0	1.00	1.00	63.76		0	0.0
T		3.0	0.50	0.71	44.80		0	0.0
P	4.5	4.5	0.80	0.89	56.99		0	0.0
T			0.30	0.55	34.64		0	0.0
P	4.4	9.0	1.70	1.30	83.34		0	0.0
T		3.5	0.60	0.77	49.07		0	0.0
P	4.3	8.5	1.70	1.30	83.14		0	0.0
T			0.50	0.71	44.83		0	0.0
P	4.2	8.0	1.70	1.30	83.07		0	0.0
T		3.0	0.50	0.71	44.80		0	0.0
P	4.1	6.0	1.20	1.10	69.68		0	0.0
T		3.0	0.50	0.71	44.69		0	0.0
P TW Avg				1.15				
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			456	450	280	408	
T				456	180	275	408	
P	1.5			456	450	275	408	
T				456	180	270	408	
P	1.4			456	450	285	408	
T				456	180	280	408	
P	1.3			456	450	280	408	
T				456	180	275	408	
P	1.2			456	450	285	408	
T				456	180	280	408	
P	1.1			456	450	280	408	
T				456	180	275	408	
P	2.6			456	450	285	408	
T				456	180	280	408	
P	2.5			456	450	280	408	
T				456	180	275	408	
P	2.4			456	450	285	396	
T				456	180	280	396	
P	2.3			456	450	275	396	
T				456	180	270	396	
P	2.2			456	450	285	396	
T				456	180	280	396	
P	2.1			456	450	275	408	
T				456	180	270	408	
P	3.6			456	450	280	408	
T				456	180	275	408	
P	3.5			456	450	275	408	
T				456	180	270	408	
P	3.4			456	450	280	408	
T				456	180	275	408	
P	3.3			456	450	275	408	
T				456	180	270	408	
P	3.2			456	450	280	408	
T				456	180	275	408	
P	3.1			456	450	275	408	
T				456	180	270	408	
P	4.6			456	450	280	408	
T				456	180	275	408	
P	4.5			456	450	275	408	
T				456	180	270	408	
P	4.4			456	450	280	408	
T				456	180	275	408	
P	4.3			456	450	275	408	
T				456	180	270	408	
P	4.2			456	450	280	408	
T				456	180	275	408	
P	4.1			456	450	275	408	
T				456	180	270	408	
P TW Avg			0.00	456	450	279	407	0
T TW Avg			0.00		180	275	406	0

LABORATORY DATA

Orsat Analysis
Operator - Milburn

Run	1		2		3		Avg
Gas	Act %	Net %	Act %	Net %	Act %	Net %	Net %
CO2	0.8	0.8	0.8	0.8	0.8	0.8	0.8
O2	20.8	20.0	20.8	20.0	20.8	20.0	20.0
CO	20.8	0.0	20.8	0.0	20.8	0.0	0.0
N2	100.0	79.2	100.0	79.2	100.0	79.2	79.2
Molecular Weight, Dry			28.93				

Particulate Analysis

Front-half Filter Dry Catch, mg	29.55
Blank Filter Catch, mg	0.00
Front-half Aqueous Wash, mg	
Filterable	13.45
Non-filterable	5.47
Front-half Acetone Wash, mg	9.31
Impinger Catch, mg	
Filterable	0.01
Non-filterable	17.69
Back-half Acetone rinse, mg	2.79
Total Front-half Filterable, mg	43.00
Total Front-half Nonfilterable, mg	14.78
Total Front-half, mg	57.78
Total Back-half Filterable, mg	0.01
Total Pennsylvania DER Mass, mg	57.79
Total Back-half Solubles, mg	20.48

CALCULATIONS

Standard Temp, deg F	68
Standard Press, in Hg	29.92
Barometric Press, in Hg	29.45
Stack Press, in Hg	29.38
Vol of H2O Std, dscf	15.251
M-5 Stack Moist. Content, %	32.19
Sat Stack Moist. Content, %	28.87
Stack Moist. Cont. Used, %	28.87
Molecular Weight, Dry	28.93
Molecular Weight, Wet	25.77
Nozzle Dia, in	0.317
X-Area of Stack, ft2	32.125

	Push	Travel	Total
Time-avg Stack Temp, deg F	158	151	155
Meter Volume Corr, ft3	19.946	12.206	32.152
Meter Volume Std, dscf	19.934	12.199	32.134
Vol of H2O Std, dscf	8.093	4.953	13.045
Sample Time, min	15.87	14.25	30.12
Stack Vel, fps	73.16	40.80	
Percent Isokinetic, %	88	106	
Stack Gas Vol, acfm	141011	78639	
Stack Gas Vol, dscfm	84167	47452	
Stack Gas Density, lb/ft3	0.0562	0.0568	
DER Part. Emission Conc., gr/dscf		0.0278	
DER Part. Emission Rate, lb/ton coke		0.0302	
DER Part. Emission Rate, lb/hr		3.69	
Front-half Part. Conc., gr/dscf		0.0277	
Front-half Part. Rate, lb/ton coke		0.0302	
Front-half Part. Rate, lb/hr		3.69	
Back-half Filt. Conc., gr/dscf		.0000	
Back-half Filt. Rate, lb/ton coke		.0000	
Back-half Filt. Rate, lb/hr		.00	
Back-half Soluble Conc., gr/dscf		0.0098	
Back-half Soluble Rate, lb/ton coke		0.0107	
Back-half Soluble Rate, lb/hr		1.31	

DUCT VELOCITIES AT SAMPLING PLANE

Push

Position	1	2	3	4
6	64	90	78	64
5	45	78	90	57
4	53	90	61	83
3	64	83	60	83
2	78	78	64	83
1	83	78	78	70

Position

Travel

Position	1	2	3	4
6	40	45	40	45
5	32	37	49	35
4	35	40	38	49
3	35	40	0	45
2	35	40	40	45
1	45	40	49	45

Position

EVT Coke Quench Car Tests RGP06.27.85 File: DAT 1203

FIELD DATA

Plant		USS - Clairton, PA
Date		10-03-85
Car No.		H-3-2
Battery No.		7,8 & 9
Sample Location		HCQC - Test Car
Sample Type		M-5
Run Number		12.3
Operator		Smith & Milburn
No. of Ovens Tested		24
No. of Ovens Tested/hr		10.4
Coke Prd'n Rate, tons/oven		11
Ambient Temp, deg F		60
Barometric Pressure, in Hg		29.38
Static Pressure, in H2O		-0.9
Stack Area, ft2		32.125
Filter Type		RA934AH
Top Filter Number		RA102G-080
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		30

	in Hg	CFM
Leak Check Initial	17	0.002
Final	23	0.004

Water Volume:

Location	Initial	Final	Net Gain
Imp A1	100	260	160
Imp A2	100	108	8
Imp A3	0	0	0
Sil Gel A	616.8	621	4.2
Imp B1	100	200	100
Imp B2	100	102	2
Imp B3	0	0	0
Sil Gel B	645.6	653	7.4
Total Volume			281.6

Combined Impinger pH 3.9

	Point No.	Oven No.	Start Time	Sample Time sec Total	Sample Time sec DGM Start	Gas Metr ft3	Rotometer	Orifice del P in. WC
						339.690		
P	1.6	A-9/8	8:27	86	40	340.580	28.0	0.85
T					46	341.275	15.4	0.38
P	1.5	B-9/7	8:33	51	40	341.900	18.6	0.40
T					11	342.010	10.4	0.16
P	1.4	A-11/9	8:38	99	41	342.580	15.4	0.32
T					58	343.155	10.4	0.20
P	1.3	B-11/8	8:44	81	41	343.840	20.0	0.49
T					40	344.400	15.4	0.34
P	1.2	B-11/9	8:49	93	40	345.150	22.5	0.58
T					53	345.895	15.4	0.34
P	1.1	A-11/7	8:56	60	40	346.790	28.0	0.86
T					20	347.120	18.6	0.46
P	2.6	A-11/8	9:01	87	40	348.025	28.0	0.86
T					47	348.770	17.1	0.39
P	2.5	A-13/9	9:09	94	39	349.640	28.0	0.86
T					55	350.505	17.1	0.39
P	2.4	B-11/7	9:17	51	39	351.350	28.0	0.86
T					12	351.565	17.1	0.42
P	2.3	B-13/8	9:22	81	40	352.575	29.9	0.96
T					41	353.140	17.1	0.36
P	2.2	B-13/9	9:27	92	39	353.850	22.5	0.58
T					53	354.675	17.1	0.38
P	2.1	A-13/7	9:34	61	41	355.650	29.9	0.97
T					20	355.975	18.6	0.45
P	3.6	A-13/8	9:39	85	42	356.920	28.0	0.86
T					43	357.530	15.4	0.36
P	3.5	B-13/7	9:45	52	40	358.420	28.0	0.85
T					12	358.600	17.1	0.38
P	3.4	A-15/9	9:50	96	39	359.460	28.0	0.85
T					57	360.335	17.1	0.39
P	3.3	B-15/8	9:58	78	41	361.040	20.0	0.48
T					37	361.570	15.4	0.28
P	3.2	B-15/9	10:04	91	39	362.300	22.5	0.58
T					52	362.945	13.7	0.25
P	3.1	A-15/7	10:10	60	39	363.785	28.0	0.86
T					21	364.095	15.4	0.33
P	4.6	A-15/8	10:15	82	40	364.760	20.0	0.47
T					42	365.200	10.4	0.16
P	4.5	B-15/7	10:21	51	41	365.900	20.0	0.47
T					10	366.020	11.6	0.22
P	4.4	A-17/9	10:26	97	37	366.810	28.0	0.85
T					60	367.700	15.4	0.32
P	4.3	B-17/8	10:32	78	40	368.640	29.9	0.96
T					38	369.260	18.6	0.43
P	4.2	B-17/9	10:39	92	40	370.200	29.9	0.94
T					52	371.065	18.6	0.44
P	4.1	A-17/7	10:45	64	41	371.845	22.5	0.59
T					23	372.125	13.7	0.24
Total		(Time in minutes)			31.03	32.435		
Push					15.98	19.515	File: DAT	1203
Travel					15.05	12.920	Page 2 of 8	

	Point No.	Temperature, deg F						
		Stack	Probe	Oven	Imping A	Imping B	GM In	GM Out
P	1.6	162	274	262	50	50	59	59
T		151	275	262	50	50	59	59
P	1.5	154	274	268	52	52	59	59
T		147	275	269	52	52	59	59
P	1.4	157	274	270	52	52	59	59
T		148	275	270	52	52	59	59
P	1.3	154	272	272	52	52	59	59
T		147	275	272	52	52	59	59
P	1.2	164	272	272	52	52	59	59
T		150	274	272	52	52	60	59
P	1.1	154	272	272	52	52	60	59
T		147	273	272	52	52	60	59
P	2.6	159	273	273	52	52	61	60
T		150	273	273	52	52	61	60
P	2.5	156	273	274	52	52	62	61
T		146	274	274	52	52	62	61
P	2.4	153	273	274	52	52	62	61
T		148	273	274	52	52	62	61
P	2.3	158	274	274	52	52	63	62
T		149	273	274	52	52	63	62
P	2.2	158	273	273	52	52	63	62
T		149	273	273	52	52	63	62
P	2.1	156	273	272	52	52	64	63
T		148	272	272	52	52	64	63
P	3.6	157	273	274	52	52	64	63
T		149	273	274	52	52	65	63
P	3.5	157	273	273	52	52	65	64
T		152	274	273	52	52	65	64
P	3.4	159	274	273	52	52	66	64
T		148	272	272	52	52	66	64
P	3.3	154	273	273	52	52	66	65
T		148	274	273	52	52	66	65
P	3.2	161	273	272	52	52	66	66
T		153	273	272	52	52	66	66
P	3.1	158	273	272	52	52	67	66
T		150	273	272	52	52	67	66
P	4.6	159	272	272	52	52	67	66
T		151	274	272	52	52	67	67
P	4.5	155	274	273	52	52	68	67
T		150	273	273	52	52	68	67
P	4.4	158	274	273	54	54	68	67
T		148	274	273	54	54	68	67
P	4.3	160	272	272	54	54	69	68
T		149	274	272	54	54	69	68
P	4.2	158	274	272	54	54	69	68
T		152	273	272	54	54	69	68
P	4.1	158	272	272	54	54	69	69
T		150	274	272	54	54	69	69

P TW Avg 157
T TW Avg 149

	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	7.0	1.50	1.22	78.24		0	0.0
T		3.0	0.50	0.71	44.77		0	0.0
P	1.5	3.0	0.70	0.84	53.10		5	0.0
T		1.5	0.25	0.50	31.55		5	0.0
P	1.4	3.0	0.50	0.71	44.99		5	0.0
T		1.5	0.25	0.50	31.58		0	0.0
P	1.3	4.0	0.80	0.89	56.77		5	0.0
T		3.0	0.50	0.71	44.62		0	0.0
P	1.2	5.0	1.00	1.00	63.99		25	2.6
T		3.0	0.50	0.71	44.73		5	0.0
P	1.1	7.0	1.50	1.22	77.74		5	0.0
T			0.70	0.84	52.80		0	0.0
P	2.6	7.0	1.50	1.22	78.05		0	0.0
T		3.0	0.60	0.77	49.00		0	0.0
P	2.5	7.0	1.50	1.22	77.86		0	0.0
T		3.0	0.60	0.77	48.84		0	0.0
P	2.4	7.0	1.50	1.22	77.67		5	0.0
T		3.0	0.60	0.77	48.92		0	0.0
P	2.3	8.0	1.70	1.30	83.03		0	0.0
T		4.0	0.60	0.77	48.96		0	0.0
P	2.2	5.0	1.00	1.00	63.68		15	0.0
T		3.0	0.60	0.77	48.96		10	0.0
P	2.1	8.0	1.70	1.30	82.89		10	0.0
T			0.70	0.84	52.84		5	0.0
P	3.6	7.0	1.50	1.22	77.93		0	0.0
T		3.0	0.50	0.71	44.70		5	0.0
P	3.5	7.0	1.50	1.22	77.93		40	4.2
T			0.60	0.77	49.08		10	0.0
P	3.4	7.0	1.50	1.22	78.05		0	0.0
T		3.0	0.60	0.77	48.92		0	0.0
P	3.3	4.0	0.80	0.89	56.77		0	0.0
T			0.50	0.71	44.66		0	0.0
P	3.2	5.0	1.00	1.00	63.83		0	0.0
T		2.5	0.40	0.63	40.11		0	0.0
P	3.1	7.0	1.50	1.22	77.99		15	0.0
T			0.50	0.71	44.73		10	0.0
P	4.6	4.0	0.80	0.89	57.00		0	0.0
T		2.0	0.25	0.50	31.66		10	0.0
P	4.5		0.80	0.89	56.82		15	0.0
T			0.30	0.55	34.65		15	0.0
P	4.4	7.0	1.50	1.22	77.99		5	0.0
T		3.0	0.50	0.71	44.66		0	0.0
P	4.3	8.0	1.70	1.30	83.16		75	9.2
T		3.5	0.70	0.84	52.89		35	7.3
P	4.2	8.0	1.70	1.30	83.03		0	0.0
T		4.0	0.70	0.84	53.02		5	0.0
P	4.1	5.0	1.00	1.00	63.68		10	0.0
T			0.70	0.84	52.93		5	0.0
P TW Avg				1.11				
T TW Avg				0.72				

	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			444	450	260	396	
T				444	180	255	396	
P	1.5			444	450	265	396	
T				444	180	260	396	
P	1.4			444	450	265	396	
T				444	180	255	396	
P	1.3			444	450	270	396	
T				444	180	270	396	
P	1.2			444	450	270	396	
T				444	180	265	396	
P	1.1			456	450	270	396	
T				456	180	270	396	
P	2.6			456	450	270	396	
T				456	180	270	396	
P	2.5			456	450	280	396	
T				456	180	275	396	
P	2.4			456	450	275	408	
T				456	180	270	408	
P	2.3			456	450	280	408	
T				456	180	275	408	
P	2.2			456	450	275	408	
T				456	180	270	408	
P	2.1			456	450	280	408	
T				456	180	275	408	
P	3.6			456	450	275	408	
T				456	180	270	408	
P	3.5			456	450	280	408	
T				456	180	275	408	
P	3.4			456	450	275	408	
T				456	180	270	408	
P	3.3			456	450	280	408	
T				456	180	275	408	
P	3.2			456	450	275	408	
T				456	180	270	408	
P	3.1			456	450	280	408	
T				456	180	275	408	
P	4.6			456	450	275	408	
T				456	180	270	408	
P	4.5			456	450	280	408	
T				456	180	275	408	
P	4.4			456	450	275	408	
T				456	180	270	408	
P	4.3			456	450	280	396	
T				456	180	275	408	
P	4.2			456	450	280	408	
T				456	180	275	408	
P	4.1			456	450	275	408	
T				456	180	270	408	
P	TW Avg		0.00	454	450	275	403	0
T	TW Avg		0.00		180	269	404	0

LABORATORY DATA

Orsat Analysis
Operator - Milburn

Run	1		2		3		Avg
Gas	Act %	Net %	Act %	Net %	Act %	Net %	Net %
CO2	0.8	0.8	0.8	0.8	0.8	0.8	0.8
O2	20.8	20.0	20.8	20.0	20.8	20.0	20.0
CO	20.8	0.0	20.8	0.0	20.8	0.0	0.0
N2	100.0	79.2	100.0	79.2	100.0	79.2	79.2
Molecular Weight, Dry			28.93				

Particulate Analysis

Front-half Filter Dry Catch, mg	18.39
Blank Filter Catch, mg	0.00
Front-half Aqueous Wash, mg	
Filterable	3.75
Non-filterable	0.00
Front-half Acetone Wash, mg	12.48
Impinger Catch, mg	
Filterable	0.00
Non-filterable	50.56
Back-half Acetone rinse, mg	2.20
Total Front-half Filterable, mg	22.14
Total Front-half Nonfilterable, mg	12.48
Total Front-half, mg	34.62
Total Back-half Filterable, mg	0.00
Total Pennsylvania DER Mass, mg	34.62
Total Back-half Solubles, mg	52.76

CALCULATIONS

Standard Temp, deg F	68
Standard Press, in Hg	29.92
Barometric Press, in Hg	29.38
Stack Press, in Hg	29.31
Vol of H2O Std, dscf	13.255
M-5 Stack Moist. Content, %	28.34
Sat Stack Moist. Content, %	28.05
Stack Moist. Cont. Used, %	28.05
Molecular Weight, Dry	28.93
Molecular Weight, Wet	25.86
Nozzle Dia, in	0.317
X-Area of Stack, ft2	32.125

	Push	Travel	Total
Time-avg Stack Temp, deg F	157	149	153
Meter Volume Corr, ft3	20.237	13.372	33.609
Meter Volume Std, dscf	20.177	13.333	33.510
Vol of H2O Std, dscf	7.867	5.198	13.065
Sample Time, min	15.98	15.05	31.03
Stack Vel, fps	70.42	45.41	
Percent Isokinetic, %	91	97	
Stack Gas Vol, acfm	135726	87527	
Stack Gas Vol, dscfm	81815	53475	
Stack Gas Density, lb/ft3	0.0563	0.0570	
DER Part. Emission Conc., gr/dscf		0.0159	
DER Part. Emission Rate, lb/ton coke		0.0182	
DER Part. Emission Rate, lb/hr		2.08	
Front-half Part. Conc., gr/dscf		0.0159	
Front-half Part. Rate, lb/ton coke		0.0182	
Front-half Part. Rate, lb/hr		2.08	
Back-half Filt. Conc., gr/dscf		0.0000	
Back-half Filt. Rate, lb/ton coke		0.0000	
Back-half Filt. Rate, lb/hr		0.00	
Back-half Soluble Conc., gr/dscf		0.0243	
Back-half Soluble Rate, lb/ton coke		0.0278	
Back-half Soluble Rate, lb/hr		3.18	

DUCT VELOCITIES
AT SAMPLING PLANE

Push

Position	1	2	3	4
6	78	78	78	57
5	53	78	78	57
4	45	78	78	78
3	57	83	57	83
2	64	64	64	83
1	78	83	78	64

Position

Travel

Position	1	2	3	4
6	45	49	45	32
5	32	49	49	35
4	32	49	49	45
3	45	49	45	53
2	45	49	40	53
1	53	53	45	53

Position