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.

AP-42 Section 12.2
Reference
Report Sect. 4
Reference 81

Reviewed

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

Report on

COMPLIANCE DEMONSTRATION
NO. 20 BATTERY COMBUSTION STACK

OCTOBER 1994

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

Project No. IKM-0205

R.C. WESTMAN
GWL
WGG Rec'd 11/2
WVC
File
OCT 25 1994

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

October 21, 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: #20 Battery Stack Compiance Demonstration
USS Clairton Works

I am enclosing with this letter the mass emission report on #20 Battery Combustion Stack. The compliance demonstration was conducted at USS Clairton Works, a division of USX Corporation, on September 21, 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

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EXECUTIVE SUMMARY

On September 21, 1994, a compliance test program was conducted for USS Clairton Works, Clairton, Pennsylvania, on the #20 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 2 through 4.

The results of the testing showed an average particulate matter concentration and emission rate of 0.0105 grains per dry standard cubic foot (gr/dscf) and 7.36 pounds per hour (lb/hr), respectively. As promulgated by the Second Consent Decree, Chapter V, Section F.2.a, the allowable particulate matter concentration for #20 Battery Combustion Stack is 0.015 gr/dscf (a Lowest Achievable Emission Rate [LAER] standard). Thus, the particulate matter emissions from the stack are less than the allowable concentration.

During the test periods, the opacity of the exhaust gas was zero 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 September 21, 1994, a compliance test program was conducted for USS Clairton Works, Clairton, Pennsylvania, on the #20 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 2 through 4.

Testing was performed by Messrs. Richard Casselberry and Patrick Stockton 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 and Sections 139.11 and 139.12 of the Pennsylvania Department of Environmental Resources (PA DER) Source Testing Manual. 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 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 are maintained. Clean up of the sampling train included a water rinse followed by an acetone rinse of both the front-half and back-half components of the sample train, as per PA DER particulate matter test methods. The water soluble and

water insoluble portions of the front-half of the sampling train were determined as a total; that is, the water rinse was not filtered to determine soluble and insoluble portions. Front-half acetone and water rinses were evaporated to dryness, desiccated, and weighed to a constant weight. The water soluble and water insoluble portions of the back-half were determined separately in accordance with Section 139.12 of the PA DER Source Testing Manual. The back-half water rinses and first three impinger solutions were combined and then filtered under suction through a preweighed 0.22 micrometer membrane filter. The filter used to capture the insoluble material was dried, desiccated, and weighed to a constant weight. After filtration, the soluble back-half water was evaporated to dryness, desiccated, and weighed to a constant weight. Back-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 and one deionized distilled water blank were prepared in the same manner as the test sample rinses. The blank residue weights were subtracted from the test sample residue weights. After blank correction, front-half water and acetone rinse residue weights, sample train filter weights, and back-half water insoluble 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 0.0105 grains per dry standard cubic foot (gr/dscf) and 7.36 pounds per hour (lb/hr), respectively. As promulgated by the Second Consent Decree, Chapter V, Section F.2.a, the allowable particulate matter concentration for #20 Battery Combustion Stack is 0.015 gr/dscf (a Lowest Achievable Emission Rate [LAER] standard). 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.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. During the test periods, the opacity of the exhaust gas was zero 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

#20 BATTERY COMBUSTION STACK
PARTICULATE MATTER EMISSIONS DATA

		Run 1	Run 2	Run 3	Average
Test Number		CLR-BS#20-1	CLR-BS#20-2	CLR-BS#20-3	
Test Date		09-21-94	09-21-94	09-21-94	
Mass Emissions Rate and Concentration					
Particulate Matter	(lb/hr)	8.03	7.33	6.72	7.36
	(gr/dscf)	0.0115	0.0104	0.0095	0.0105
Stack Conditions					
Flow Rate	(acfm)	176500	175700	175400	175900
	(scfm)	96400	96600	96700	96600
	(dscfm)	81600	82300	82300	82100
Temperature	(°F)	490	484	481	485
Moisture Content	(%)	15.4	14.8	14.9	15.0
Sampling Conditions					
Test times	(EDT)	0931 to 1001	1225 to 1255	1520 to 1550	
		1004 to 1034	1258 to 1328	1554 to 1624	
		1038 to 1108	1332 to 1402	1631 to 1701	
		1112 to 1142	1406 to 1436	1705 to 1735	
Sampling Time	(minutes)	120	120	120	
Sample Volume	(dscf)	69.222	66.215	66.098	
Isokinetics	(%)	101.9	96.6	96.4	

ATS
ADVANCED TECHNOLOGY SYSTEMS, INC.

COMPLIANCE DEMONSTRATION
NO. 20 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
#20 BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

Particulate matter sampling will be performed in accordance with the Second Consent Decree (Civil Action Nos. 79-709, 91-329 - Chapter V, Section F, Specific Items 2 through 4), EPA Stationary Source Sampling Methods 1 through 5, 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 test 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.

At the beginning and end of each test, gas concentrations of carbon dioxide (CO_2), oxygen (O_2), and nitrogen (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.

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

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 a

water rinse followed by an acetone rinse of both the front-half and back-half components of the sample train, as per PA DER particulate matter test methods. The water soluble and water insoluble portions of the front-half of the sampling train will be determined as a total; that is, the water rinse will not be filtered to determine soluble and insoluble portions. Front-half acetone and water rinses will be evaporated to dryness, desiccated, and the residues weighed to a constant weight. The water soluble and water insoluble portions of the back-half will be determined separately in accordance with Section 139.12 of the PA DER Source Testing Manual. The back-half water rinses and first three impinger solutions will be combined and then filtered under suction through a preweighed 0.22 micrometer membrane filter. The filter used to capture the insoluble material will be dried, desiccated, and the catch weighed to a constant weight. The filtrate will be evaporated to dryness, desiccated, and the residue weighed to a constant weight. Back-half acetone rinses will be evaporated to dryness, desiccated, and the residue weighed to a constant weight. Sample train 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 and one deionized distilled water blank will be prepared in the same manner as the test sample rinses. The blank residue weights will be subtracted from the test sample residue weights. After blank correction, front-half water and acetone rinse residue weights, sample train filter weights, and back-half water insoluble filter weights will be used to determine total particulate matter catch.

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 - Department of Air Quality, field data sheets for the particulate matter sampling and visible emissions determinations, analytical results for each test, and emissions calculations sheets.

STACK SAMPLING DATA SHEET

CLIENT USS- CLAIRTON WORKS	TEST DATE 09-21-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 3
TEST UNIT BATCH STACK #20	TEST NO. USS-ELR-BS#20-1	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM - Ø2Ø5	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 901
TEST CREW RPC PJS	STATIC PRESSURE -1.2	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.50	PORT DIRECTION WEST, NORTH	CONTROL BOX NO. SIX	PORT SIZE 4.0" THROUGH PIPE

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
66.1	09:31	985.010	.08	1.40	1.40	59	56	2.0	491	~250°F	<68°F Ice Water	~250°F	5 min./point
46.5			0.03	0.84	0.84	72	57	1.5	486				
33.0			0.02	0.56	0.56	77	59	1.0	489				
22.0			0.04	1.12	1.12	84	62	2.0	490				
12.5			0.04	1.12	1.12	84	63	2.0	500				
4.0	10:01	1001.612	0.03	0.84	0.84	93	67	1.5	486				
66.1	10:04	1001.612	0.05	1.40	1.40	90	70	3.0	485				
46.5			0.04	1.12	1.12	96	71	2.5	490				
33.0			0.03	0.84	0.84	98	74	2.0	495				
22.0			0.04	1.12	1.12	98	75	2.5	495				
12.5			0.05	1.40	1.40	98	76	3.0	490				
4.0	10:34	1019.346	0.03	0.84	0.84	100	78	2.0	485				
													Estimates:
													MW= 28.0
													%H2O= 13.5

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	<0.012 cfm
After	5.0	<0.005

PITOT LEAK CHECK

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

GAS	1	2
CO2	4.5	4.5
O2	10.5	10.5
CO	0	0
N2	85.0	85.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100 mL DI H2O	759.3	542.9	216.4
2.	100 mL DI H2O	592.0	561.7	30.3
3.	EMPTY	454.6	451.1	3.5
4.	SILICA GEL	675.6	659.7	15.9
5.				
6.			total	= 266.1 g
7.				
8.				

250.2 g

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STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 09-21-94 (WED) 1/8	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 3
TEST UNIT BATTERY STACK #20	TEST NO. USS-CLR-BS#20-X+1	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-0205	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 901
TEST CREW RPC, PJS	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.50	PORT DIRECTION EAST, SOUTH	CONTROL BOX NO. SIX	PORT SIZE 40" THICKNESS MAKE

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
66.1	10:38	1019.346	0.05	1.40	1.40	88	87	3.5	491	~250°F	<68°F Sent down	~250°F	5 min./point
46.5			0.03	0.84	0.84	99	77	3.0	489				
33.0			0.04	1.12	1.12	99	78	3.0	493				
22.0			0.03	0.84	0.84	103	79	3.0	475				
12.5			0.04	1.12	1.12	103	79	3.5	481				
4.0	11:08	1037.371	0.06	1.68	1.68	106	86	4.0	475				
66.1	11:12	1037.371	0.05	1.40	1.40	92	81	3.5	488				
46.5			0.05	1.40	1.40	93	80	4.0	505				
33.0			0.05	1.40	1.40	95	80	4.0	493				
22.0			0.04	1.12	1.12	105	81	3.5	495				
12.5			0.03	0.84	0.84	108	84	3.5	496				
4.0	11:42	1055.924	0.04	1.12	1.12	108	85	3.5	488				
Test Totals	Δ=120 min	Δ=70.914 dcf	$(\Delta P)_{Avg}$ = 0.04	$(\Delta H)_{Avg}$ = 1.12		$(T_{meter})_{Avg}$ = 84.0 °F			$(T_{stack})_{Avg}$ = 489.6 °F				Estimates: MW= 28.0 %H2O= 13.5

SYSTEM LEAK CHECK

	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			
2.				
3.				
4.				
5.				
6.				
7.				
8.				

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STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 09-21-94 (Wed)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 6
TEST UNIT BATTERY STACK #20	TEST NO. USS-CLR-BS#20-2	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-82855	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1325
TEST CREW RJC, PJS	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.50	PORT DIRECTION WEST, NORTH	CONTROL BOX NO. S18	PORT SIZE 40" Thermometer

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
66.1	12:25	1056.366	0.02	0.59	0.59	79	79	1.0	495	~250°F	<68°F Ice down	~250°F	5 min./point
46.5			0.02	0.59	0.59	93	79	1.0	480				
33.0			0.03	0.88	0.88	99	81	1.0	475				
22.0			0.03	0.88	0.88	104	82	1.0	480				
12.5			0.04	1.17	1.17	108	84	2.0	486				
4.0	12:55	1071.150	0.02	0.59	0.59	108	84	1.0	488				
66.1	12:58	1071.150	0.03	0.88	0.88	90	86	1.5	489				
46.5			0.03	0.88	0.88	112	88	1.5	479				
33.0			0.03	0.88	0.88	117	89	1.5	478				
22.0			0.03	0.88	0.88	117	89	1.5	485				
12.5			0.05	1.46	1.46	117	92	3.0	480				
4.0	1328	1088.222	0.04	1.17	1.17	120	93	2.5	470				
													Estimates:
													MW= 28.0
													%H2O= 13.5

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	<0.011 cfm
After	5.6	<0.01 cfm

PITOT LEAK CHECK

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

GAS	1	2
CO2	4.5	4.5
O2	10.5	10.5
CO	0	0
N2	85.0	85.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100 ml DI H2O	717.0	520.0	197.0
2.	100 ml DI H2O	584.6	555.4	29.2
3.	EMPTY	425.3	422.5	2.8
4.	SILICA GEL	664.8	650.2	14.6
5.				
6.			total	= 243.6g
7.				
8.				

229.0g

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STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 09-21-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 6
TEST UNIT BATTERY STACK #20	TEST NO. CLR-BS #20-2	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-Ø2Ø5	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 1325
TEST CREW R/C PJS	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.50	PORT DIRECTION EAST SOUTH	CONTROL BOX NO. 5/1	PORT SIZE 4.0" THREADED PORTS

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
66.1	13:32	1088.222	0.05	1.46	1.46	100	93	3.5	500	~250°	<68° Dry Box	~250°	5 min./point
46.5			0.05	1.46	1.46	117	93	3.5	484				
33.0			0.04	1.17	1.17	117	93	2.5	479				
22.0			0.05	1.46	1.46	118	94	3.5	485				
12.5			0.04	1.17	1.17	118	95	2.5	485				
4.0	14:02	1107.174	0.03	0.88	0.88	118	95	2.0	481				
66.1	14:06	1107.174	0.05	1.46	1.46	104	95	3.0	480				
46.5			0.04	1.19	1.19	118	96	2.5	507				
33.0			0.04	1.19	1.19	118	96	2.5	486				
22.0			0.05	1.48	1.48	119	96	3.0	480				
12.5			0.05	1.48	1.48	120	97	3.0	484				
4.0	14:36	1126.200	0.03	0.88	0.88	121	98	2.0	470				
Test Totals	Δ=120 min	Δ=69.834 dcf	$(\Delta P)_{AVG}$= 0.04	$(\Delta H)_{AVG}$= 1.09		$(T_{meter})_{AVG}$= 100.4 °F			$(T_{stack})_{AVG}$= 483.6 °F				Estimates: MW= 28.0 %H2O= 13.5

SYSTEM LEAK CHECK

	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.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

ATS

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 09-21-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 4
TEST UNIT BATTERY STACK #20	TEST NO. USS-CLR-BS#20-3	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-B2185	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 902
TEST CREW RPC, PJS	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.50	PORT DIRECTION WEST NORTH	CONTROL BOX NO. SIX	PORT SIZE 4.0 THREADED PIPE

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
										~250°F	<68°F Iced down	~250°F	5 min./point
66.1	15:20	1126.840	0.04	1.19	1.19	91	90	3.0	485				
46.5			0.04	1.19	1.19	106	90	3.0	472				
33.0			0.02	0.60	0.60	110	92	2.5	461				
22.0			0.02	0.60	0.60	112	93	2.5	470				
12.5			0.03	0.89	0.89	115	95	4.0	475				
4.0	15:50	1142.858	0.03	0.89	0.89	117	95	4.0	470				
66.1	15:54	1142.858	.03	0.89	0.89	106	95	3.5	495				
46.5			0.04	1.19	1.19	115	95	4.0	474				
33.0			0.04	1.19	1.19	116	96	4.0	478				
22.0			0.02	0.60	0.60	120	97	3.0	480				
12.5			0.03	0.89	0.89	119	98	3.5	467				
4.0	16:24	1159.330	0.03	0.89	0.89	119	98	3.5	480				
													Estimates:
													MW= 28.0
													%H2O= 13.5

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	<0.011 cfm
After	6.5	<0.011 cfm

PITOT LEAK CHECK

	Positive	Negative
Before	04/15sec	04/15sec
After	04/15sec	04/15sec

GAS	1	2
CO2	4.5	4.5
O2	10.5	10.5
CO	0	0
N2	85.0	85.0

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100 ml DI H2O	753.0	554.1	198.8
2.	100 ml DI H2O	578.2	551.0	27.2
3.	EMPTY	456.6	453.6	3.0
4.	Silica gel	658.9	644.0	14.9
5.				
6.			total	= 244.0g
7.				
8.				

227.1g

ATS

STACK SAMPLING DATA SHEET

CLIENT USS-CLAIRTON WORKS	TEST DATE 09-21-94 (WED)	ORIFICE CORRECTION (ΔH@) 1.837	HOT/COLD BOX NO. 4
TEST UNIT BATTERY STACK #20	TEST NO. USS-CLR-BS#20-3	METER CORRECTION (Y) 1.0172	PROBE NO. 10-2
PROJECT NO. IKM-02485	NOZZLE (SIZE,#) 0.490	CALIBRATION DATE 06-20-94	FILTER NO. 902
TEST CREW RPC, PJS	STATIC PRESSURE -1.20	PITOT CORRECTION 0.84	STACK DIA. 186"
BAROMETRIC PRESSURE 29.50	PORT DIRECTION EAST SOUTH	CONTROL BOX NO. SIX	PORT SIZE 40" [illegible]

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
66.1	16:31	1159.330	0.05	1.49	1.49	105	100	4.5	490	~250°	<68° [illegible]	~250°C	5 min./point
46.5			0.05	1.49	1.48	109	99	4.5	499				
33.0			0.06	1.79	1.79	120	98	5.0	484				
22.0			0.05	1.49	1.49	120	98	4.5	500				
12.5			0.05	1.49	1.49	123	100	4.5	493				
4.0	17:01	1178.929	0.03	0.89	0.89	123	100	3.5	485				
66.1	17:05	1178.929	0.05	1.49	1.49	101	100	4.5	471				
46.5			0.05	1.49	1.49	119	99	4.5	498				
33.0			0.04	1.19	1.19	120	99	4.0	480				
22.0			0.04	1.19	1.19	121	101	4.0	490				
12.5			0.04	1.19	1.19	121	101	4.0	484				
4.0	17:35	1197.290	0.03	0.89	0.89	120	101	3.5	470				
													Estimates:
Tot	Δ=120	Δ=70.450	(ΔP)Avg=	(ΔH)Avg=		(Tmeter)Avg=			(Tstack)Avg=				MW= 28.0
Totals	min.	dcf											%H2O= 13.5
			.04	1.13		105.8	°F		481.3	°F			

SYSTEM LEAK CHECK

	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.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

ATS

VISIBLE EMISSIONS OBSERVATIONS FORM

20 STACK TEST

OBSERVER: [signature]

DATE: 9-21-94

FACILITY: USX - CLAIRTON

OBSERVATION: START TIME: 9:30
END TIME: 10:30

OBSERVATION POINT:
TRAILER AREA

SOURCE:

DISTANCE: 500'
DIRECTION FROM: SOUTH
HEIGHT: 200'

WIND:

SPEED: 5 MPH
DIRECTION: EAST
TEMPERATURE: 59°F
SKY CONDITION: LIGHT HAZE
BACKGROUND: SKY

READING CONDITIONS: FAIR
COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240
No. READINGS >= 20% 0
No. READINGS >= 60% 0
GREATEST OPACITY: 0
CREW: A FOREMAN: LEWIS

COMMENTS:
MARK HUGHES
B.A.P.C.

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

20 STACK TEST

OBSERVER: [signature]

DATE: 9.21.94

FACILITY: USX-CLAIRTON

OBSERVATION: START TIME: 10:30

END TIME: 11:30

OBSERVATION POINT: TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 5 MPH

DIRECTION: S.E

TEMPERATURE: 64 °F

SKY CONDITION: LIGHT HAZE

BACKGROUND: SKY

READING CONDITIONS: FAIR

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: A FOREMAN: LEWIS

COMMENTS:

MARK HUGHES

B.A.P.C.

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

20 STACK TEST

OBSERVER: [signature]

DATE: 9-21-94

FACILITY: USX-CLAIRTON

OBSERVATION: START TIME: 11:30

END TIME: 11:42

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 5 MPH

DIRECTION: EAST

TEMPERATURE: 67°F

SKY CONDITION: LIGHT HAZE

BACKGROUND: SKY

READING CONDITIONS: FAIR

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 48

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: A FOREMAN: LEWIS

COMMENTS: — = 0%

MARK HUGHES

B.A.P.C.

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				
13				
14				
15				
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17				
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56				
57				
58				
59				

VISIBLE EMISSIONS OBSERVATIONS FORM

20 STACK TEST

OBSERVER: [illegible]

DATE: 9-21-94

FACILITY: USX-Clairton

OBSERVATION: START TIME: 12:25

END TIME: 13:25

OBSERVATION POINT: TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 8 MPH

DIRECTION: S-E

TEMPERATURE: 72°F

SKY CONDITION: HIGH clouds

BACKGROUND: SKY

READING CONDITIONS: FAIR

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: A FOREMAN: LEWIS

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

20 STACK TEST

OBSERVER: [signature]

DATE: 9-21-94

FACILITY: USX-CLAIRTON

OBSERVATION: START TIME: 13:25
END TIME: 14:25

OBSERVATION POINT:
TRAILER AREA

SOURCE:

DISTANCE: 500'
DIRECTION FROM: SOUTH
HEIGHT: 200'

WIND:

SPEED: 7 MPH
DIRECTION: S-E
TEMPERATURE: 76°F
SKY CONDITION: LITE CLOUDS
BACKGROUND: SKY

READING CONDITIONS: FAIR
COLOR OF EMISSION:

TOTAL No. OF READINGS: 240
No. READINGS >= 20% 0
No. READINGS >= 60% 0
GREATEST OPACITY: 0
CREW: A FOREMAN: LEWIS

COMMENTS: -=0%

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

20 STACK TEST

OBSERVER: [signature]

DATE: 9-21-94

FACILITY: USX-CLAINTON

OBSERVATION: START TIME: 14:25

END TIME: 14:40

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 5 MPH

DIRECTION: SOUTH

TEMPERATURE: 77°F

SKY CONDITION: LITE clouds

BACKGROUND: SKY

READING CONDITIONS: FAIR

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 60

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: A FOREMAN: LEWIS

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
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57				
58				
59				

VISIBLE EMISSIONS OBSERVATIONS FORM

2 0 STACK TEST

OBSERVER: [signature]

DATE: 9-21-94

FACILITY: USX-Clairton

OBSERVATION: START TIME: 15:20

END TIME: 16:20

OBSERVATION POINT: TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 12 MPH

DIRECTION: SOUTH

TEMPERATURE: 77°F

SKY CONDITION: LITE clouds

BACKGROUND: SKY

READING CONDITIONS: FAIR

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: B FOREMAN: B 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

20 STACK TEST

OBSERVER: [signature]

DATE: 9-21-94

FACILITY: USA-CLAIRTON

OBSERVATION: START TIME: 16:20

END TIME: 17:20

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 8 MPH

DIRECTION: S.E

TEMPERATURE: 78°F

SKY CONDITION: LITE CLOUDS

BACKGROUND: SKY

READING CONDITIONS: FAIR

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: B FOREMAN: B. 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

20 STACK TEST

OBSERVER: Larry Dunlap

DATE: 9-21-94

FACILITY: USX - CLAIRTON

OBSERVATION: START TIME: 17:20

END TIME: 17:35

OBSERVATION POINT:

TRAILER AREA

SOURCE:

DISTANCE: 500'

DIRECTION FROM: SOUTH

HEIGHT: 200'

WIND:

SPEED: 8 MPH

DIRECTION: S-E.

TEMPERATURE: 78°F

SKY CONDITION: LITE clouds

BACKGROUND: SKY

READING CONDITIONS: Fair

COLOR OF EMISSION: —

TOTAL No. OF READINGS: 60

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: B FOREMAN: B. 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	0	0	0	0	40					
11	0	0	0	0	41					
12	0	0	0	0	42					
13	0	0	0	0	43					
14	0	0	0	0	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					

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 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				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

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 10-18-94
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

ΔH	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 10-18-94
OPERATOR RPC

	START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
DRY	897.500	897.706	0.206	10.000	-0.0006
WET	0.000	0.200	0.200		

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 10-18-94
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	201.0
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		

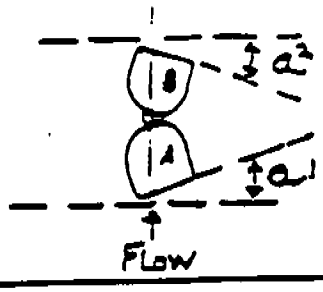
RUN	1		2		3	
INITIAL CF	110.300		118.300		126.300	
FINAL CF	117.825		125.828		133.810	
DIFFERENCE	7.525		7.528		7.510	
	IN	OUT	IN	OUT	IN	OUT
TEMP INITIAL	105	100	102	98	102	97
TEMP 5 MIN	102	99	101	97	102	97
TEMP 10 MIN	102	98	102	97	103	98
TEMP 15 MIN	102	98	102	97	103	98
		TEMP R		TEMP R		TEMP R
TEMP 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 # XGF :59
Precheck
Post Check

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

①

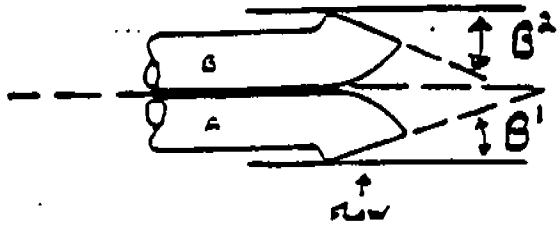


a¹ = 3°
a² = 0°
a¹, a² = <10°

B¹ = 0°
B² = 1°
B¹, B² = <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"

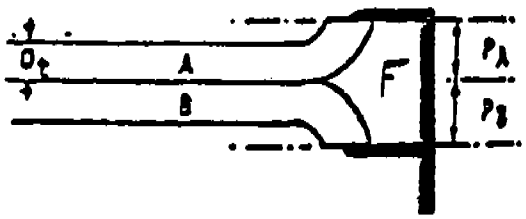
X = 0.97 — X ≥ 0.750" (3/4" using 1/2" nozzle)

Y = 5.6 — Y ≥ 3.0"

Z = 3.6 — Z > 2.0"

D_t = .375 — D_t > .1875"

③

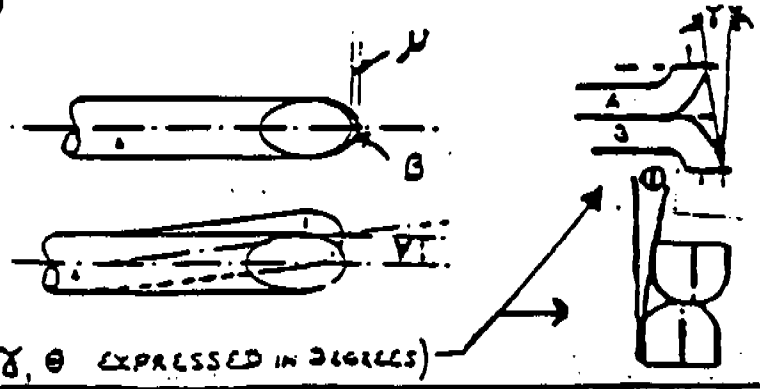


1.05 D_t < A < 1.50 D_t

P_A = P_B

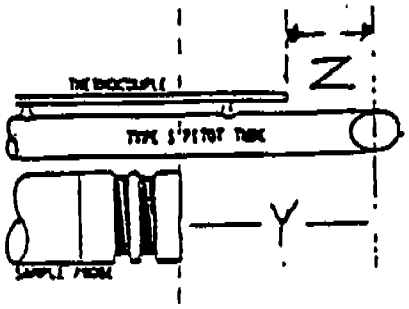
2.10 D_t < A < 3.00 D_t

④

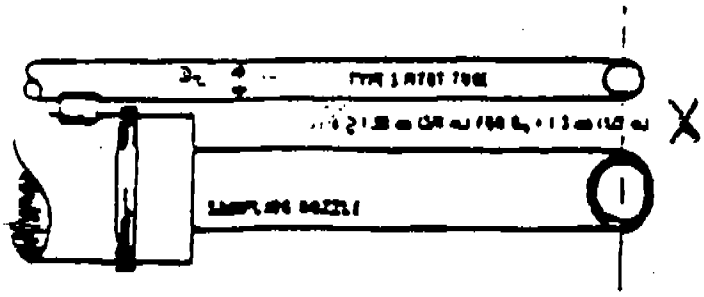


(γ, θ EXPRESSED IN DEGREES)

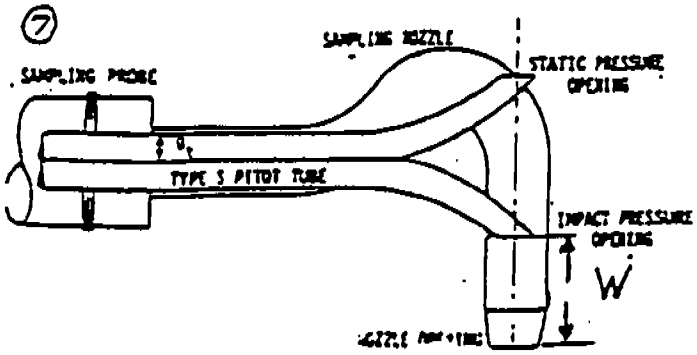
⑥



⑤



⑦

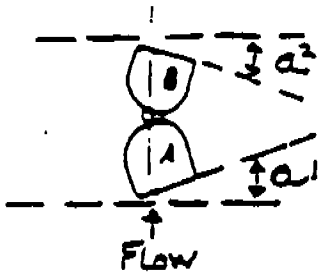


GEOMETRIC PITOT CALIBRATION

Caliper # XEF-59
Precheck
Post Check

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

①

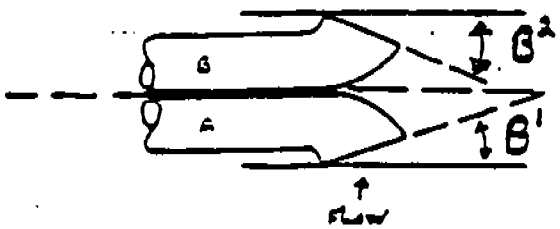


a^1 = 3°
a^2 = 0°
a^1, a^2 = <10°

B^1 = 0°
B^2 = 1°
B^1, B^2 = <5°

F = 94"

②



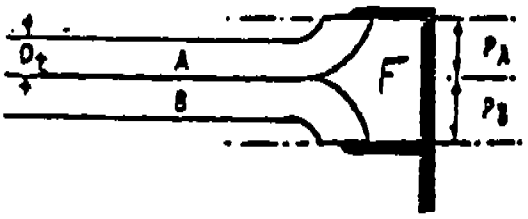
μ = .16 — $\mu \le 0.1250"$ ($\mu = F \tan \gamma$)

V = 0 — $V \le 0.03125"$ ($V = F \tan \theta$)

W = .200 — $W \ge 0"$

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

③



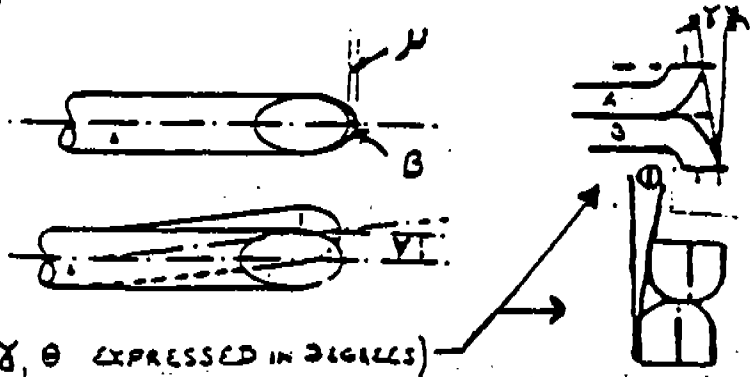
$1.05\ D_t < A < 1.50\ D_t$
$P_A = P_B$
$2.10\ D_t < A < 3.00\ D_t$

Y = 5.6" — $Y \ge 3.0"$

Z = 3.8 — $Z > 2.0"$

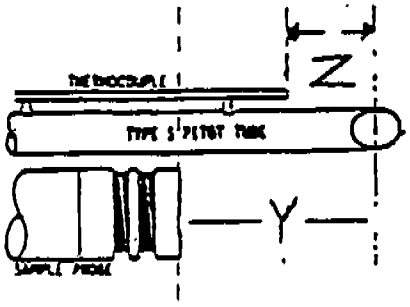
D_t = .376 — $D_t > .1875"$

④



(γ, θ EXPRESSED IN DEGREES)

⑥



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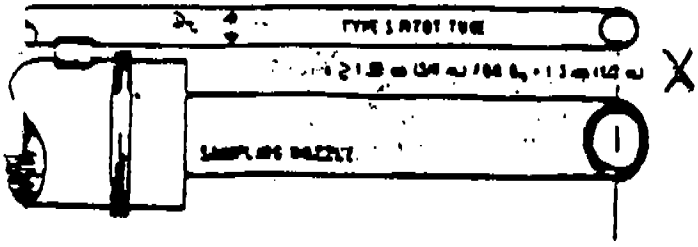
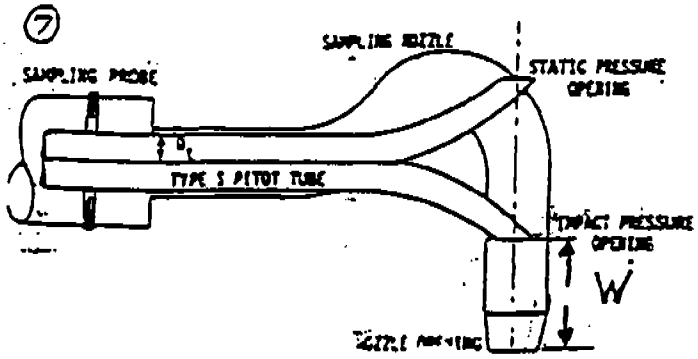


⑦



COMPLIANCE DEMONSTRATION
NO. 20 BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PENNSYLVANIA

APPENDIX B

PLANT OPERATIONAL DATA

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.

PUSHING SCHEDULE

Wednesday, September 21, 1994 Turn 1
Batteries: 19-20_2

eq #	Oven	Last Pushed	Earliest	Desired	Latest
1	C29/19	18:43	10:50pm	11:00pm	11:10pm
2	C29/20	18:42	10:57pm	11:06pm	11:16pm
3	A2 /20	18:42	11:02pm	11:12pm	11:22pm
4	A4 /20	18:36	11:09pm	11:19pm	11:29pm
5	A6 /19	18:35	11:15pm	11:25pm	11:35pm
6	A6 /20	18:36	11:22pm	11:32pm	11:42pm
7	A8 /19	18:35	11:28pm	11:38pm	11:48pm
8	A8 /20	18:36	11:35pm	11:45pm	11:55pm
9	A10/19	18:35	11:41pm	11:51pm	12:01am
10	A10/20	18:36	11:48pm	11:58pm	12:08am
11	A12/19	18:35	11:54pm	12:04am	12:14am
12	A12/20	18:36	12:01am	12:11am	12:21am
13	A14/19	18:35	12:07am	12:17am	12:27am
14	C16/19	18:42	12:14am	12:24am	12:34am
15	A14/20	18:42	12:20am	12:30am	12:40am
16	A16/19	18:42	12:27am	12:37am	12:47am
17	A16/20	18:42	12:33am	12:43am	12:53am
18	A18/19	18:42	12:40am	12:50am	1:00am
19	A18/20	18:42	12:46am	12:56am	1:06am
20	A20/19	18:42	12:53am	1:03am	1:13am
21	A5 /19	18:48	12:59am	1:09am	1:19am
22	A20/20	18:49	1:06am	1:16am	1:26am
23	A22/19	18:48	1:12am	1:22am	1:32am
24	A22/20	18:49	1:19am	1:29am	1:39am
25	A24/19	16:48	1:25am	1:35am	1:45am
26	A24/20	16:49	1:32am	1:42am	1:52am
27	A26/19	18:48	1:38am	1:48am	1:58am
28	A26/19	18:49	1:45am	1:55am	2:05am
29	A28/20	18:48	1:51am	2:01am	2:11am
30	B1 /19	18:48	1:58am	2:08am	2:18am
31	B1 /20	18:47	2:04am	2:14am	2:24am
32	B3 /19	18:47	2:11am	2:21am	2:31am
33	B3 /20	16:46	2:17am	2:27am	2:37am
34	B5 /19	18:47	2:24am	2:34am	2:44am
35	B5 /20	18:46	2:30am	2:40am	2:50am
36	B7 /19	18:46	2:37am	2:47am	2:57am
37	B7 /20	16:45	2:43am	2:53am	3:03am
38	B9 /19	18:44	2:49am	2:59am	3:09am
39	B9 /20	16:44	2:56am	3:06am	3:16am
40	B11/19	18:43	3:02am	3:12am	3:22am
41	B11/20	18:43	3:09am	3:19am	3:29am
42	B13/19	18:43	3:15am	3:25am	3:35am
43	B13/20	18:43	3:22am	3:32am	3:42am
44	B15/19	18:42	3:28am	3:38am	3:48am
45	B15/20	16:42	3:35am	3:45am	3:55am
46	B17/19	18:41	3:41am	3:51am	4:01am
47	B17/20	18:41	3:48am	3:58am	4:08am
48	B19/19	18:40	3:54am	4:04am	4:14am
49	B19/20	18:41	4:01am	4:11am	4:21am
50	B21/19	18:40	4:07am	4:17am	4:27am
51	B21/20	18:40	4:14am	4:24am	4:34am
52	B23/19	18:39	4:20am	4:30am	4:40am
53	B23/20	18:39	4:27am	4:37am	4:47am
54	B25/19	18:38	4:33am	4:43am	4:53am
55	B25/20	18:38	4:40am	4:50am	5:00am
56	B27/19	18:38	4:46am	4:56am	5:06am
57	B27/20	18:38	4:53am	5:03am	5:13am
58	B29/19	18:37	4:59am	5:09am	5:19am
59	B29/20	16:37	5:06am	5:16am	5:26am
60	C2 /19	18:29	5:12am	5:22am	5:32am
61	C2 /20	18:29	5:19am	5:29am	5:39am
62	C4 /19	18:29	5:25am	5:35am	5:45am
63	C4 /20	18:29	5:32am	5:42am	5:52am
64	C6 /19	18:28	5:38am	5:48am	5:58am
65	C6 /20	18:28	5:45am	5:55am	6:05am
66	C8 /19	18:27	5:51am	6:01am	6:11am
67	C8 /20	16:27	5:58am	6:08am	6:18am
68	C10/19	18:26	6:04am	6:14am	6:24am
69	C10/20	18:27	6:11am	6:21am	6:31am
70	C12/19	18:26	6:17am	6:27am	6:37am
71	C12/20	18:26	6:24am	6:34am	6:44am
72	C14/19	18:25	6:30am	6:40am	6:50am
73	C14/20	18:25	6:37am	6:47am	6:57am
74	C16/20	18:24	6:43am	6:53am	7:03am

$-\frac{A-2}{19}$ $-\frac{A-4}{19}$ $-\frac{A-26}{20}$ $-\frac{C-16}{19}$

$+\frac{C-16}{19}$ A $\frac{A-14}{19}$

$+\frac{A-5}{19}$ A $\frac{A-20}{19}$

PUSHING SCHEDULE

Wednesday, September 21, 1994 Turn 2
Batteries: 19-20_2

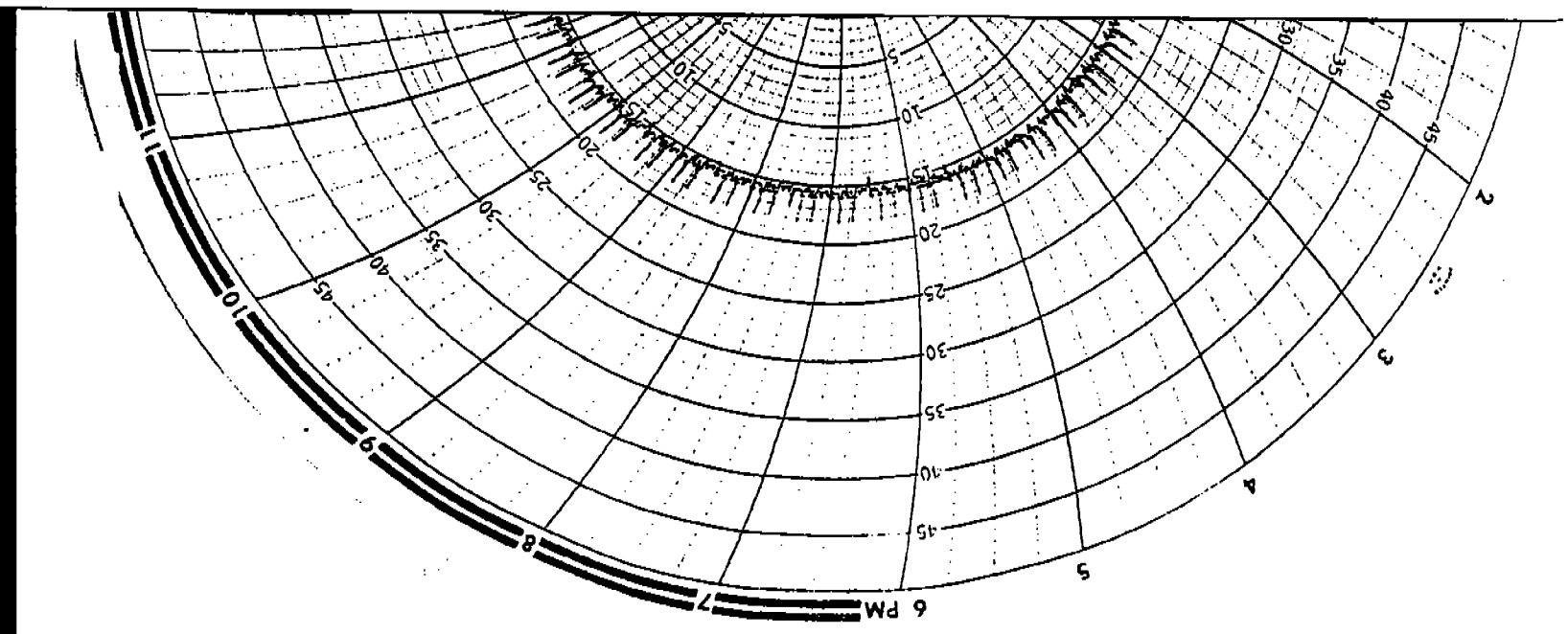
Seq #	Oven	Last Pushed	Earliest	Desired	Latest
1	C18/19	18:25	6:45am	7:00am	7:15am
2	C18/20	18:24	6:52am	7:06am	7:21am
3	C20/19	18:24	6:59am	7:13am	7:28am
4	C20/20	18:24	7:05am	7:20am	7:35am
5	C22/19	18:24	7:12am	7:27am	7:42am
6	C22/20	18:24	7:19am	7:34am	7:49am
7	C24/19	18:24	7:26am	7:41am	7:56am
8	C24/20	18:24	7:32am	7:47am	8:02am
9	C26/19	18:24	7:39am	7:54am	8:09am
10	C26/20	18:24	7:46am	8:01am	8:16am
11	C28/19	18:24	7:53am	8:08am	8:23am
12	C28/20	18:24	8:00am	8:15am	8:30am
13	A1 /20	18:24	8:07am	8:22am	8:37am
14	A3 /20	18:24	8:14am	8:29am	8:44am
15	A5 /20	18:25	8:21am	8:36am	8:51am
16	A7 /19	18:24	8:27am	8:42am	8:57am
17	A7 /20	18:24	8:34am	8:49am	9:04am
18	A9 /19	18:24	8:41am	8:56am	9:11am
19	A9 /20	18:24	8:48am	9:03am	9:18am
20	A11/19	18:24	8:55am	9:10am	9:25am
21	A11/20	22:31	9:02am	9:17am	9:32am
22	A13/19	18:31	9:09am	9:24am	9:39am
23	A13/20	18:30	9:15am	9:30am	9:45am
24	A15/19	18:31	9:22am	9:37am	9:52am
25	A15/20	18:32	9:29am	9:44am	9:59am
26	A17/19	18:32	9:36am	9:51am	10:06am
27	A17/20	18:33	9:43am	9:58am	10:13am
28	A19/19	18:33	9:50am	10:05am	10:20am
29	A19/20	18:34	9:57am	10:12am	10:27am
30	A21/19	18:33	10:03am	10:18am	10:33am
31	A21/20	18:34	10:10am	10:25am	10:40am
32	A23/19	18:34	10:17am	10:32am	10:47am
33	A23/20	18:35	10:24am	10:39am	10:54am
34	A25/19	18:35	10:31am	10:46am	11:01am
35	A25/20	18:36	10:38am	10:53am	11:08am
36	A27/19	18:36	10:45am	11:00am	11:15am
37	A27/20	18:36	10:51am	11:06am	11:21am
38	A29/19	18:36	10:58am	11:13am	11:28am
39	A29/20	18:37	11:05am	11:20am	11:35am
40	B2 /19	18:37	11:12am	11:27am	11:42am
41	B2 /20	18:38	11:19am	11:34am	11:49am
42	B4 /19	18:38	11:26am	11:41am	11:56am
43	B4 /20	18:39	11:33am	11:48am	12:03pm
44	B6 /19	18:38	11:39am	11:54am	12:09pm
45	B6 /20	18:39	11:46am	12:01pm	12:16pm
46	B8 /19	18:39	11:53am	12:08pm	12:23pm
47	B8 /20	18:40	12:00pm	12:15pm	12:30pm
48	B10/19	18:40	12:07pm	12:22pm	12:37pm
49	B10/20	18:41	12:14pm	12:29pm	12:44pm
50	B12/19	18:40	12:20pm	12:35pm	12:50pm
51	B12/20	18:41	12:27pm	12:42pm	12:57pm
52	B14/19	18:41	12:34pm	12:49pm	1:04pm
53	B14/20	18:42	12:41pm	12:56pm	1:11pm
54	B16/19	18:42	12:48pm	1:03pm	1:18pm
55	B16/20	18:43	12:55pm	1:10pm	1:25pm
56	B18/19	18:43	1:02pm	1:17pm	1:32pm
57	B18/20	18:43	1:08pm	1:23pm	1:38pm
58	B20/19	18:43	1:15pm	1:30pm	1:45pm
59	B20/20	18:44	1:22pm	1:37pm	1:52pm
60	B22/19	18:45	1:29pm	1:44pm	1:59pm
61	B22/20	18:45	1:36pm	1:51pm	2:06pm
62	B24/19	18:46	1:43pm	1:58pm	2:13pm
63	B24/20	18:46	1:50pm	2:05pm	2:20pm
64	B26/19	18:46	1:56pm	2:11pm	2:26pm
65	B26/20	18:46	2:03pm	2:18pm	2:33pm
66	B28/19	18:47	2:10pm	2:25pm	2:40pm
67	B28/20	18:47	2:17pm	2:32pm	2:47pm
68	C1 /19	18:48	2:24pm	2:39pm	2:54pm
69	C1 /20	18:48	2:31pm	2:46pm	3:01pm
70	C3 /19	18:49	2:38pm	2:53pm	3:08pm

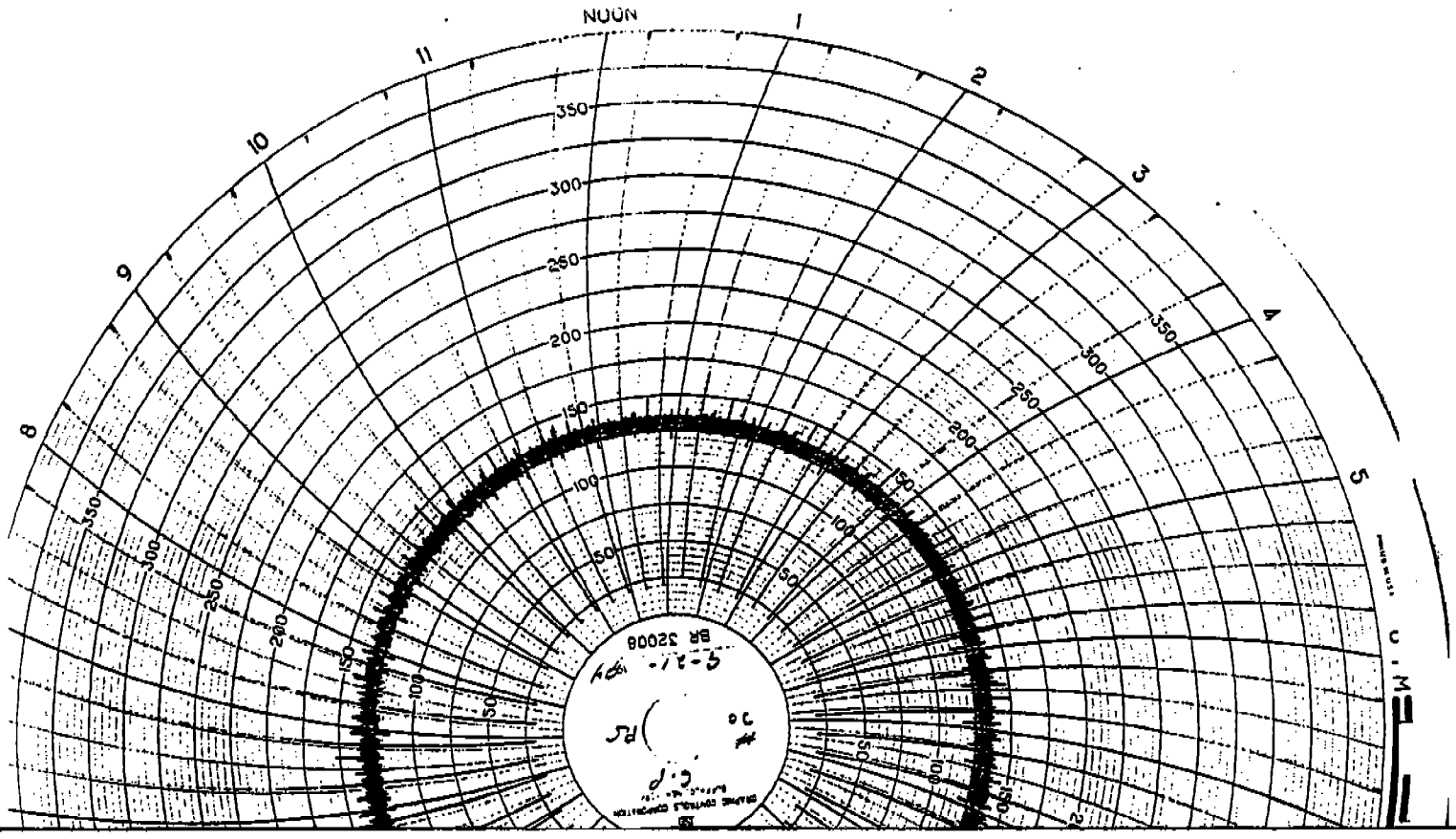
- 0 16/19 - A-1-3-5 - (19)

P U S H I N G S C H E D U L E

Wednesday, September 21, 1994 Turn 3
Batteries: 19-20_2

Seq #	Oven	Last Pushed	Earliest	Desired	Latest
1	C3 /20	18:49	2:50pm	3:00pm	3:10pm
2	C5 /19	18:49	2:57pm	3:06pm	3:16pm
3	C5 /20	18:48	3:02pm	3:12pm	3:22pm
4	C7 /19	18:49	3:09pm	3:19pm	3:29pm
5	C7 /20	18:48	3:15pm	3:25pm	3:35pm
6	C9 /19	18:49	3:22pm	3:32pm	3:42pm
7	C9 /20	18:48	3:28pm	3:38pm	3:48pm
8	C11/19	18:49	3:35pm	3:45pm	3:55pm
9	C11/20	18:48	3:41pm	3:51pm	4:01pm
10	C13/19	18:49	3:48pm	3:58pm	4:08pm
11	C13/20	18:48	3:54pm	4:04pm	4:14pm
12	C15/19	18:49	4:01pm	4:11pm	4:21pm
13	C15/20	18:48	4:07pm	4:17pm	4:27pm
14	C17/19	18:49	4:14pm	4:24pm	4:34pm
15	C17/20	18:48	4:20pm	4:30pm	4:40pm
16	C19/19	18:49	4:27pm	4:37pm	4:47pm
17	C19/20	18:48	4:33pm	4:43pm	4:53pm
18	C21/19	18:49	4:40pm	4:50pm	5:00pm
19	C21/20	18:48	4:46pm	4:56pm	5:06pm
20	C23/19	18:49	4:53pm	5:03pm	5:13pm
21	C23/20	18:48	4:59pm	5:09pm	5:19pm
22	C25/19	18:49	5:06pm	5:16pm	5:26pm
23	C25/20	18:48	5:12pm	5:22pm	5:32pm
24	C27/19	18:42	5:19pm	5:29pm	5:39pm
25	C27/20	18:42	5:25pm	5:35pm	5:45pm
26	C29/19	18:42	5:32pm	5:42pm	5:52pm
27	C29/20	18:42	5:38pm	5:48pm	5:58pm
28	A2 /20	18:43	5:45pm	5:55pm	6:05pm
29	A4 /20	18:42	5:51pm	6:01pm	6:11pm
30	A6 /19	18:43	5:58pm	6:08pm	6:18pm
31	A6 /20	18:42	6:04pm	6:14pm	6:24pm
32	A8 /19	18:43	6:11pm	6:21pm	6:31pm
33	A8 /20	18:42	6:17pm	6:27pm	6:37pm
34	A10/19	18:43	6:24pm	6:34pm	6:44pm
35	A10/20	18:42	6:30pm	6:40pm	6:50pm
36	A12/19	18:43	6:37pm	6:47pm	6:57pm
37	A12/20	18:42	6:43pm	6:53pm	7:03pm
38	A14/19	18:42	6:49pm	6:59pm	7:09pm
39	A14/20	18:36	6:56pm	7:06pm	7:16pm
40	A16/19	18:35	7:02pm	7:12pm	7:22pm
41	A16/20	18:36	7:09pm	7:19pm	7:29pm
42	A18/19	18:35	7:15pm	7:25pm	7:35pm
43	A18/20	18:36	7:22pm	7:32pm	7:42pm
44	A20/19	18:35	7:28pm	7:38pm	7:48pm
45	A20/20	18:29	7:35pm	7:45pm	7:55pm
46	A22/19	18:29	7:41pm	7:51pm	8:01pm
47	A22/20	18:29	7:48pm	7:58pm	8:08pm
48	A24/19	18:29	7:54pm	8:04pm	8:14pm
49	A24/20	18:29	8:01pm	8:11pm	8:21pm
50	A26/19	18:29	8:07pm	8:17pm	8:27pm
51	A28/19	18:29	8:14pm	8:24pm	8:34pm
52	A28/20	18:29	8:20pm	8:30pm	8:40pm
53	B1 /19	18:29	8:27pm	8:37pm	8:47pm
54	B1 /20	18:29	8:33pm	8:43pm	8:53pm
55	B3 /19	18:29	8:40pm	8:50pm	9:00pm
56	B3 /20	18:29	8:46pm	8:56pm	9:06pm
57	B5 /19	18:29	8:53pm	9:03pm	9:13pm
58	B5 /20	18:29	8:59pm	9:09pm	9:19pm
59	B7 /19	18:29	9:06pm	9:16pm	9:26pm
60	B7 /20	18:29	9:12pm	9:22pm	9:32pm
61	B9 /19	18:30	9:19pm	9:29pm	9:39pm
62	B9 /20	18:29	9:25pm	9:35pm	9:45pm
63	B11/19	18:30	9:32pm	9:42pm	9:52pm
64	B11/20	18:29	9:38pm	9:48pm	9:58pm
65	B13/19	18:30	9:45pm	9:55pm	10:05pm
66	B13/20	18:29	9:51pm	10:01pm	10:11pm
67	B15/19	18:30	9:58pm	10:08pm	10:18pm
68	B15/20	18:29	10:04pm	10:14pm	10:24pm
69	B17/19	18:30	10:11pm	10:21pm	10:31pm
70	C16/19	18:36	10:17pm	10:27pm	10:37pm
71	B17/20	18:36	10:24pm	10:34pm	10:44pm
72	B19/19	18:36	10:30pm	10:40pm	10:50pm
73	B19/20	18:36	10:37pm	10:47pm	10:57pm
74	B21/19	18:36	10:43pm	10:53pm	11:03pm

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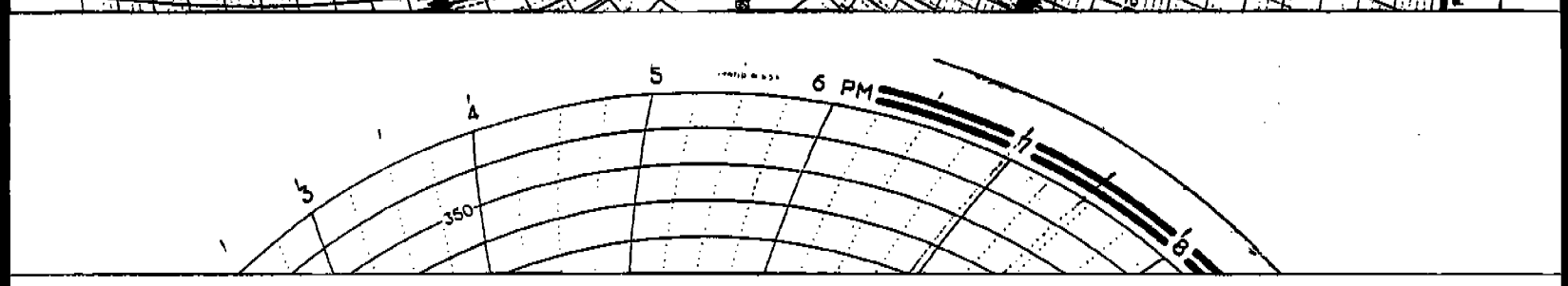
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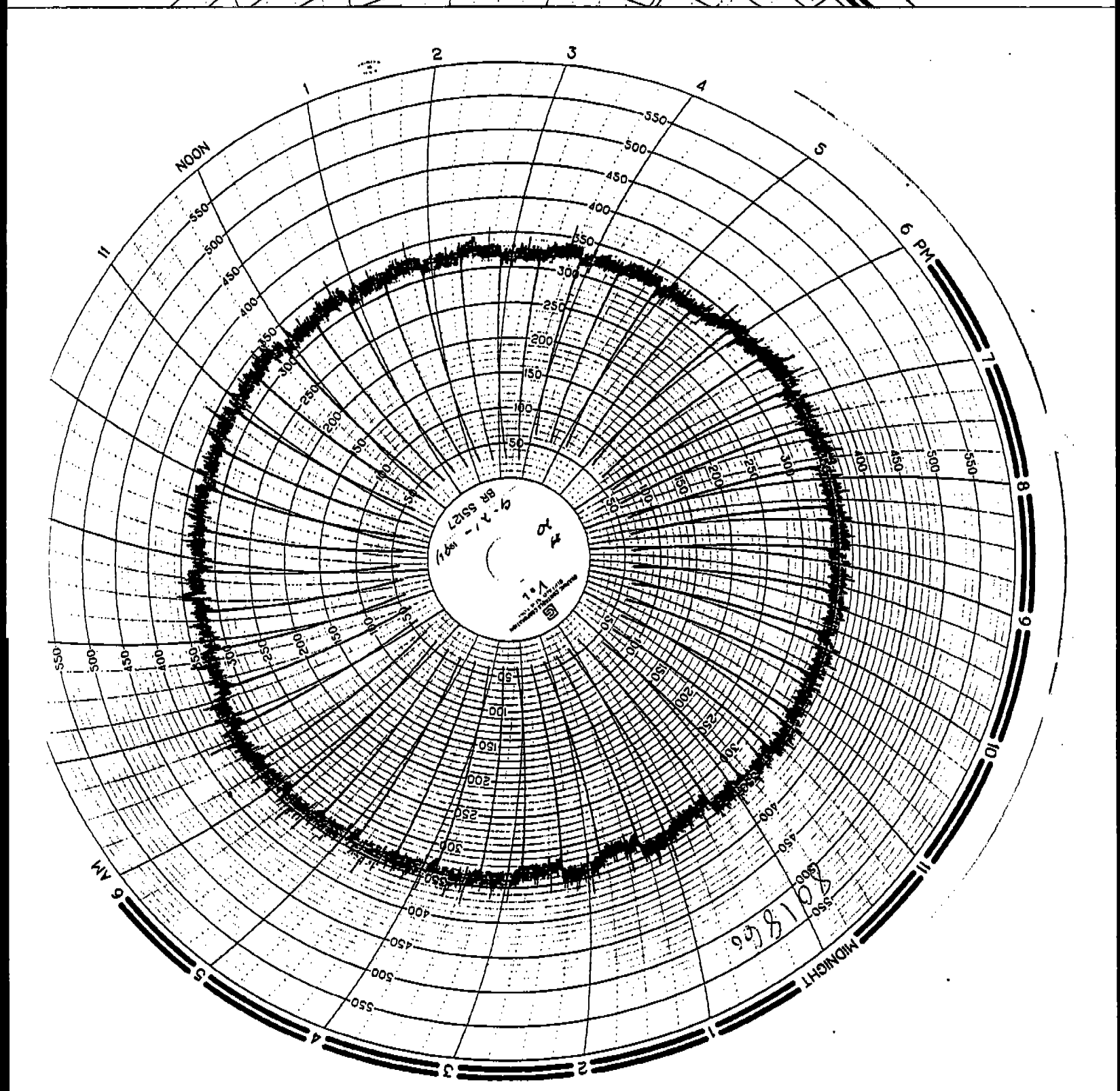
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COMPLIANCE DEMONSTRATION
NO. 20 BATTERY COMBUSTION STACK

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 Works
PLANT LOCATION: Clairton PA
PROJECT NUMBER: IKM 0205
UNIT TESTED: Battery Stack #20

TEST DATE: 9/21/94
DATE RECEIVED: 9/21/94
DATE ANALYZED: 9/29/94
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 (grams)	Soluble Portion of Front Half Acetone Rinse Units (grams)	Soluble Portion of Back Half H2O Rinse Units (grams)	Soluble Portion of Back Half Acetone Rinse Units (grams)	0.22µm Filter Insoluble Portion of Back Half H2O Rinse Units (grams)
CLR-BS#20-1	901	Particulate		0.0122	0.0284	0.0079	0.0038	0.0038	0.0030
CLR-BS#20-2	1325	Particulate		0.0186	0.0158	0.0100	0.0042	0.0028	0.0002
CLR-BS#20-3	902	Particulate		0.0118	0.0172	0.0112	0.0101	0.0012	0.0006
CLR-BS#20-BK.	1242	Particulate		0.0002	0.0000	0.0000			

Analyst's Signature: Patrick J. Stockton
Date: 10/6/94

Comments

AQE 10/92

STACK SAMPLING CALCULATIONS

CLIENT: USS CLAIRTON WORKS
TEST SITE #20 BATTERY COMBUSTION STACK

TEST DATE: 09-21-94
TEST NUMBER: CLR-BS#20-1

A.	Barometric Pressure	29.50	in. Hg	
B.	Static Pressure	-1.2	in. H2O	
C.	Stack Pressure	29.41	in. Hg	[A+(B/13.6)]
D.	Average ΔH	1.12	in. H2O	
E.	Meter Pressure	29.58	in. Hg	[A+(D/13.6)]
F.	Average ΔP	0.04	in. H2O	
G.	Pitot Coefficient	0.84		
H.	Gas Meter Coefficient	1.0172		
I.	Stack Diameter	186	in.	
J.	Stack Area	188.69	ft²	(0.00545*I²)
K.	Nozzle Diameter	0.490	in.	
L.	Nozzle Area	1.31E-03	ft²	(0.00545*K²)
M.	Average Stack Temperature	490	°F	
N.	Average Stack Temperature	950	°R	(460+M)
O.	Average Meter Temperature	84	°F	
P.	Average Meter Temperature	544	°R	(460+O)
Q.	Condensate Volume	250.2	mL	
R.	Absorbed H2O	15.9	mL	
S.	Total H2O	266.1	mL	(Q+R)
T.	Filter Weight	0.0122	g	
U.	Probe Weight	0.0363	g	
V.	Impinger Weight	0.0030	g	
W.	Total Weight	0.0515	g	(T+U+V)
X.	Metered Gas Volume	70.914	dcf	
Y.	Corrected Metered Gas Volume	72.134	dcf	(X*H)
Z.	H2O Gas Volume	13.102	cf	(0.00267*S*P/A)
AA.	Total Sample Volume	85.236	cf	(Y+Z)
BB.	Percent H2O	15.4	%	(100*Z/AA)
CC.	Gas Volume Sampled	69.222	dscf	[Y*(528/P)*(E/29.92)]
DD.	Grain Loading	0.0115	gr/dscf	(15.43*W/CC)

EE. Average Molecular Weight:

Component	% Volume ÷100	*(1-BB/100)	* Mol. Weight	= Weight/Mol
H2O	0.154		18	2.767
CO2	0.045	0.846	44	1.676
CO	0.000	0.846	28	0.000
O2	0.105	0.846	32	2.844
N2	0.850	0.846	28	20.142

Average Molecular Weight 27.43 lb./lb. mol

FF.	Average Stack Velocity	15.6	fps	{85.49*G*[(F*N)/(C*EE)]^0.5}
GG.	Averge Flow Rate	176500	acfm	(60*FF*J)
HH.	Standard Flow Rate	96400	scfm	[GG*(528/N)*(C/29.92)]
II.	Sample Time	7200	sec	
JJ.	Percent Isokinetic	101.9	%	{[100*CC*60*J]/[HH*L*II*(1-BB/100)]}
KK.	Mass Flow Rate	8.03	lb/hr	[DD*HH*(1-BB/100)*60/7000]

STACK SAMPLING CALCULATIONS

CLIENT: USS CLAIRTON WORKS
TEST SITE #20 BATTERY COMBUSTION STACK

TEST DATE: 09-21-94
TEST NUMBER: CLR-BS#20-2

A.	Barometric Pressure	29.50	in. Hg	
B.	Static Pressure	-1.2	in. H2O	
C.	Stack Pressure	29.41	in. Hg	[A+(B/13.6)]
D.	Average ΔH	1.09	in. H2O	
E.	Meter Pressure	29.58	in. Hg	[A+(D/13.6)]
F.	Average ΔP	0.04	in. H2O	
G.	Pitot Coefficient	0.84		
H.	Gas Meter Coefficient	1.0172		
I.	Stack Diameter	186	in.	
J.	Stack Area	188.69	ft²	(0.00545*I²)
K.	Nozzle Diameter	0.490	in.	
L.	Nozzle Area	1.31E-03	ft²	(0.00545*K²)
M.	Average Stack Temperature	484	°F	
N.	Average Stack Temperature	944	°R	(460+M)
O.	Average Meter Temperature	100	°F	
P.	Average Meter Temperature	560	°R	(460+O)
Q.	Condensate Volume	229.0	mL	
R.	Absorbed H2O	14.6	mL	
S.	Total H2O	243.6	mL	(Q+R)
T.	Filter Weight	0.0186	g	
U.	Probe Weight	0.0258	g	
V.	Impinger Weight	0.0002	g	
W.	Total Weight	0.0446	g	(T+U+V)
X.	Metered Gas Volume	69.834	dcf	
Y.	Corrected Metered Gas Volume	71.035	dcf	(X*H)
Z.	H2O Gas Volume	12.347	cf	(0.00267*S*P/A)
AA.	Total Sample Volume	83.382	cf	(Y+Z)
BB.	Percent H2O	14.8	%	(100*Z/AA)
CC.	Gas Volume Sampled	66.215	dscf	[Y*(528/P)*(E/29.92)]
DD.	Grain Loading	0.0104	gr/dscf	(15.43*W/CC)

EE. Average Molecular Weight:

Component	% Volume ÷100	*(1-BB/100)	* Mol. Weight	= Weight/Mol
H2O	0.148		18	2.665
CO2	0.045	0.852	44	1.687
CO	0.000	0.852	28	0.000
O2	0.105	0.852	32	2.862
N2	0.850	0.852	28	20.276

Average Molecular Weight 27.49 lb./lb. mol

FF.	Average Stack Velocity	15.5	fps	{85.49*G*[(F*N)/(C*EE)]^0.5}
GG.	Averge Flow Rate	175700	acfm	(60*FF*J)
HH.	Standard Flow Rate	96600	scfm	[GG*(528/N)*(C/29.92)]
II.	Sample Time	7200	sec	
JJ.	Percent Isokinetic	96.6	%	{[100*CC*60*J]/[HH*L*II*(1-BB/100)]}
KK.	Mass Flow Rate	7.33	lb/hr	[DD*HH*(1-BB/100)*60/7000]

STACK SAMPLING CALCULATIONS

CLIENT: USS CLAIRTON WORKS
TEST SITE #20 BATTERY COMBUSTION STACK

TEST DATE: 09-21-94
TEST NUMBER: CLR-BS#20-3

A.	Barometric Pressure	29.50	in. Hg	
B.	Static Pressure	-1.2	in. H2O	
C.	Stack Pressure	29.41	in. Hg	[A+(B/13.6)]
D.	Average ΔH	1.13	in. H2O	
E.	Meter Pressure	29.58	in. Hg	[A+(D/13.6)]
F.	Average ΔP	0.04	in. H2O	
G.	Pitot Coefficient	0.84		
H.	Gas Meter Coefficient	1.0172		
I.	Stack Diameter	186	in.	
J.	Stack Area	188.69	ft²	(0.00545*I²)
K.	Nozzle Diameter	0.490	in.	
L.	Nozzle Area	1.31E-03	ft²	(0.00545*K²)
M.	Average Stack Temperature	481	°F	
N.	Average Stack Temperature	941	°R	(460+M)
O.	Average Meter Temperature	106	°F	
P.	Average Meter Temperature	566	°R	(460+O)
Q.	Condensate Volume	229.1	mL	
R.	Absorbed H2O	14.9	mL	
S.	Total H2O	244.0	mL	(Q+R)
T.	Filter Weight	0.0118	g	
U.	Probe Weight	0.0284	g	
V.	Impinger Weight	0.0006	g	
W.	Total Weight	0.0408	g	(T+U+V)
X.	Metered Gas Volume	70.450	dcf	
Y.	Corrected Metered Gas Volume	71.662	dcf	(X*H)
Z.	H2O Gas Volume	12.500	cf	(0.00267*S*P/A)
AA.	Total Sample Volume	84.161	cf	(Y+Z)
BB.	Percent H2O	14.9	%	(100*Z/AA)
CC.	Gas Volume Sampled	66.098	dscf	[Y*(528/P)*(E/29.92)]
DD.	Grain Loading	0.0095	gr/dscf	(15.43*W/CC)

EE. Average Molecular Weight:

Component	% Volume ÷100	*(1-BB/100)	* Mol. Weight	= Weight/Mol
H2O	0.149		18	2.673
CO2	0.045	0.851	44	1.686
CO	0.000	0.851	28	0.000
O2	0.105	0.851	32	2.861
N2	0.850	0.851	28	20.265

Average Molecular Weight 27.49 lb./lb. mol

FF.	Average Stack Velocity	15.5	fps	{85.49*G*[(F*N)/(C*EE)]^0.5}
GG.	Averge Flow Rate	175400	acfm	(60*FF*J)
HH.	Standard Flow Rate	96700	scfm	[GG*(528/N)*(C/29.92)]
II.	Sample Time	7200	sec	
JJ.	Percent Isokinetic	96.4	%	{[100*CC*60*J]/[HH*L*II*(1-BB/100)]}
KK.	Mass Flow Rate	6.72	lb/hr	[DD*HH*(1-BB/100)*60/7000]