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.

R.C. WESTMAN

U. S. Steel
Clairton Works
400 State Street
Clairton, PA 15025-1855

RECEIVED
OCT 19 1994
DIRECTOR'S OFFICE
Environmental Quality

October 14, 1994

Director
Bureau of Air Quality Control
Department of Environmental Resources
P.O. Box 2063
Harrisburg, PA 17120

Deputy Director
Allegheny County Health Department
Department of Air Quality
301 Thirty-ninth Street
Pittsburgh, PA 15201

U.S. Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, PA 19017

Office of Chief Counsel
Western Region
Department of Environmental Resources
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Gentlemen:

Subject: #19 Battery Stack Compiance Demonstration
USS Clairton Works

I am enclosing with this letter the mass emission report on #19 Battery Combustion Stack. The compliance demonstration was conducted at USS Clairton Works, a division of USX Corporation, on August 24, 1994.

For questions regarding this report please call William C. Graeser at (412) 233-1467

Very truly yours,

G. T. Weber, Jr.
General Manager
USS Clairton Works

GTW/BAC
Enclosure

Steel the recycled material

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

Report on

COMPLIANCE DEMONSTRATION
NO. 19 BATTERY COMBUSTION STACK

SEPTEMBER 1994

Prepared By
Advanced Technology Systems, Inc.
3000 Tech Center Drive
Monroeville, Pennsylvania 15146 - 3055

Project No. IKM-0204

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APPENDIX C GRAVIMETRIC RESULTS, EMISSIONS CALCULATIONS

EXECUTIVE SUMMARY

On August 24, 1994, a compliance test program was conducted for USS Clairton Works, Clairton, Pennsylvania, on the #19 Battery Combustion Stack. The purpose of the testing was to determine the (1) concentration and mass emission rate of particulate matter, and (2) presence and extent of visible emissions from the stack as required by the Second Consent Decree (Civil Action Nos. 79-709, 91-329), Chapter V (Compliance Requirements - Clairton Works), Section F (Combustion Stacks), Specific Items 1, 3, and 4.

The results of the testing showed an average particulate matter concentration and emission rate of 0.0143 grains per dry standard cubic foot (gr/dscf) and 8.80 pounds per hour (lb/hr), respectively. As promulgated by the Second Consent Decree, Chapter V, Section F.1.a, the allowable particulate matter concentration for #19 Battery Combustion Stack is 0.030 gr/dscf. Thus, the particulate matter emissions from the stack are less than the allowable concentration.

During the test periods, the maximum opacity of the exhaust gas was ten percent. As promulgated by the Second Consent Decree, Chapter V, Sections F.2.b and F.3, the visible emissions shall not equal or exceed 20 percent opacity for a period or periods aggregating in excess of 3 minutes in any 60-minute period and shall never equal or exceed 60 percent opacity. Thus, the observed opacities were less than the allowable values.

1.0 INTRODUCTION

On August 24, 1994, a compliance test program was conducted for USS Clairton Works, Clairton, Pennsylvania, on the #19 Battery Combustion Stack. The purpose of the testing was to determine the (1) concentration and mass emission rate of particulate matter, and (2) presence and extent of visible emissions from the stack as required by the Second Consent Decree (Civil Action Nos. 79-709, 91-329), Chapter V (Compliance Requirements - Clairton Works), Section F (Combustion Stacks), Specific Items 1, 3, and 4.

Testing was performed by Messrs. Richard Casselberry and Thomas Morgan of Advanced Technology Systems, Inc. (previously the Monroeville, Pennsylvania-based Air Emissions Measurement Group of Chester Environmental) and Mr. Lance Grumling of Environmental Technical Services under the direction of Mr. Bernie Clark of Chester Environmental. All test procedures were witnessed by Mr. Phil Lawrence of the Allegheny County Health Department - Department of Air Quality (DAQ).

2.0 METHODOLOGIES

The compliance test program was conducted in accordance with the emissions measurement test protocol, which can be found in Appendix A.

Particulate matter sampling was performed in accordance with EPA Stationary Source Sampling Methods 1 through 5. Three two-hour tests were executed during normal operating conditions. Greater than 50 dry standard cubic feet of sample gas was collected during each test run.

The process exhausts through a 186 inch diameter stack at stack platform level. A total of 24 traverse points (12 per diameter) were sampled; the traverse points were calculated in accordance with EPA Method 1. Sampling was conducted through four equally spaced ports, with six traverse points sampled per port. Each point was sampled for 5 minutes, thus bringing the total sampling time to 120 minutes.

In accordance with EPA Method 2, velocities and volumetric flow rates of the exhaust gas were determined using a calibrated S type pitot tube. Positive and negative pitot lines were leak-checked at the beginning and end of each test run. Gas velocity differential pressures along with stack gas temperatures were recorded at each sampling point.

At the beginning and end of each test, gas concentrations of carbon dioxide (CO_2), oxygen (O_2), and nitrogen (N_2 - by difference) were determined with the use of Fyrite apparatus as specified by EPA Method 3. Gas concentrations were used to obtain dry molecular weight of the process gas.

Percent moisture content, by volume, of the exhaust gas was determined by measuring the weight gain of the four sample train impingers and knowledge of the dry gas volume sampled in accordance with EPA Method 4.

As specified by EPA Method 5, each sample train was assembled as required by the method, leak-checked on site at the beginning and end of each test run, and operated such that isokinetic conditions were maintained. Clean up of the sampling train included an acetone rinse of the front-half components of the sample train. Front-half acetone rinses

were evaporated to dryness, desiccated, and weighed to a constant weight. Sample train filters were desiccated for 24 hours, and particulate matter weight was determined gravimetrically. Rinse residue weights and filter weights were measured to the nearest 0.1 mg. One acetone blank was prepared in the same manner as the test sample rinses. The blank residue weight was subtracted from the test sample residue weights. After blank correction, front-half acetone rinse residue weights and sample train filter weights were used to determine total particulate matter catch.

All visible emissions determinations were performed in accordance with EPA Stationary Source Sampling Method 9. Visible emission readings were recorded for the duration of each particulate matter test.

3.0 RESULTS

The test results have been summarized in Table 1. The results of the testing showed an average particulate matter concentration and emission rate of 0.0143 grains per dry standard cubic foot (gr/dscf) and 8.80 pounds per hour (lb/hr), respectively. As promulgated by the Second Consent Decree, Chapter V, Section F.1.a, the allowable particulate matter concentration for #19 Battery Combustion Stack is 0.030 gr/dscf. Thus, the particulate matter emissions from the stack are less than the allowable concentration.

Table 1 also lists other pertinent stack and sampling parameters which include stack gas flow rate in units of actual cubic feet per minute (acfm), standard cubic feet per minute (scfm), and dry standard cubic feet per minute (dscfm), stack gas temperature (^{o}F), moisture content of the stack gas (percent by volume), gas volume sampled for each test in units of dry standard cubic feet (dscf), and the isokinetics value for each test. The isokinetics value is equal to the ratio of the average linear gas velocity sampled through the probe nozzle to the average stack gas velocity. An isokinetics value between 90 percent and 110 percent is considered acceptable. All isokinetic values were within the acceptable range of values. The gas volume sampled for each 120 minute test was greater than 50 dry standard cubic feet. Actual test sampling times have also been included in Table 1.

Copies of all field data sheets, including the visible emissions readings, can be found in Appendix A. As promulgated by the Second Consent Decree, Chapter V, Sections F.1.b and F.3, the visible emissions shall not equal or exceed 20 percent opacity for a period or periods aggregating in excess of 3 minutes in any 60-minute period and shall never equal or exceed 60 percent opacity. During the test periods, the maximum opacity of the exhaust gas was ten percent. Thus, the observed opacities were less than the allowable values.

All sampling equipment was calibrated and operated in accordance with EPA Stationary Source Sampling Methods 1 through 5. Copies of the pre-test calibration results, post-test calibration results, and the results of an audit conducted with a critical orifice provided by the Allegheny County Health Department DAQ can be found in Appendix A. All testing was performed during periods of normal plant operation. Copies of the plant operational data can be found in Appendix B. The gravimetric results and the emissions calculations for each test can be found in Appendix C.

USS CLAIRTON WORKS
CLAIRTON, PA

TABLE 1

#19 BATTERY COMBUSTION STACK
PARTICULATE MATTER EMISSIONS DATA

		Run 1	Run 2	Run 3	Average
Test Number		CLR-BS#19-1	CLR-BS#19-2	CLR-BS#19-3	
Test Date		08-24-94	08-24-94	08-24-94	
Mass Emissions Rate and Concentration					
Particulate Matter	(lb/hr)	8.18	8.10	10.11	8.80
	(gr/dscf)	0.0133	0.0132	0.0165	0.0143
Stack Conditions					
Flow Rate	(acfm)	151700	152100	152300	152000
	(scfm)	83900	83600	83500	83700
	(dscfm)	71700	71500	71400	71500
Temperature	(°F)	482	487	490	486
Moisture Content	(%)	14.6	14.5	14.5	14.5
Sampling Conditions					
Test times		0810 to 0840	1051 to 1121	1335 to 1405	
		0843 to 0913	1124 to 1154	1408 to 1438	
		0916 to 0946	1157 to 1227	1442 to 1512	
		0949 to 1019	1230 to 1300	1516 to 1546	
Sampling Time	(minutes)	120	120	120	
Sample Volume	(dscf)	62.579	61.192	63.594	
Isokinetics	(%)	104.8	102.8	107.0	

COMPLIANCE DEMONSTRATION
NO. 19 BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

APPENDIX A

TEST PROTOCOL, FIELD DATA SHEETS, CALIBRATION RESULTS

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.

TEST PROTOCOL
COMPLIANCE DEMONSTRATION
#19 BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

Particulate matter sampling will be performed in accordance with EPA Stationary Source Sampling Methods 1 through 5 (40 CFR, Part 60, Appendix A) and Sections 139.11 and 139.12 of the Pennsylvania Department of Environmental Resources (PA DER) Source Testing Manual. Three two-hour tests will be executed during normal operating conditions. Greater than 50 dry standard cubic feet of sample gas will be collected during each test run.

The process exhausts through a 186 inch diameter stack at stack platform level. A total of 24 traverse points (12 per diameter) will be sampled; the traverse points will be calculated in accordance with EPA Method 1. Sampling will be conducted through four equally spaced ports, with six traverse points sampled per port. Each point will be sampled for 5 minutes, thus bringing the total sampling time to 120 minutes.

In accordance with EPA Method 2, velocities and volumetric flow rates of the exhaust gas will be determined using a calibrated S type pitot tube. Positive and negative pitot lines will be leak-checked at the beginning and end of each test run. Gas velocity differential pressures along with stack gas temperatures will be recorded at each sampling point. Static pressure of the exhaust gas stream will be measured with the same pitot tube.

At the beginning and end of each test, gas concentrations of CO_2, O_2, and N_2 (by difference) will be determined with the use of Fyrite apparatus as specified by EPA Method 3. Gas concentrations will be used to obtain molecular weight of the process gas on a dry basis.

Percent moisture content, by volume, of the exhaust gas will determined by measuring the weight gain of the four sample train impingers in accordance with EPA Method 4.

As specified by EPA Method 5, each sample train will be assembled as required by the method, leak-checked on site at the beginning and end of each test run, and operated such that isokinetic conditions are maintained. Clean up of the sampling train will include an acetone rinse of the front-half components of the sample train. Front-half acetone rinses will be evaporated to dryness, desiccated, and weighed to a constant weight. Sample train glass fiber filters will be desiccated for 24 hours, and particulate matter weight will be determined gravimetrically. Rinse residue weights and filter weights will be measured to the nearest 0.1 milligram. One acetone blank will be prepared in the same manner as the test sample rinses. The blank residue weight will be subtracted from the test sample residue weights. After blank correction, front-half acetone rinse residue weights and sample train filter weights will be used to determine total particulate matter catch. Clean up and analytical procedures will follow the methodology of EPA Method 5.

All visible emissions determinations will be performed in accordance with EPA Stationary Source Sampling Method 9. Visible emission readings will be recorded for the duration of each particulate matter test.

A report summarizing the compliance test program will be submitted within 60 days following completion of field work. The report will describe test methodologies utilized and present a textual and tabular summary of the emissions results and related sampling information. Copies of operational data will be included in the report to verify that all testing was performed during periods of normal plant operation. Also incorporated into the report will be copies of the pre-test calibration results, post-test calibration results, the results of an audit conducted with a critical orifice provided by the Allegheny County Health Department Bureau of Air Quality, field data sheets for the particulate matter sampling and visible emissions determinations, computer-generated emissions calculations, and analytical results for each test.

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 08-24-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 1
TEST UNIT #19 BATTERY STACK	TEST NO. USS-CLR-BS19-1	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-02204	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1341
TEST CREW RPC, TM	STATIC PRESSURE -1.2	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.60	PORT DIRECTION EAST, SOUTH	CONTROL BOX NO. STA	PORT SIZE 4.0"

Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°F)	Hot Box Temp. (°F)	Comments
66.2	08:10	405.338	0.05	1.46	1.46	61	61	3.0	489	~250°F	<66°F	~250°F	5 min./point
46.5			0.05	1.46	1.46	79	63	3.0	486				
33.0			0.03	0.87	0.87	84	63	2.5	469				
22.0			0.02	0.58	0.58	87	66	2.0	470				
12.5			0.02	0.58	0.58	89	67	2.0	460				
4.0	08:40	419.600	0.03	0.87	0.87	92	70	2.5	469				
66.2	08:43	419.600	0.05	1.46	1.46	80	73	3.5	470				
46.5			0.04	1.16	1.16	96	74	2.5	475				
33.0			0.04	1.16	1.16	99	76	2.5	481				
22.0			0.05	1.46	1.46	102	77	3.5	490				
12.5			0.03	0.87	0.87	103	79	2.5	486				
4.0	09:13	437.940	0.05	1.46	1.46	105	80	3.5	492				
													Estimates:
													MW= 27.9
													%H2O= 12%

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	0.011 cfm
After	6.0	0.011 cfm

PITOT LEAK CHECK

	Positive	Negative
Before	0/15sec	0/15sec
After	0/15sec	0/15sec

GAS	1	2
CO2	4.0	4.0
O2	12.0	12.0
CO	0	0
N2	84.0	84.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100mL DI H2O	740.4	561.6	178.8
2.	100mL DI H2O	575.8	548.5	27.3
3.	EMPTY	452.5	448.4	4.1
4.	Silica gel	647.2	631.7	15.5
5.				
6.			total=	225.7g
7.				
8.				

210.2 g

ATS

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 08-24-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 1
TEST UNIT #19 BATTERY STACK	TEST NO. USS-CLR-BS19-1	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-Ø204	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1341
TEST CREW RPC	STATIC PRESSURE -1.2	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.60	PORT DIRECTION WEST, NORTH	CONTROL BOX NO. SIX	PORT SIZE 4.0"

Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°F)	Hot Box Temp. (°F)	Comments
66.2	09:16	437.940	0.05	1.46	1.46	90	80	4.0	489	~250°F	<68°F	~250°F	5 min./point
46.5			0.03	0.87	0.87	106	81	3.0	471				
33.0			0.02	0.58	0.58	106	81	2.5	470				
22.0			0.03	0.87	0.87	106	81	2.5	495				
12.5			0.02	0.58	0.58	107	84	2.0	460				
4.0	09:46	454.100	0.04	1.16	1.16	107	84	3.5	483				
66.2	09:49	454.100	0.04	1.16	1.16	90	85	3.5	499				
46.5			0.03	0.87	0.87	106	85	2.5	491				
33.0			0.02	0.58	0.58	106	85	2.5	481				
22.0	RPC		0.03	.87	0.87	108	86	2.5	500				
12.5	~~10:19~~		0.03	.87	0.87	110	87	2.5	496				
4.0	10:19	469.620	0.03	.87	0.87	110	87	2.5	495				
Test Totals	Δ=120 min	Δ=	$(\Delta P)_{AVG}$=	$(\Delta H)_{AVG}$=		$(T_{meter})_{AVG}$=			$(T_{stack})_{AVG}$=				Estimates: MW= 27.9
		64.282	0.03	1.01			87.17°F		482°F				%H2O= 12%

SYSTEM LEAK CHECK dcf

	Vacuum (in. Hg)	DGM Rate (cfm)
Before		
After		

PITOT LEAK CHECK

	Positive	Negative
Before		
After		

GAS	1	2
CO2	4.0	4.0
O2	12.0	12.0
CO	0	0
N2	84.0	84.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100mL DI H2O	~~687.8~~	~~520.1~~	
2.	100mL DI H2O	~~587.3~~	~~555.4~~	
3.	EMPTY	~~379.1~~	~~374.2~~	
4.	SILICA GEL	~~651.3~~	~~636.7~~	
5.				
6.				
7.				
8.				

THESE WEIGHTS ARE FOR TEST #2 (RPC)

ATS

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 08-24-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 2
TEST UNIT #19 BATTERY STACK	TEST NO. USS-CLR-BS#19-2	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-0204	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1324
TEST CREW RPC TM	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.60	PORT DIRECTION NORTH, WEST	CONTROL BOX NO. Sill	PORT SIZE 40"

Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°F)	Hot Box Temp. (°F)	Comments
66.2	10:51	470.000	0.04	1.21	1.21	84	82	2.0	486	~250°F	<68°F	~250°F	5 min./point
46.5			0.04	1.21	1.21	100	83	2.0	490				
33.0			0.02	.60	.60	105	84	1.5	495				
22.0			0.05	1.51	1.51	108	85	3.5	499				
12.5			0.02	0.60	0.60	112	87	1.5	492				
4.0	11:21	480.958	0.02	0.60	0.60	110	88	1.5	478				
66.2	11:24	480.958	0.05	1.51	1.51	100	90	3.5	488				
46.5			0.05	1.51	1.51	102	93	3.5	499				
33.0			0.03	0.91	0.91	117	92	2.5	470				
22.0			0.05	1.51	1.51	118	93	3.5	479				
12.5			0.03	0.91	0.91	119	94	2.5	464				
4.0	11:54	503.050	0.03	0.91	0.91	118	94	2.5	476				
													Estimates:
													MW= 27.9
													%H2O= 12%

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	<0.01 cfm
After	5.0	0.009 cfm

PITOT LEAK CHECK

	Positive	Negative
Before	OK/15 sec	OK/15 sec
After	OK/15 sec	OK/15 sec

GAS	1	2
CO2	4.0	4.0
O2	12.0	12.0
CO	0	0
N2	84.0	84.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100 mL DI H2O	687.8	520.1	167.7
2.	100 mL DI H2O	587.3	555.4	31.9
3.	EMPTY	379.1	374.2	4.9
4.	SILICA GEL	651.3	636.7	14.6
5.				
6.			total =	219.1g
7.				
8.				

204.5g

ATS

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 08-24-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 2
TEST UNIT #19 BATTERY STACK	TEST NO. USS-CLR-BS#19-2	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. ITM-6244	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1324
TEST CREW RAC TM	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.6	PORT DIRECTION South, East	CONTROL BOX NO. SK	PORT SIZE 4.0"

Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°F)	Hot Box Temp. (°F)	Comments
66.2	11:57	503.050	0.03	0.91	0.91	100	94	3.0	499	~250°F	<68°F	~250°F	5 min./point
46.5			0.04	1.21	1.21	119	95	3.5	501				
33.0			0.04	1.21	1.21	120	96	3.5	500				
22.0			0.03	0.91	0.91	120	96	2.5	492				
12.5			0.02	0.60	0.60	120	97	1.5	464				
4.0	12:27	519.673	0.02	0.60	0.60	120	97	1.5	476				
66.2	12:30	519.673	0.03	0.91	0.91	108	98	2.5	494				
46.5			0.02	0.60	0.60	120	99	1.5	488				
33.0			0.04	1.21	1.21	120	98	3.0	500				
22.0			0.02	0.60	0.60	121	99	1.5	505				
12.5			0.02	0.60	0.60	121	99	1.5	477				
4.0	13:00	534.662	0.02	0.60	0.60	121	99	1.5	480				
Test Totals	Δ=120 min	Δ=	$(\Delta P)_{AVG}$=	$(\Delta H)_{AVG}$=		$(T_{meter})_{AVG}$=			$(T_{stack})_{AVG}$=				Estimates:
													MW= 27.9
		64.662	0.03	0.96			102.81		487.17				%H2O= 12%

SYSTEM LEAK CHECK cfm

	Vacuum (in. Hg)	DGM Rate (cfm)
Before		
After		

PITOT LEAK CHECK

	Positive	Negative
Before		
After		

GAS	1	2
CO2		
O2		
CO		
N2		

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100 ml DI H2O			
2.	100 ml DI H2O			
3.	EMPTY			
4.	SILICA GEL			
5.				
6.				
7.				
8.				

ATS

STACK SAMPLING DATA SHEET

CLIENT	USS-CLAIRTON WORKS	TEST DATE	08-24-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 7
TEST UNIT	#19 BATTERY STACK	TEST NO.	USS-CLW-BS*A-3	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO.	TKM-02244	NOZZLE (SIZE,#)	0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1326
TEST CREW	RAC, TM	STATIC PRESSURE	-1.2	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE	29.60	PORT DIRECTION	EAST SOUTH	CONTROL BOX NO. STT	PORT SIZE 4.0"

Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pilot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°F)	Hot Box Temp. (°F)	Comments
66.2	13:35	535.015	0.05	1.54	1.54	92	92	4.0	499	~250°F	<68°F	~250°F	5 min./point
46.5			0.04	1.23	1.23	107	92	3.5	509				
33.0			0.02	0.61	0.61	113	94	1.5	515				
22.0			0.02	0.61	0.61	113	94	1.5	511				
12.5			0.03	0.92	0.92	116	95	2.5	495				
4.0	14:05	551.000	0.02	0.61	0.61	118	97	1.5	484				
66.2	14:08	551.000	0.05	1.54	1.54	109	98	4.0	496				
46.5			0.03	0.92	0.92	119	99	3.0	495				
33.0			0.03	0.92	0.92	122	100	3.0	489				
22.0			0.05	1.54	1.54	123	100	4.5	470				
12.5			0.04	1.23	1.23	125	102	4.0	482				
4.0	14:38	569.742	0.05	1.54	1.54	125	102	4.5	507				
													Estimates:
													MW= 27.9
													%H2O= 12%

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	0.007 cfm
After	5.0	0.010 cfm

PITOT LEAK CHECK

	Positive	Negative
Before	0K/15 sec	0K/15 sec
After	0K/15 sec	0K/15 sec

GAS	1	2
CO2	4.0	4.0
O2	12.0	12.0
CO	0	0
N2	84.0	84.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100mL DI H2O	739.9	551.1	188.8
2.	100mL DI H2O	573.9	552.6	21.3
3.	EMPTY	444.8	441.4	3.4
4.	Silica gel	673.5	658.6	14.9
5.				
6.			Total=	228.4 g
7.				
8.				

213.59

14

ATS

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORK	TEST DATE 08-24-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 7
TEST UNIT # A BATTERY STACK	TEST NO. USS-CLR-RS#19-3	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-0204	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1326
TEST CREW RPC, TM	STATIC PRESSURE -1.2	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.60	PORT DIRECTION WEST, NORTH	CONTROL BOX NO. SIX	PORT SIZE 4.0"

Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°F)	Hot Box Temp. (°F)	Comments
66.2	14:42	569.742	0.05	1.54	1.54	115	103	4.5	490	~250°F	<68°F	~250°F	5 min./point
46.5			0.05	1.54	1.54	124	102	4.5	500				
33.0			0.03	0.92	0.92	125	103	2.5	500				
22.0			0.03	0.92	0.92	125	104	2.5	467				
12.5			0.02	0.61	0.61	125	104	1.5	469				
4.0	15:12	587.179	0.02	0.61	0.61	124	104	1.5	472				
66.2	15:16	587.179	0.03	0.92	0.92	105	102	2.5	490				
46.5			0.02	0.61	0.61	120	103	2.0	496				
33.0			0.02	0.61	0.61	121	103	2.0	479				
22.0			0.03	0.92	0.92	123	103	3.5	480				
12.5			0.04	1.23	1.23	124	103	4.5	490				
4.0	15:46	602.962	0.03	0.92	0.92	124	103	3.5	470				
Test Totals	Δ=120 min	1= 67.947	(ΔP)AVG= 0.03	(ΔH)AVG= 1.02		(Tmeter)AVG=	109.15 °F		(Tstack)AVG= 489.79 °F				Estimates: MW= 27.9 %H2O= 12%

SYSTEM LEAK CHECK dcf

	Vacuum (in. Hg)	DGM Rate (cfm)
Before		
After		

PITOT LEAK CHECK

	Positive	Negative
Before		
After		

GAS	1	2
CO2	4.0	4.0
O2	12.0	12.0
CO	0	0
N2	84.0	84.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100 ml DI H2O			
2.	100 ml DI H2O			
3.	EMPTY			
4.	SILICA GEL			
5.				
6.				
7.				
8.				

ATS

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [signature]

DATE: 8-24-94

FACILITY: USX - CLAINTON

OBSERVATION: START TIME: 8:10

END TIME: 9:10

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: CALM

DIRECTION: CALM

TEMPERATURE: 56°F

SKY CONDITION: HIGH clouds

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [signature]

DATE: 8-24-94

FACILITY: USX-Clairton

OBSERVATION: START TIME: 9:10

END TIME: 10:10

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: CALM

DIRECTION: CALM

TEMPERATURE: 58°F

SKY CONDITION: HIGH LIGHT clouds

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0	30	0	0	0	0
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [signature]

DATE: 8-24-94

FACILITY: USX - CLAIRTON

OBSERVATION: START TIME: 10:10

END TIME: 10:20

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 6 MPH

DIRECTION: EAST

TEMPERATURE: 69°F

SKY CONDITION: CLEAR

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 40

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0	30					
1	0	0	0	0	31					
2	0	0	0	0	32					
3	0	0	0	0	33					
4	0	0	0	0	34					
5	0	0	0	0	35					
6	0	0	0	0	36					
7	0	0	0	0	37					
8	0	0	0	0	38					
9	0	0	0	0	39					
10					40					
11					41					
12					42					
13					43					
14					44					
15					45					
16					46					
17					47					
18					48					
19					49					
20					50					
21					51					
22					52					
23					53					
24					54					
25					55					
26					56					
27					57					
28					58					
29					59					

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: Sam Dunley

DATE: 8-24-94

FACILITY: USX CLAIRTON

OBSERVATION: START TIME: 10:47

END TIME: 11:47

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 7 MPH

DIRECTION: S-E

TEMPERATURE: 67°

SKY CONDITION: CLEAR

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0	30	0	0	0	0
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: Lara Drumley

DATE: 8·24·94

FACILITY: USX·CLAIRTON

OBSERVATION: START TIME: 11:47

END TIME: 12:47

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 5 MPH

DIRECTION: WEST

TEMPERATURE: 71°F

SKY CONDITION: HIGH LIGHT CLOUDS

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [signature]

DATE: 8-24-94

FACILITY: USX-CLAINTON

OBSERVATION: START TIME: 12:47

END TIME: 13:00

OBSERVATION POINT: TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 7 MPH

DIRECTION: WEST

TEMPERATURE: 75°

SKY CONDITION: HIGH LIGHT CLOUDS

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 52

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McMATT

COMMENTS:

0	0	0	0	0	30					
1	0	0	0	0	31					
2	0	0	0	0	32					
3	0	0	0	0	33					
4	0	0	0	0	34					
5	0	0	0	0	35					
6	0	0	0	0	36					
7	0	0	0	0	37					
8	0	0	0	0	38					
9	0	0	0	0	39					
10	0	0	0	0	40					
11	0	0	0	0	41					
12	0	0	0	0	42					
13					43					
14					44					
15					45					
16					46					
17					47					
18					48					
19					49					
20					50					
21					51					
22					52					
23					53					
24					54					
25					55					
26					56					
27					57					
28					58					
29					59					

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [illegible]

DATE: 8-24-94

FACILITY: USX - CLAIRTON

OBSERVATION: START TIME: 13:35

END TIME: 14:35

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 8 MPH

DIRECTION: S-W

TEMPERATURE: 78°F

SKY CONDITION: HIGH LIGHT CLOUDS

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0	30	0	0	0	0
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [signature]

DATE: 8-24-94

FACILITY: USX - CLAINTON

OBSERVATION: START TIME: 14:35

END TIME: 15:35

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 8 MPH

DIRECTION: S-W

TEMPERATURE: 79°F

SKY CONDITION: HIGH LIGHT CLOUDS

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: C FOREMAN: H. MCNATT

COMMENTS:

0	0	0	0	0	30	0	0	0	0
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

19 STACK TEST

OBSERVER: [signature]

DATE: 8·24·94

FACILITY: USX - CLAINTON

OBSERVATION: START TIME: 15:35

END TIME: 15:46

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 400'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 8 MPH

DIRECTION: S-W

TEMPERATURE: 77°F

SKY CONDITION: HIGH LIGHT CLOUDS

BACKGROUND: SKY

READING CONDITIONS: GOOD

COLOR OF EMISSION: BLACK

TOTAL No. OF READINGS: 44

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 10%

CREW: C FOREMAN: H. McNATT

COMMENTS:

0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	5
4	5	5	5	5
5	5	5	10	10
6	10	10	10	10
7	10	10	5	5
8	5	10	10	10
9	5	5	5	5
10	5	5	5	5
11				
12				
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59				

CONTROL BOX CALIBRATION

THREE POINT CALIBRATION

BOX # 6 BP 28.95 in. Hg
DATE 06-20-94 OPERATOR RPC

	WET TEST METER				DRY TEST METER					METER COEFFICIENT	ORIFICE COEFFICIENT
	TIME (min)	TEMP TW	VOLUME VM	PRESSURE PW	TEMP IN TI	TEMP OUT TO	TEMP AVG TA	ORIFICE PD	VOLUME VD	Y	ΔH@
START			0.000	28.95				0.50	350.100		
HALF		81.0			98.0	89.0	93.5				
STOP	12.75		5.000						355.151		
CALCULATION	12.75	541.0	5.013	28.95			553.5	28.99	5.051	1.0140	1.873
START			0.000	28.95				1.00	355.600		
HALF		81.0			105.0	90.0	97.5				
STOP	8.95		5.000						360.700		
CALCULATION	8.95	541.0	5.013	28.95			557.5	29.02	5.100	1.0103	1.833
START			0.000	28.95				2.00	361.200		
HALF		81.0			110.0	92.0	101.0				
STOP	6.30		5.000						366.234		
CALCULATION	6.30	541.0	5.013	28.95			561.0	29.10	5.034	1.0273	1.805
AVERAGE										1.0172	1.837

POST TEST

BOX # 6 BP 28.95 in. Hg
DATE 09-06-94 OPERATOR RPC

	WET TEST METER				DRY TEST METER					METER COEFFICIENT Y	ORIFICE COEFFICIENT ΔH@
	TIME (min)	TEMP TW	VOLUME VM	PRESSURE PW	TEMP IN TI	TEMP OUT TO	TEMP AVG TA	ORIFICE PD	VOLUME VD		
START			0.000	28.95				1.10	802.200		
HALF		72.0			104.0	85.0	94.5				
STOP	8.73		5.000						807.200		
CALCULATION	8.73	532.0	5.013	28.95			554.5	29.03	5.000	1.0420	1.865
START			0.000	28.95				1.10	807.500		
HALF		72.0			105.0	85.0	95.0				
STOP	8.68		5.000						812.500		
CALCULATION	8.68	532.0	5.013	28.95			555.0	29.03	5.000	1.0429	1.842
START			0.000	28.95				1.10	812.800		
HALF		72.0			108.0	87.0	97.5				
STOP	8.68		5.000						817.842		
CALCULATION	8.68	532.0	5.013	28.95			557.5	29.03	5.042	1.0389	1.834
AVERAGE										1.0413	1.847
DIFFERENCE										-2.3%	-0.5%

PRE-TEST MAGNEHELIC CALIBRATION
BOX# 6
DATE 06-09-94
OPERATOR RPC

0 to 3.0" H2O RANGE

MAGNEHELIC

Δ P	MANOMETER
0.50	0.50
1.00	1.00
2.00	2.00
3.00	3.00

0 to 0.50" H2O RANGE
SLANT TUBE
PRIMARY STANDARD

0 to 5" H2O RANGE

MAGNEHELIC

Δ H	MANOMETER
4.00	4.00
3.00	3.00
2.00	2.00
1.00	1.00
0.50	0.50

PRE-TEST LEAK CHECK
DATE 06-20-94
OPERATOR RPC

	START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
DRY	394.400	394.619	0.219	10.000	0.000
WET	0.000	0.222	0.222		

PYROMETER CALIBRATION
DATE 04-28-88
OPERATOR AGL

VOLTAGE INPUT (mV)	ARGE TEMP (°F)	TEMP READING (°F)
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	90.0
1.74	110	110.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	400.0
10.57	500	500.0

PRE-TEST PYROMETER CHECK
DATE 06-09-94
OPERATOR RPC

VOLTAGE INPUT (mV)	TARGET TEMP (°F)	TEMP READING (°F)
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	90.0
1.74	110	110.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	402.0
10.57	500	502.0

POST-TEST MAGNEHELIC CALIBRATION
BOX# 6
DATE 09-06-94
OPERATOR RPC

0 to 3.0" H2O RANGE

MAGNEHELIC Δ P	MANOMETER
0.50	0.50
1.00	1.00
2.00	2.00
3.00	3.00

0 to 0.50" H2O RANGE
SLANT TUBE
PRIMARY STANDARD

0 to 5" H2O RANGE

MAGNEHELIC Δ H	MANOMETER
4.00	4.00
3.00	3.00
2.00	2.00
1.00	1.00
0.50	0.50

POST-TEST LEAK CHECK
DATE 09-06-94
OPERATOR RPC

	START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
DRY	801.400	801.658	0.258	10.000	0.0002
WET	0.000	0.260	0.260		

PYROMETER CALIBRATION
DATE 04-28-88
OPERATOR AGL

VOLTAGE INPUT (mV)	ARGE TEMP (°F)	TEMP READING (°F)
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	90.0
1.74	110	110.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	400.0
10.57	500	500.0

POST-TEST PYROMETER CHECK
DATE 09-06-94
OPERATOR RPC

VOLTAGE INPUT (mV)	TARGET TEMP (°F)	TEMP READING (°F)
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	90.0
1.74	110	110.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	400.0
10.57	500	502.0

QA ORIFICE AUDIT

ORIFICE	BAPC-3	DATE	06-09-94	B.P.	29.00
OPERATOR	RPC	BOX #	6		

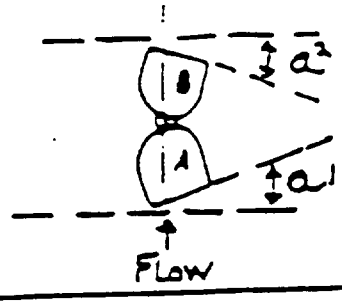
RUN	1		2		3	
INITIAL CF	110.300		118.300		126.300	
FINAL CF	117.825		125.828		133.810	
DIFFERENCE	7.525		7.528		7.510	
	IN	OUT	IN	OUT	IN	OUT
TEMP INITIAL	105	100	102	98	102	97
TEMP 5 MIN	102	99	101	97	102	97
TEMP 10 MIN	102	98	102	97	103	98
TEMP 15 MIN	102	98	102	97	103	98
		TEMP R		TEMP R		TEMP R
TEMP AVG	100.75	560.75	99.5	559.5	100	560
TIME (MIN.)	15.00		15.00		15.00	
	IN WATE	IN HG	IN WATER	IN HG	IN WATER	IN HG
ORIFICE	0.75	0.06	0.75	0.06	0.75	0.06
METER PRESSURE		29.06		29.06		29.06
	°F	°C	°F	°C	°F	°C
AMBIENT TEMP.	78.0	25.6	78.0	25.6	78.0	25.6
VACUUM IN HG	21.0		21.0		21.0	
DGM CAL Y	1.0128		1.0128		1.0128	
STD CF	6.995		7.014		6.991	
STD CUBIC METERS	0.1981		0.1986		0.1980	

GEOMETRIC PITOT CALIBRATION

Caliper # X6F-59
Precheck
Post Check

Probe #: 10.2
Date: 6-10-94
Initials: RPC

①

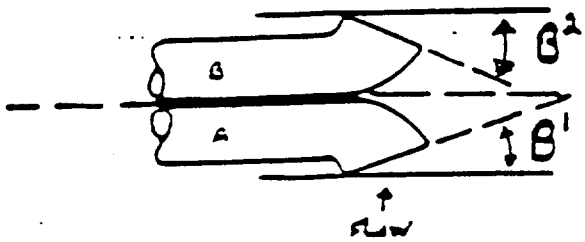


a^1 = 3°
a^2 = 0°
$a^1, a^2 = <10°$

B^1 = 0°
B^2 = 1°
$B^1, B^2 = <5°$

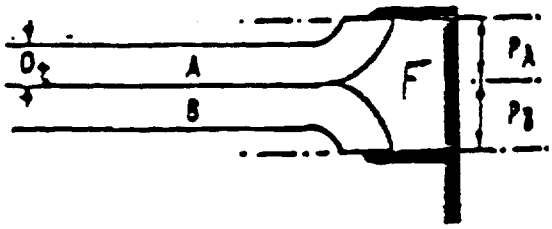
F = .93"

②



μ = 16 — μ = ≤ 0.1250" (μ = F TAN γ)
V = 0 — V = ≤0.03125" (V = F TAN θ)
W = .194 — W ≥ 0"
X = 0.97 — X ≥ 0.750" (3/4" using 1/2" nozzle)

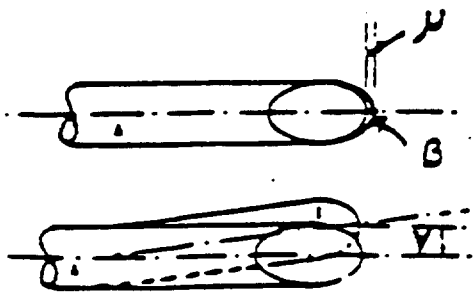
③

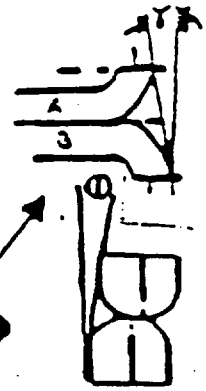


1.05 D_t < A < 1.50 D_t
$P_A = P_B$
2.10 D_t < A < 3.00 D_t

Y = 5.6 — Y ≥ 3.0"
Z = 3.6 — Z > 2.0"
D_t = .375 — D_t > .1875"

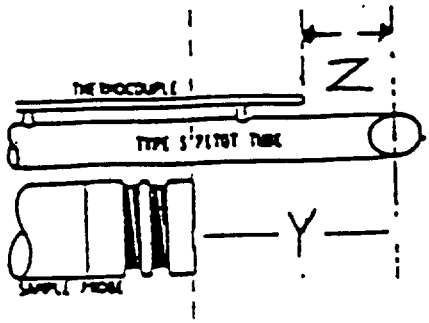
④



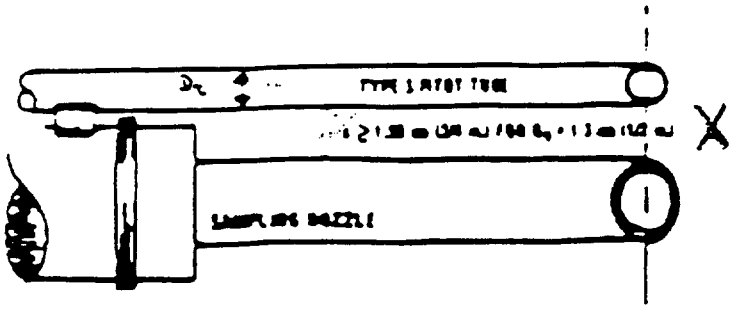


(γ, θ EXPRESSED IN DEGREES)

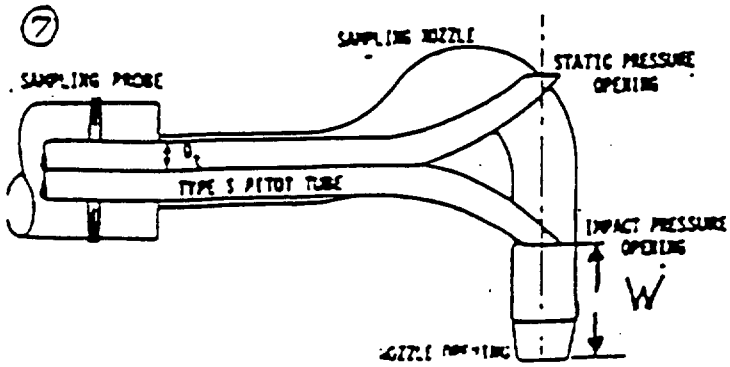
⑥



⑤



⑦

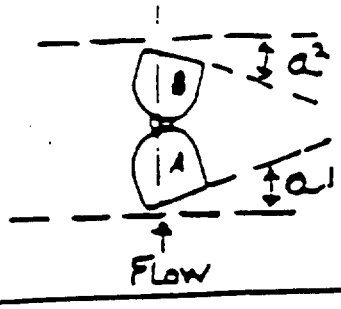


GEOMETRIC PITOT CALIBRATION

Caliper # XEF-59
Precheck
Post Check

Probe #: 10-2
Date: 10-10-94
Initials: RPC

①

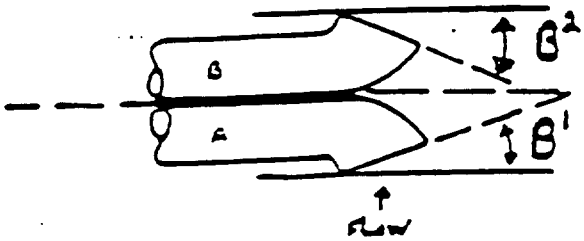


a^1 = 3°
a^2 = 0°
a^1, a^2 = <10°

B^1 = 0
B^2 = 1
B^1, B^2 = <5°

F = 94"

②



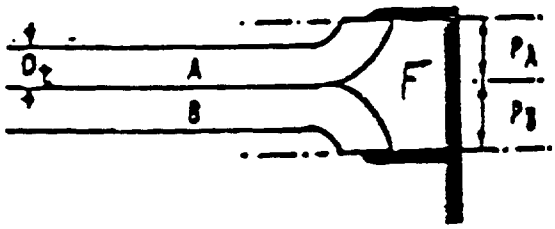
μ = .16 — μ = ≤ 0.1250" (μ = F TAN γ)

V = 0 — V = ≤0.03125" (V = F TAN θ

W = .200 — W ≥ 0"

X = .97 — X ≥ 0.750" (3/4" using 1/2" nozzle)

③



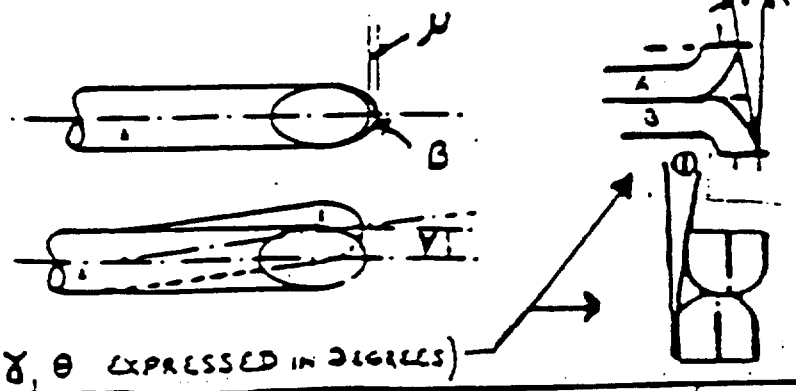
1.05 D_t < d < 1.50 D_t
$P_A = P_B$
2.10 D_t < A < 3.00 D_t

Y = 5.6" — Y ≥ 3.0"

Z = 3.8 — Z > 2.0"

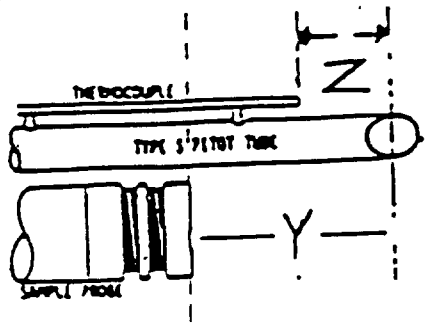
D_t = .376 — D_t > .1875"

④

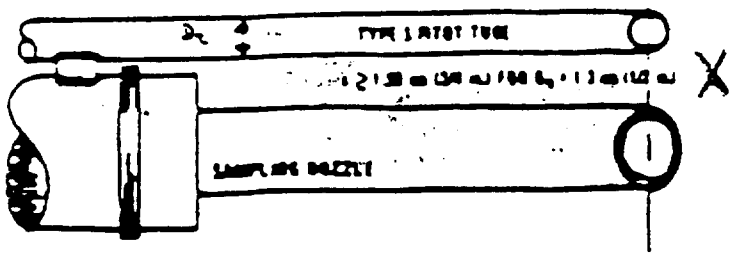


(γ, θ EXPRESSED IN DEGREES)

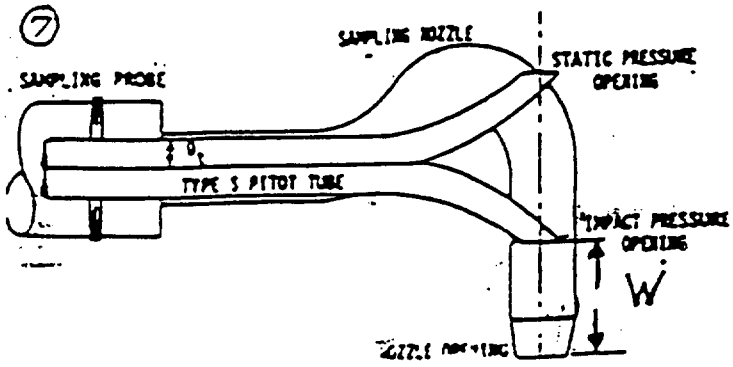
⑥



⑤



⑦



COMPLIANCE DEMONSTRATION
NO. 19 BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

APPENDIX B

PLANT OPERATIONAL DATA

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.

CC-10295 REV. 1181
03.001.0020

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT

UNIT NO. 7

12 Hrs. Beginning 12:00 A M

Date 8-24-94

BATTERY NO. A19

OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	12	11	12	41	
3	—		—		
5	12	21	12	55	
7	3	33	4	02	
9	3	45	4	11	
11	3	56	4	21	
13	4	07	4	36	
15	4	16	4	46	
17	4	26	5	00	
19	4	40	5	15	
21	4	51	5	23	
23	5	03	5	37	
25	5	17	5	50	
27	5	29	6	09	
29	5	40	6	21	
31					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
1					
2					

BATTERY NO. B19

OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1					
3					
5					
7					
9					
11					
13					
15			11	10	
17			11	22	
19			11	31	
21	11	14	11	41	
23	11	25	11	54	
25	11	36	12	09	
27	11	46	12	19	
29	11	59	12	30	
31					
2	5	57	6	32	
4	6	12	6	37	
6	6	28	6	42	
8	6	40	6	45	
10	7	18	7	38	
12	7	36	7	53	
14	7	50	8	02	
16	8	—	8	15	
18	8	12	8	27	
20	8	25	8	40	
22	8	38	8	46	
24	8	48	8	56	
26	8	58	9	11	
28	9	13	9	13	
30					
1					
2					

BATTERY NO. C19

OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	9	20	9	42	
3	9	40	10	03	
5	10	—	10	20	
7	10	18	10	37	
9	10	35	10	48	
11	10	46			
13					
15					
17					
19					
21					
23					
25					
27					
29					
31					
2	12	35	1	08	
4	12	47	1	20	
6	12	59	1	32	
8	1	12	1	43	
10	1	25	1	56	
12	1	38	2	16	
14	1	49	2	22	
16	—		2	09	
18	1	59	2	31	
20	2	12	2	46	
22	2	24	3	10	
24	2	38	3	30	
26	2	53	3	40	
28	3	15	3	51	
30					
1					
2					

REMARKS:

14/14 19/22 19/19

Condition of Signals

Condition of Pusher

HOURLY REPORT OF OPERATION

TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED	TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
1-1	5	5		8-7	5	5	
1-2	5	5		7-8	3	6	
2-3	5	5		8-9	3	2	
2-4	4	5		9-10	6	6	
3-5	4	4		10-11	3	3	
4-6	5	5		11-12	4	4	
	28	27			24	26	

Total Ovens Pushed 52

Total Ovens Charged 55

Pusherman

Battery Foreman R. McNew

CC-10295 REV. 1161
03.001.0020

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT

UNIT NO. 7

12 Hrs. Beginning 12:00 P M

Date 8-24-94

BATTERY NO. A-19

OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1					
3					
5					
7	9	56			
9	10	07			
11	10	18			
13					
15					
17					
19					
21					
23					
25					
27					
29					
31					
2					
4					
6	1	20	1	36	
8	1	38	1	46	
10	1	49	1	55	
12	1	58	2	07	
14	2	10	2	18	
16	2	25	2	32	
18	2	30	2	50	
20	2	38	2	48	
22	2	45	2	55	
24	3	14	3	24	
26	3	26	3	40	
28	3	37	3	52	
30					
1					
2					

BATTERY NO. B-19

OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	3	48	4	04	
3	4	—	4	15	
5	4	11	4	27	
7	4	23	4	38	
9	4	35	4	49	
11	4	47	5	02	
13	4	58	5	16	
15	5	12	5	27	
17	5	24	5	39	
19	5	36	5	50	
21	5	47	5	58	
23	6	20	6	30	
25	6	32	6	47	
27	6	43	7	04	
29	6	54	7	11	
31					
2					
4					
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
1					
2					

BATTERY NO. C-19

OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1					
3					
5					
7					
9					
11			11	08	
13	11	05	11	23	
15	11	20	11	34	
17	11	31	11	46	
19	11	44	12	20	
21	11	55	12	30	
23	12	25	12	38	
25	12	35	12	40	
27	12	45	12	50	
29	12	55	1	25	
31	—				
2	7	06	7	21	
4	7	18	7	33	
6	7	29	7	45	
8	7	41	7	57	
10	7	53	8	08	
12	8	05	8	20	
14	8	17	8	31	
16	8	28	8	43	
18	8	40	8	56	
20	8	52	9	21	
22	9	18	9	32	
24	9	26	9	48	
26	9	38	9	48	
28	9	44	10	—	
30					
1					
2					

REMARKS:

15/12 15/15 23/24

Condition of Signals

Condition of Pusher

HOURLY REPORT OF OPERATION

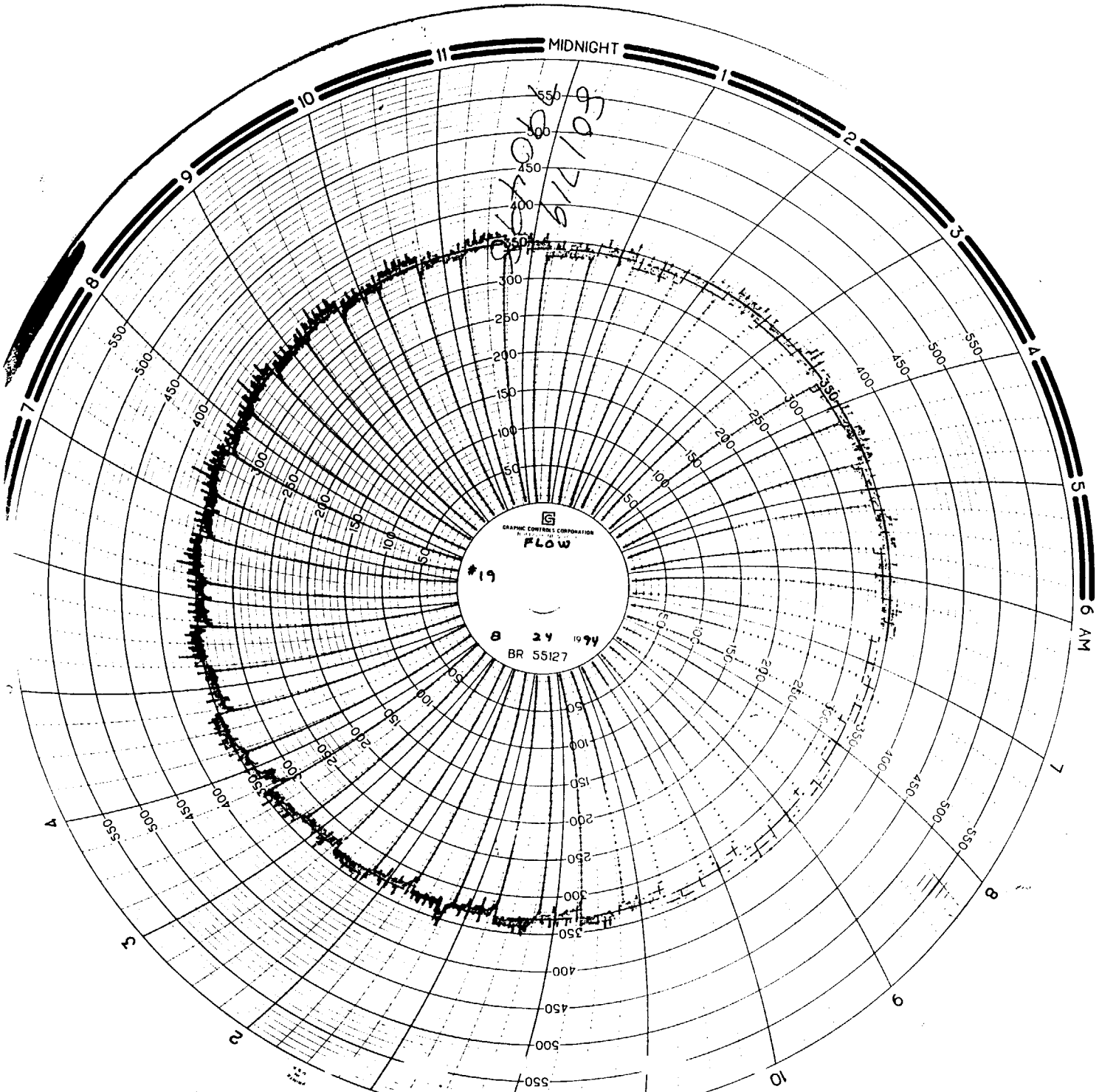
TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED	TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
12/1	5	4		6/7	4	6	
1/2	4	5		7/8	4	2	
2/3	4	4		8/9	5	6	
3/4	5	6		9/10	5	5	
4/5	4	3		10/11	5	4	
5/6	6	5		11/12	2	1	
	28	27			25	24	

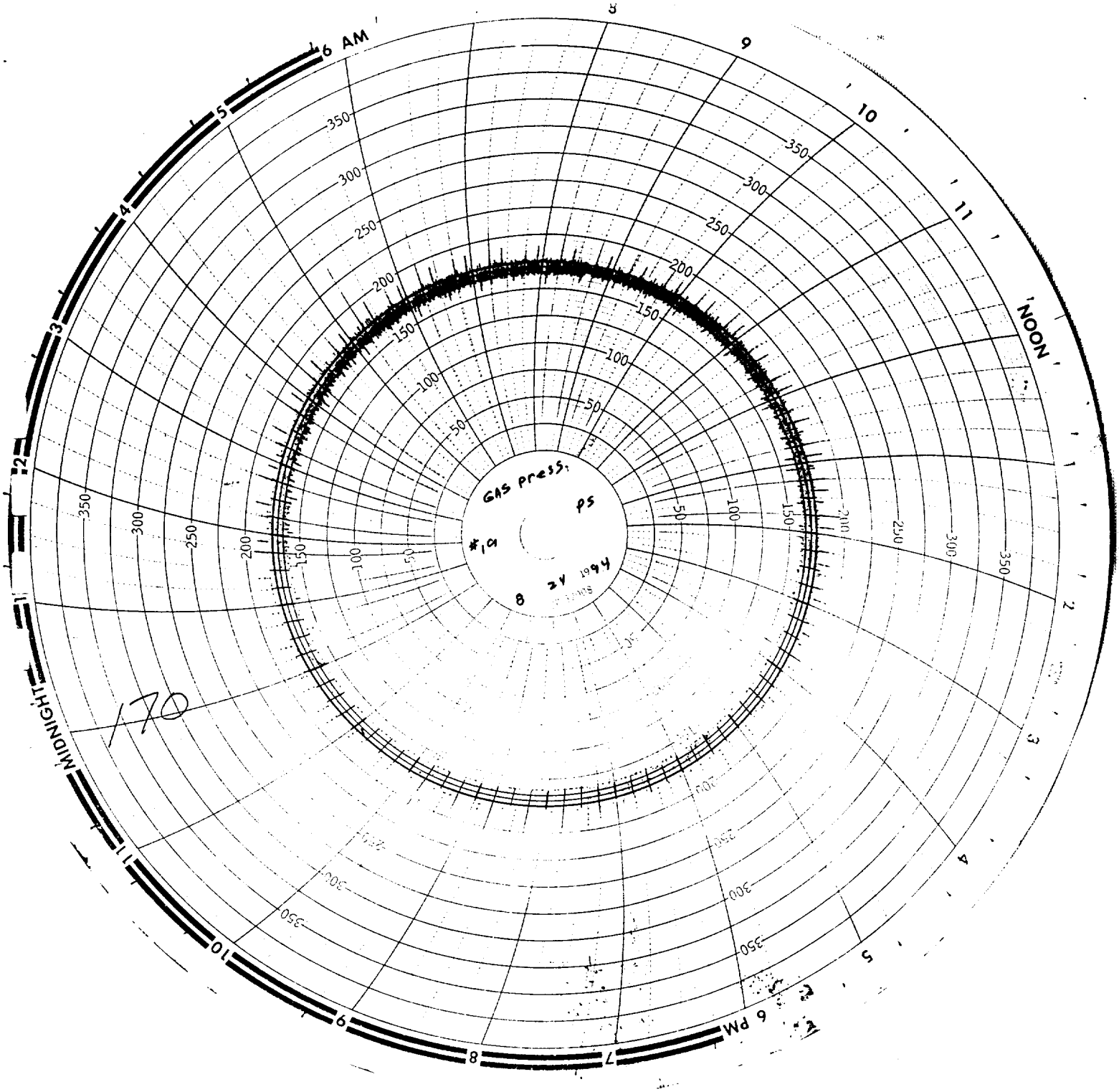
Total Ovens Pushed 53

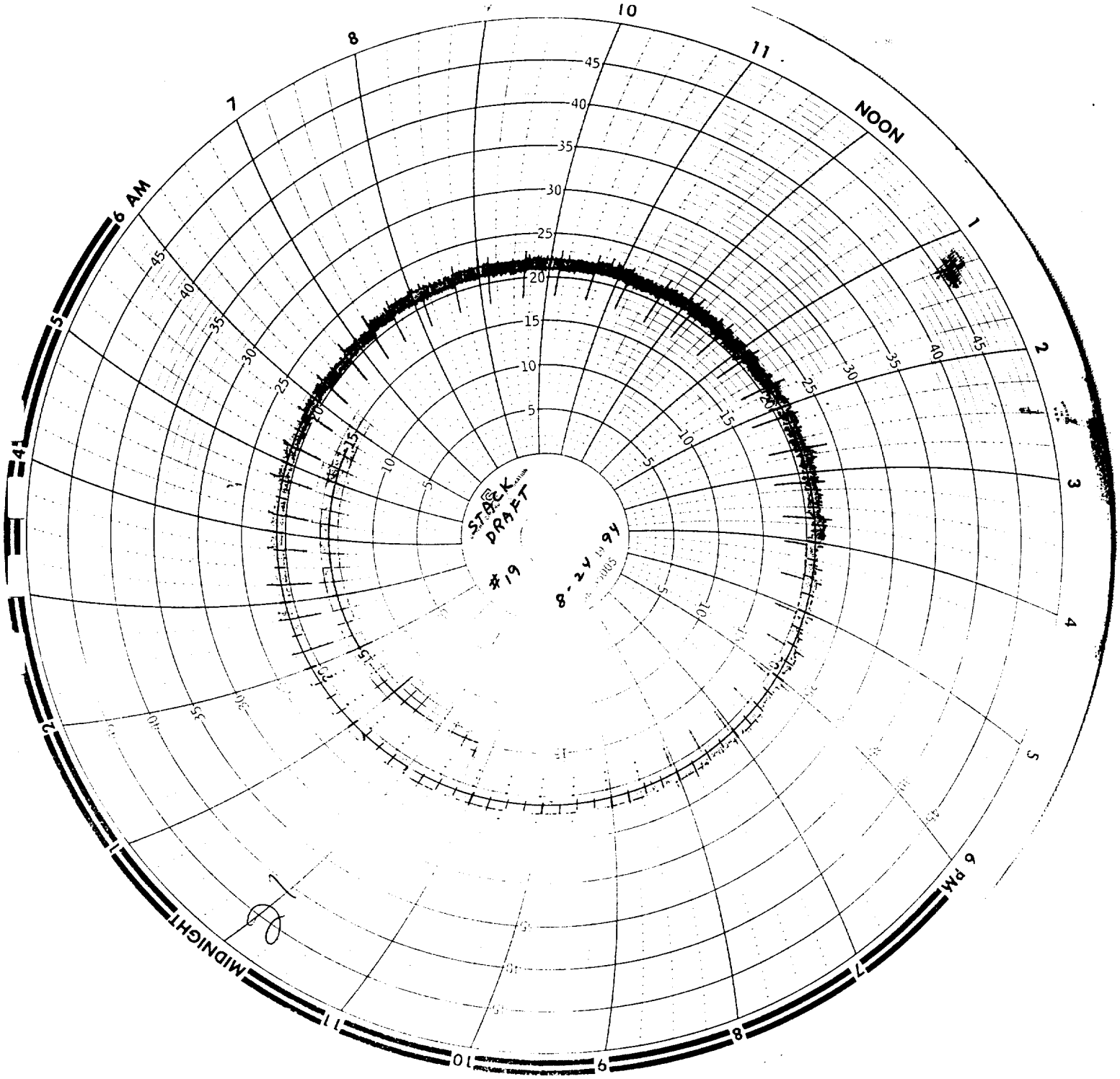
Total Ovens Charged 51

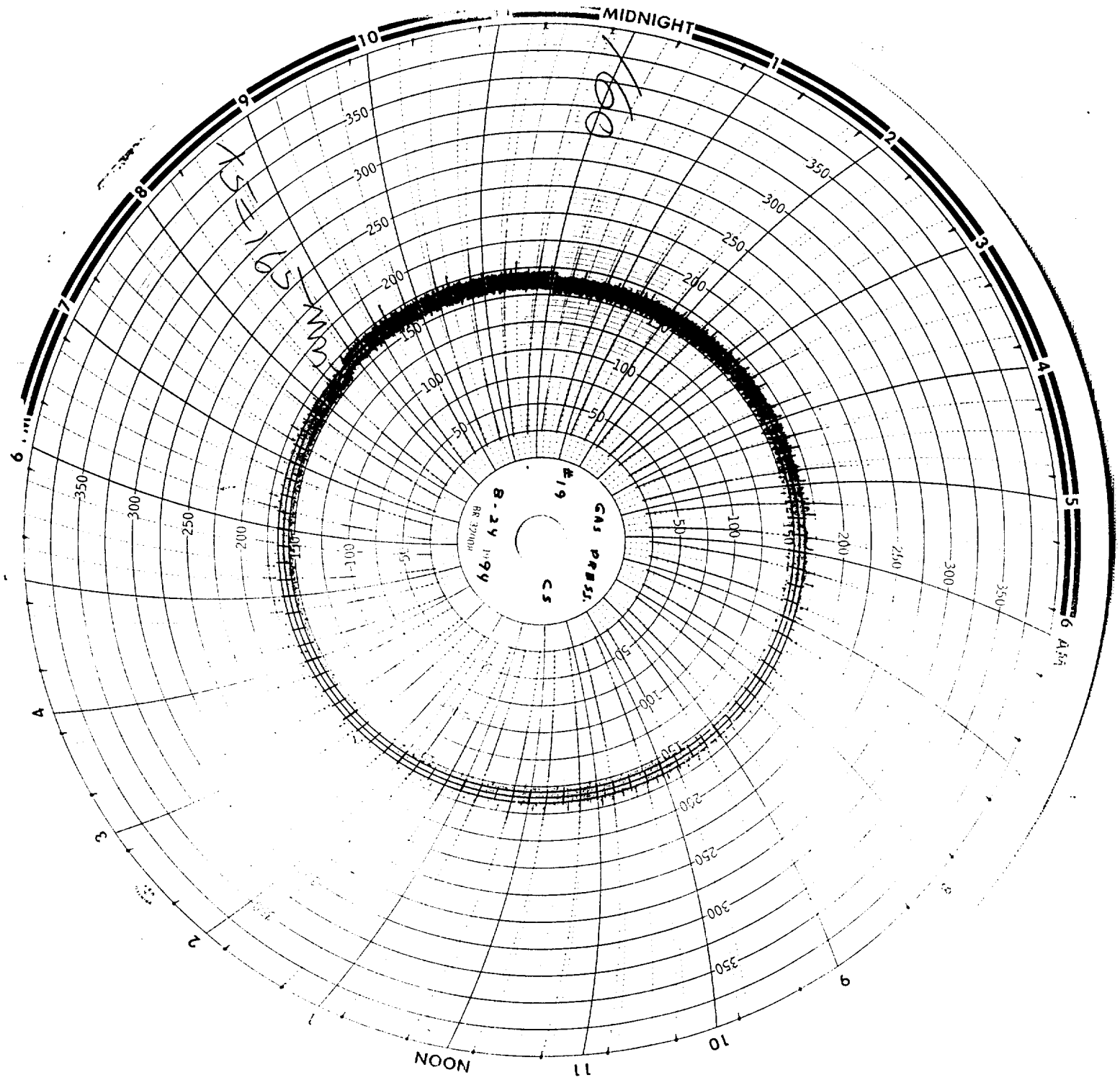
Pusherman

Battery Foreman R. M. [illegible]


MIDNIGHT
6 AM
GRAPHIC CONTROLS CORPORATION
FLOW
#19
8 24 1994
BR 55127


6 AM
NOON
6 PM
MIDNIGHT
GAS PRESS.
PS
#19
8 24 1994
170


STACK DRAFT
#19
8-24 to 94
6 AM
7
8
10
11
NOON
1
2
3
4
5
6 PM
7
8
9
10
11
MIDNIGHT
1
2
3
4
5


MIDNIGHT
NOON
GAS PRESS.
#19
CS
8-24 1994
TS=165 mm
160

COMPLIANCE DEMONSTRATION
NO. 19 BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

APPENDIX C

GRAVIMETRIC RESULTS, EMISSIONS CALCULATIONS

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.

ATS
AIR QUALITY ENGINEERING
ANALYTICAL REPORTING FORM

CLIENT: USS - Clairton Steel
PLANT LOCATION: Clairton, PA
PROJECT NUMBER: IKM 0204
UNIT TESTED: Battery Stack #19

TEST DATE: 8/24/94
DATE RECEIVED: 8/24/94
DATE ANALYZED: 8/31/94
ANALYTICAL METHOD: Gravimetric Method

Test Number	Filter ID Number	Component	Cyclone Weight Units ( )	Filter Weight Units (grams)	Soluble Portion of Front Half H2O Rinse Units ( )	Soluble Portion of Front Half Acetone Rinse Units (grams)	Soluble Portion of Back Half H2O Rinse Units ( )	Soluble Portion of Back Half Acetone Rinse Units ( )	0.22μm Filter Insoluble Portion of Back Half H2O Rinse Units ( )
CLR-BS19-1	1341	Particulate		0.0314		0.0226			
CLR-BS19-2	1324	Particulate		0.0241		0.0283			
CLR-BS19-3	1326	Particulate		0.0357		0.0324			
CLR-BS19-BLK	1308	Particulate		0.0000		0.0001			

Analyst's Signature: Patricia J. Stockton
Date: 9/2/94

Comments

AQE 10/92

STACK SAMPLING CALCULATIONS

CLIENT: USS CLAIRTON WORKS
TEST SITE #19 BATTERY COMBUSTION STACK

TEST DATE: 08-24-94
TEST NUMBER: CLR-BS#19-1

A.	Barometric Pressure	29.60	in. Hg	
B.	Static Pressure	-1.2	in. H2O	
C.	Stack Pressure	29.51	in. Hg	[A+(B/13.6)]
D.	Average ΔH	1.01	in. H2O	
E.	Meter Pressure	29.67	in. Hg	[A+(D/13.6)]
F.	Average ΔP	0.03	in. H2O	
G.	Pitot Coefficient	0.84		
H.	Gas Meter Coefficient	1.0172		
I.	Stack Diameter	186	in.	
J.	Stack Area	188.69	ft^2	$(0.00545*I^2)$
K.	Nozzle Diameter	0.490	in.	
L.	Nozzle Area	1.31E-03	ft^2	$(0.00545*K^2)$
M.	Average Stack Temperature	482	°F	
N.	Average Stack Temperature	942	°R	(460+M)
O.	Average Meter Temperature	87	°F	
P.	Average Meter Temperature	547	°R	(460+O)
Q.	Condensate Volume	210.2	mL	
R.	Absorbed H2O	15.5	mL	
S.	Total H2O	225.7	mL	(Q+R)
T.	Filter Weight	0.0314	g	
U.	Probe Weight	0.0226	g	
V.	Impinger Weight	0.0000	g	
W.	Total Weight	0.0540	g	(T+U+V)
X.	Metered Gas Volume	64.282	dcf	
Y.	Corrected Metered Gas Volume	65.388	dcf	(X*H)
Z.	H2O Gas Volume	11.140	cf	(0.00267*S*P/A)
AA.	Total Sample Volume	76.527	cf	(Y+Z)
BB.	Percent H2O	14.6	%	(100*Z/AA)
CC.	Gas Volume Sampled	62.579	dscf	[Y*(528/P)*(E/29.92)]
DD.	Grain Loading	0.0133	gr/dscf	(15.43*W/CC)

EE. Average Molecular Weight:

Component	% Volume ÷100	*(1-BB/100)	* Mol. Weight	= Weight/Mol
H2O	0.146		18	2.620
CO2	0.040	0.854	44	1.504
CO	0.000	0.854	28	0.000
O2	0.120	0.854	32	3.281
N2	0.840	0.854	28	20.096

Average Molecular Weight 27.50 lb./lb. mol

FF.	Average Stack Velocity	13.4	fps	{85.49*G*[(F*N)/(C*EE)]^0.5}
GG.	Averge Flow Rate	151700	acfm	(60*FF*J)
HH.	Standard Flow Rate	83900	scfm	[GG*(528/N)*(C/29.92)]
II.	Sample Time	7200	sec	
JJ.	Percent Isokinetic	104.8	%	{[100*CC*60*J]/[HH*L*II*(1-BB/100)]}
KK.	Mass Flow Rate	8.18	lb/hr	[DD*HH*(1-BB/100)*60/7000]

STACK SAMPLING CALCULATIONS

CLIENT: USS CLAIRTON WORKS
TEST SITE #19 BATTERY COMBUSTION STACK

TEST DATE: 08-24-94
TEST NUMBER: CLR-BS#19-2

A.	Barometric Pressure	29.60	in. Hg	
B.	Static Pressure	-1.2	in. H2O	
C.	Stack Pressure	29.51	in. Hg	[A+(B/13.6)]
D.	Average Δ H	0.96	in. H2O	
E.	Meter Pressure	29.67	in. Hg	[A+(D/13.6)]
F.	Average Δ P	0.03	in. H2O	
G.	Pitot Coefficient	0.84		
H.	Gas Meter Coefficient	1.0172		
I.	Stack Diameter	186	in.	
J.	Stack Area	188.69	ft^2	$(0.00545*I^2)$
K.	Nozzle Diameter	0.490	in.	
L.	Nozzle Area	1.31E-03	ft^2	$(0.00545*K^2)$
M.	Average Stack Temperature	487	°F	
N.	Average Stack Temperature	947	°R	(460+M)
O.	Average Meter Temperature	103	°F	
P.	Average Meter Temperature	563	°R	(460+O)
Q.	Condensate Volume	204.5	mL	
R.	Absorbed H2O	14.6	mL	
S.	Total H2O	219.1	mL	(Q+R)
T.	Filter Weight	0.0241	g	
U.	Probe Weight	0.0283	g	
V.	Impinger Weight	0.0000	g	
W.	Total Weight	0.0524	g	(T+U+V)
X.	Metered Gas Volume	64.662	dcf	
Y.	Corrected Metered Gas Volume	65.774	dcf	(X*H)
Z.	H2O Gas Volume	11.123	cf	(0.00267*S*P/A)
AA.	Total Sample Volume	76.897	cf	(Y+Z)
BB.	Percent H2O	14.5	%	(100*Z/AA)
CC.	Gas Volume Sampled	61.192	dscf	[Y*(528/P)*(E/29.92)]
DD.	Grain Loading	0.0132	gr/dscf	(15.43*W/CC)

EE. Average Molecular Weight:

Component	% Volume ÷100	*(1-BB/100)	* Mol. Weight	= Weight/Mol
H2O	0.145		18	2.604
CO2	0.040	0.855	44	1.505
CO	0.000	0.855	28	0.000
O2	0.120	0.855	32	3.285
N2	0.840	0.855	28	20.118

Average Molecular Weight 27.51 lb./lb. mol

FF.	Average Stack Velocity	13.4	fps	{85.49*G*[(F*N)/(C*EE)]^0.5}
GG.	Averge Flow Rate	152100	acfm	(60*FF*J)
HH.	Standard Flow Rate	83600	scfm	[GG*(528/N)*(C/29.92)]
II.	Sample Time	7200	sec	
JJ.	Percent Isokinetic	102.8	%	{[100*CC*60*J]/[HH*L*II*(1-BB/100)]}
KK.	Mass Flow Rate	8.10	lb/hr	[DD*HH*(1-BB/100)*60/7000]

STACK SAMPLING CALCULATIONS

CLIENT: USS CLAIRTON WORKS — TEST DATE: 08-24-94

TEST SITE #19 BATTERY COMBUSTION STACK — TEST NUMBER: CLR-BS#19-3

A.	Barometric Pressure	29.60	in. Hg	
B.	Static Pressure	-1.2	in. H2O	
C.	Stack Pressure	29.51	in. Hg	[A+(B/13.6)]
D.	Average Δ H	1.02	in. H2O	
E.	Meter Pressure	29.68	in. Hg	[A+(D/13.6)]
F.	Average Δ P	0.03	in. H2O	
G.	Pitot Coefficient	0.84		
H.	Gas Meter Coefficient	1.0172		
I.	Stack Diameter	186	in.	
J.	Stack Area	188.69	ft^2	$(0.00545*I^2)$
K.	Nozzle Diameter	0.490	in.	
L.	Nozzle Area	1.31E-03	ft^2	$(0.00545*K^2)$
M.	Average Stack Temperature	490	°F	
N.	Average Stack Temperature	950	°R	(460+M)
O.	Average Meter Temperature	109	°F	
P.	Average Meter Temperature	569	°R	(460+O)
Q.	Condensate Volume	213.5	mL	
R.	Absorbed H2O	14.9	mL	
S.	Total H2O	228.4	mL	(Q+R)
T.	Filter Weight	0.0357	g	
U.	Probe Weight	0.0324	g	
V.	Impinger Weight	0.0000	g	
W.	Total Weight	0.0681	g	(T+U+V)
X.	Metered Gas Volume	67.947	dcf	
Y.	Corrected Metered Gas Volume	69.116	dcf	(X*H)
Z.	H2O Gas Volume	11.726	cf	(0.00267*S*P/A)
AA.	Total Sample Volume	80.841	cf	(Y+Z)
BB.	Percent H2O	14.5	%	(100*Z/AA)
CC.	Gas Volume Sampled	63.594	dscf	[Y*(528/P)*(E/29.92)]
DD.	Grain Loading	0.0165	gr/dscf	(15.43*W/CC)

EE. Average Molecular Weight:

Component	% Volume ÷100	*(1-BB/100)	* Mol. Weight	= Weight/Mol
H2O	0.145		18	2.611
CO2	0.040	0.855	44	1.505
CO	0.000	0.855	28	0.000
O2	0.120	0.855	32	3.283
N2	0.840	0.855	28	20.108

Average Molecular Weight 27.51 lb./lb. mol

FF.	Average Stack Velocity	13.5	fps	{85.49*G*[(F*N)/(C*EE)]^0.5}
GG.	Averge Flow Rate	152300	acfm	(60*FF*J)
HH.	Standard Flow Rate	83500	scfm	[GG*(528/N)*(C/29.92)]
II.	Sample Time	7200	sec	
JJ.	Percent Isokinetic	107.0	%	{[100*CC*60*J]/[HH*L*II*(1-BB/100)]}
KK.	Mass Flow Rate	10.11	lb/hr	[DD*HH*(1-BB/100)*60/7000]