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ADVANCED TECHNOLOGY SYSTEMS, INC.

ATS Project No. 00-062-P

September 12, 2000

Mr. William C. Graeser
Manager – Environmental and Quality Assurance
U.S. Steel Clairton Works
400 State Street
Clairton, PA 15025

RE: LETTER REPORT – HYDROCHLORIC ACID, CHLORINE GAS AND AMMONIA GAS EMISISONS TESTING CONDUCTED AT NO. 2 BATTERY COMBUSTION STACK ON MAY 31, 2000 AND JUNE 1, 2000

Dear Mr. Graeser:

This letter, with attachments, constitutes the report that summarizes the results of the hydrochloric acid (HCl), chlorine gas (Cl_2) and ammonia gas (NH_3) emissions testing conducted at No. 2 Battery Combustion Stack by Advanced Technology Systems, Inc. (ATS). Three two-hour test runs were conducted on May 31, 2000 and June 1, 2000 simultaneous with the compliance test program at this stack (particulate matter and visible emissions were measured as part of the compliance test program).

The test results have been summarized in the attached Table 1. Hydrochloric acid, chlorine gas and ammonia gas concentrations are listed in units of milligrams per dry standard cubic meter (mg/dscm). Hydrochloric acid, chlorine gas and ammonia gas mass emission rates are listed in units of pounds per hour (lb/hr). Table 1 also presents pertinent exhaust gas and sampling parameters including exhaust gas flow rates in units of actual cubic feet per minute (acfm), standard cubic feet per minute (scfm), and dry standard cubic feet per minute (dscfm), exhaust gas temperature (^{o}F), and moisture content of the exhaust gas (percent by volume), gas volume sampled for each test run in units of dry standard cubic feet (dscf) and the isokinetic variation value for each test run. The isokinetic variation value is equal to the ratio of the average linear gas velocity sampled through the probe nozzle to the average exhaust gas velocity. All isokinetic variation values are between 90 percent and 110 percent, which is the acceptable range of values. Actual test sampling times have also been included in Table 1.

Hydrochloric acid, chlorine gas and ammonia gas emission testing was performed in accordance with U.S. EPA Reference Methods 1 through 4 and 26A, U.S. EPA Conditional Test Method 027 and the requirements of the Pennsylvania Department of Environmental Protection (PA DEP) Source Testing Manual (Draft Revision 3.1, May 3, 1999). Detailed information regarding the procedures used to measure the exhaust gas stream velocity and volumetric flow rate (i.e., U.S. EPA Reference Methods 1 through 4) can be found in the summary report for the compliance test program. Hydrochloric acid and chlorine gas sampling was performed in accordance with U.S. EPA Reference Method 26A. Ammonia gas sampling was performed, where possible, in accordance with U.S. EPA Conditional Test Method 027. (The test procedures specified in Method 027 were modified slightly for this test program based on the expected exhaust gas temperatures of 450°F. The modifications were made

after ATS consulted with Ms. Rima Howell of the U.S. EPA, who is the pertinent contact for Method 027. It should also be noted that the U.S. EPA had not promulgated Method 027 at the time of this test program, however, this method was apparently the only test method available from the U.S. EPA designed for measuring ammonia gas emissions from stationary sources.) Process gas samples were withdrawn isokinetically from the stack, with particulate matter collected in a glass nozzle, a heated glass-lined probe, and on a heated quartz filter. Vapor phase hydrochloric acid, chlorine gas and ammonia gas were collected in a series of chilled impingers. The impinger type and sequence is listed below:

No.	Impinger Type	Contents
1.	Modified Greenburg-Smith	50 mL 0.1 N sulfuric acid (for HCl and NH_3 collection)
2.	Greenburg-Smith	100 mL 0.1 N sulfuric acid (for HCl & NH_3 collection)
3.	Greenburg-Smith	100 mL 0.1 N sulfuric acid (for HCl & NH_3 collection)
4.	Modified Greenburg-Smith	100 mL 0.1 N sodium hydroxide (for Cl_2 collection)
5.	Modified Greenburg-Smith	100 mL 0.1 N sodium hydroxide (for Cl_2 collection)
6.	Modified Greenburg-Smith	200 g Silica Gel

A gas volume greater than 50 dry standard cubic feet (dscf) – the minimum gas volume required by the PA DEP for the compliance test program - was sampled for each test run. The flow rate through each sample train was less than 1 dry standard cubic foot per minute as required by U.S. EPA Reference Method 26A.

Following each test run, the sample trains were processed in accordance with PA DEP requirements. Detailed information regarding the procedures used to recover the particulate matter catch (essentially U.S. EPA Reference Method 5 procedures) can be found in the summary report for the compliance test program. Following the gravimetric analysis of the impingers for moisture gain, the following four samples fractions were generated for each sample train:

Fraction	Description
A	Contents of Impinger Nos. 1 & 2 plus applicable distilled deionized water rinses (for HCl and NH_3)
B	Contents of Impinger No. 3 plus applicable distilled deionized water rinses (for HCl and NH_3)
C	Contents of Impinger No. 4 plus applicable distilled deionized water rinses (for Cl_2)
D	Contents of Impinger No. 5 plus applicable distilled deionized water rinses (for Cl_2)

For each sample train, each of the four fractions were analyzed separately as required by the PA DEP to allow for the calculation of the collection efficiency of the sample train for HCl, Cl_2 and NH_3 collection. The contents of Impinger No. 6 were discarded.

The actual test samples plus field blanks of the impinger scrubbing solutions (0.1 N sulfuric acid and 0.1 N sodium hydroxide) were submitted to the subcontract analytical laboratory for chloride ion analyses using ion chromatographic techniques in accordance with U.S. EPA Reference Method 26A.

Sample Fractions A and B and the 0.1 N sulfuric acid solution field blank were also analyzed for ammonium ion concentration using specific ion electrode analysis techniques. The analytical laboratory results showed the following:

- The chloride ion concentrations of the field blanks were less than the analytical detection limit;
- For all three test runs, the HCl collection efficiency of the sample train was calculated to be greater than the minimum collection efficiency specified by the PA DEP (i.e., the chloride catch of the Sample Fraction B was at most 10 percent of the chloride catch from Sample Fraction A plus Sample Fraction B);
- For all three test runs, the Cl_2 collection efficiency of the sample train could not be calculated since the chloride catch of Sample Fractions C and D were less than the analytical detection limit;
- The ammonium ion concentration of the field blank was less than the analytical detection limit; and
- For all three test runs, the NH_3 collection efficiency of the sample train could not be calculated since the ammonium catch of Sample Fractions A and B were less than or just slightly greater than the analytical detection limit.

Copies of the field data sheets, equipment calibration data, analytical laboratory results and emissions calculations are included in the appendix.

ATS appreciates the opportunity to provide U.S. Steel with process gas testing services. If you have any questions regarding this letter report, please call Dr. Robinson Khosah or me at (412) 967-1900 or e-mail me at the following address: jshimshock@atsengineers.com.

Very truly yours,

John P. Shimshock

John P. Shimshock, Ph.D.
Senior Project Scientist

Approved by:

R. P. Khosah

Robinson P. Khosah, Ph.D.
Vice President
Science and Technology Division

JPS/blc

ATS
ADVANCED TECHNOLOGY SYSTEMS, INC.

U.S. STEEL CLAIRTON WORKS
CLAIRTON, PENNSYLVANIA

TABLE 1

NO. 2 BATTERY COMBUSTION STACK
HYDROCHLORIC ACID, CHLORINE GAS AND AMMONIA GAS EMISSIONS DATA
MAY 31, 2000 AND JUNE 1, 2000

		Run 1	Run 2	Run 3	Average
Test Date		5/31/00	5/31/00	6/1/00	
Emissions Data					
Hydrochloric Acid (HCl)					
Concentration	(mg/dscm)	8.74E+00	1.08E+01	8.77E+00	9.44E+00
Mass Emission Rate	(lb/hr)	1.33E+00	1.58E+00	1.22E+00	1.38E+00
Chlorine Gas (Cl_2)					
Concentration	(mg/dscm)	< 1.43E-01	< 1.38E-01	< 1.67E-01	< 1.49E-01
Mass Emission Rate	(lb/hr)	< 2.18E-02	< 2.01E-02	< 2.32E-02	< 2.17E-02
Ammonia Gas (NH_3)					
Concentration	(mg/dscm)	< 2.06E-02	< 1.95E-02	1.78E-02	< 1.93E-02
Mass Emission Rate	(lb/hr)	< 3.13E-03	< 2.84E-03	2.47E-03	< 2.81E-03
Exhaust Stack Conditions					
Volumetric Flow Rate	(acfm)	8.93E+04	8.62E+04	8.31E+04	8.62E+04
	(scfm)	4.68E+04	4.51E+04	4.32E+04	4.50E+04
	(dscfm)	4.06E+04	3.89E+04	3.71E+04	3.89E+04
Temperature	(°F)	535	535	540	537
Moisture Content	(%)	13.1	13.7	14.0	13.6
Sampling Conditions					
Test Times	(EDT)	0820 to 1026	1045 to 1258	1310 to 1518	
Sampling Time *	(minutes)	120	120	120	
Sample Volume **	(dscf)	72.121	70.121	67.737	
Isokinetic Variation ***	(%)	99.3	100.8	102.1	

mg / dscm = milligrams per dry standard cubic meter
*: Minimum required sampling time is 2 hours (120 minutes)
**: Minimum required sample volume is 50 dscf
***: Acceptable range of values is 90.0% <= Isokinetic Variation <= 110.0%

U.S. STEEL CLAIRTON WORKS
CLAIRTON, PENNSYLVANIA

Hydrochloric Acid, Chlorine Gas and Ammonia Gas Emissions Testing Conducted at No. 2 Battery Combustion Stack on May 31, 2000 and June 1, 2000

September 2000

APPENDIX

Field Data Sheets, Equipment Calibration Data, Analytical Laboratory Results and Emissions Calculations

ATS
ADVANCED TECHNOLOGY SYSTEMS, INC.

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	4
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 1	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	485 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.3	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
A	40.6	0820	235.606	0.10	1.89	1.89	7.00	244	543	72	71	247	60	5 min./pt.
	28.5			0.10	1.89	1.89	7.00	244	557	76	72	247	60	
	20.2			0.08	1.51	1.51	6.00	244	566	80	73	246	58	
	13.5			0.07	1.32	1.32	5.00	243	571	82	74	246	54	
	7.6			0.05	0.95	0.95	3.00	243	535	84	75	246	54	
	2.4	0850	253.205	0.02	0.38	0.38	2.00	243	530	84	76	246	50	
B	40.6	0851	253.205	0.07	1.32	1.32	5.00	244	520	83	76	246	50	
	28.5			0.06	1.14	1.14	4.00	245	526	85	77	246	50	
	20.2			0.06	1.14	1.14	4.00	245	530	87	77	246	47	
	13.5			0.05	0.95	0.95	3.00	245	531	88	78	246	47	
	7.6			0.04	0.76	0.76	2.00	245	528	88	78	246	46	
	2.4		268.788	0.02	0.38	0.38	2.00	244	521	86	79	246	46	
	Page 1	Δ = 60	Δ = 33.182	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.06		1.08			538 (°F)		79 (°F)			Estimates:
	Test	Δ = 120	Δ = 74.505	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.07		1.32			535 (°F)		83 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2	3.5%	
O2	12%	
CO	—	
N2	84.5%	

$$= \left[\frac{\Sigma \sqrt{\Delta P_i}}{n}\right]$$

System Leak Check (60 sec)

2	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.004	< 0.02
After	7.50	0.009	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	632.0	508.7	123.3
2.	100 mL 0.1 N H2SO4	651.5	575.7	75.8
3.	100 mL 0.1 N H2SO4	494.4	487.9	6.5
4.	100 mL 0.1 N NaOH	477.2	476.5	0.7
5.	100 mL 0.1 N NaOH	551.4	546.4	5.0
6.	~ 200 g Silica Gel	635.5	615.8	19.7
7.				
8.			total =	231.0 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	4
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 1	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	485 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.30	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00-062-P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
C	40.6	0923	268.788	0.11	2.12	2.12	7.50	245	543	85	79	247	47	5 min./pt.
	28.5			0.10	1.90	1.90	7.00	245	570	87	79	247	47	
	20.2			0.09	1.71	1.71	7.00	245	579	89	80	247	48	
	13.5			0.09	1.71	1.71	7.00	244	588	90	80	247	48	
	7.6			0.07	1.39	1.39	5.00	244	477	91	81	247	48	
	2.4	0953	288.281	0.02	0.40	0.40	2.00	245	470	92	81	247	48	
D	40.6	0956	288.281	0.11	2.17	2.17	7.00	244	530	86	82	247	48	
	28.5			0.11	2.17	2.17	7.00	244	541	90	82	245	47	
	20.2			0.11	2.17	2.17	7.00	244	548	91	82	245	47	
	13.5			0.11	2.17	2.17	7.00	245	552	92	83	245	47	
	7.6			0.07	1.39	1.39	5.0	245	520	93	83	245	47	
	2.4	1026	310.111	0.02	0.40	0.40	2.0	245	475	93	83	245	47	
														Estimates:
	Page 2	Δ = 60	Δ = 41.323	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.08		1.55			532 (°F)		86 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

$$= \left[\frac{\Sigma\sqrt{\Delta P'}}{n}\right]$$

System Leak Check (60 sec)

2	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before			< 0.02
After			< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before		
After		

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4			
2.	100 mL 0.1 N H2SO4			
3.	100 mL 0.1 N H2SO4			
4.	100 mL 0.1 N NaOH			
5.	100 mL 0.1 N NaOH			
6.	~ 200 g Silica Gel			
7.				
8.				

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	5
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 2	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	486 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.30	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
AD	40.6	1045	310.531	0.11	2.18	2.18	7.0	242	520	84	83	241	60	5 min./pt.
	28.5			0.11	2.18	2.18	7.0	242	527	88	84	241	60	
	20.2			0.11	2.16	2.16	7.0	242	534	90	84	242	57	
	13.5			0.10	1.96	1.96	7.0	242	539	92	84	241	57	
	7.6			0.07	1.37	1.37	5.0	243	520	95	85	241	54	
	2.4	1115	331.382	0.04	0.78	0.78	3.0	243	480	95	85	241	52	
BC	40.6	1120	33.382	0.10	1.96	1.96	6.0	243	564	92	86	242	51	
	28.5			0.10	1.96	1.96	6.0	243	574	97	87	242	51	
	20.2			0.09	1.76	1.76	6.0	243	576	97	87	242	50	
	13.5			0.08	1.57	1.57	5.0	243	585	99	88	242	47	
	7.6			0.06	1.13	1.13	4.0	244	525	99	88	243	47	
	2.4	1150	350.325	0.02	0.38	0.38	2.0	245	515	97	89	243	47	
	Page 1	Δ = 60	Δ = 39.794	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.08		1.55			538 (°F)		90 (°F)			Estimates:
	Test	Δ = 120	Δ = 73.645	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.065		1.29			535 (°F)		92 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2	3.5%	
O2	12%	
CO	—	
N2	84.5%	

19.5

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.003	< 0.02
After	7.00	0.002	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	605.3	479.9	125.4
2.	100 mL 0.1 N H2SO4	572.1	491.6	80.5
3.	100 mL 0.1 N H2SO4	580.3	578.7	1.6
4.	100 mL 0.1 N NaOH	545.5	543.6	1.9
5.	100 mL 0.1 N NaOH	531.7	524.0	7.7
6.	~ 200 g Silica Gel	656.1	636.3	19.8
7.				
8.			total =	236.9 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	5
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 2	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	486 · QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA.	STATIC P. (in. H2O)	-1.	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
~~B~~	40.6	1154	350.325	0.07	1.39	1.39	4.0	245	520	95	89	244	48	5 min./pt.
	28.5			0.05	1.00	1.00	4.0	245	538	97	89	245	48	
	20.2			0.05	0.98	0.98	3.0	244	545	98	89	244	48	
	13.5			0.04	0.78	0.78	3.0	244	548	98	89	244	48	
	7.6			0.04	0.78	0.78	3.0	243	485	98	89	244	49	
	2.4	1224	365.562	0.02	0.39	0.39	2.0	243	460	98	89	244	49	
~~A~~	40.6	1228	365.562	0.09	1.79	1.79	6.0	245	540	95	89	244	48	
	28.5			0.09	1.79	1.79	6.0	245	580	98	89	246	47	
	20.2			0.07	1.37	1.37	5.0	246	589	100	90	246	47	
	13.5			0.06	1.17	1.17	4.0	246	530	100	90	246	47	
	7.6			0.06	1.17	1.17	4.0	246	530	101	90	246	48	
	2.4	1258	384.176	0.02	0.39	0.39	2.0	246	515	101	90	246	49	
	Page 2	Δ = 60	Δ =	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			Estimates:
	Totals	min	dcf	0.05		1.03			531 (°F)		94 (°F)			MW = 27.6
														%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before			< 0.02
After			< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before		
After		

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4			
2.	100 mL 0.1 N H2SO4			
3.	100 mL 0.1 N H2SO4			
4.	100 mL 0.1 N NaOH			
5.	100 mL 0.1 N NaOH			
6.	~ 200 g Silica Gel			
7.				
8.				

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	06-01-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	7
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 3	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	487 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.51	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA.	STATIC P. (in. H2O)	-1.3	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
A	40.6	1310	385.178	0.09	1.79	1.79	7.0	244	530	91	91	245	60	5 min./pt.
	28.5			0.09	1.79	1.79	7.0	244	542	94	91	245	60	
	20.2			0.06	1.19	1.19	5.0	244	549	95	91	245	60	
	13.5			0.06	1.19	1.19	5.0	244	559	98	91	245	58	
	7.6			0.04	0.77	0.77	4.0	244	567	101	92	245	58	
	2.4	1340	403.000	0.02	0.39	0.39	3.0	244	552	102	93	245	58	
B	40.6	1342	403.000	0.06	1.19	1.19	6.0	243	520	98	94	246	55	
	28.5			0.06	1.21	1.21	6.0	243	521	102	94	246	55	
	20.2			0.04	0.81	0.81	4.0	243	529	103	94	246	52	
	13.5			0.04	0.81	0.81	4.0	244	534	104	95	246	52	
	7.6			0.02	0.39	0.39	4.0	243	529	105	95	246	52	
	2.4	1412	417.834	0.02	0.39	0.39	2.0	243	500	104	95	246	52	
	Page 1	Δ = 60	Δ = 32.656	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.05		0.93			536 (°F)		95 (°F)			Estimates:
	Test	Δ = 120	Δ = 72.203	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.06		1.17			540 (°F)		98 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

$= \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2$

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.005	< 0.02
After	8.00	0.006	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	531.5	478.1	53.4
2.	100 mL 0.1 N H2SO4	663.8	574.8	89.0
3.	100 mL 0.1 N H2SO4	594.6	557.5	37.1
4.	100 mL 0.1 N NaOH	584.8	571.6	13.2
5.	100 mL 0.1 N NaOH	553.6	538.3	15.3
6.	~ 200 g Silica Gel	654.7	629.9	25.8
7.				
8.			total =	233.8 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	06-01-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	7
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 3	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	287 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.51	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.3	CALIBRATION DATE	09-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
C	40.6	1445	417.834	0.09	1.81	1.81	7.0	244	530	100	96	246	51	5 min./pt.
	28.5			0.09	1.81	1.81	7.0	244	556	104	96	246	51	
	20.2			0.09	1.76	1.76	7.0	245	569	105	97	246	49	
	13.5			0.07	1.36	1.36	7.0	244	576	106	97	246	49	
	7.6			0.04	0.78	0.78	5.0	244	580	106	97	246	48	
	2.4	1445	436.398	0.02	0.39	0.39	3.0	245	530	106	97	245	48	
D	40.6	1448	436.398	0.10	2.02	2.02	8.0	246	520	105	97	244	48	
	28.5			0.10	2.02	2.02	8.0	246	531	105	97	244	48	
	20.2			0.10	2.02	2.02	8.0	246	538	106	98	244	48	
	13.5			0.09	1.80	1.80	7.5	247	542	106	98	243	49	
	7.6			0.06	1.20	1.20	6.0	247	543	106	98	243	49	
	2.4	1518	457.381	0.04	0.80	0.80	5.0	247	510	106	98	243	48	
	Page 2	Δ= 60	Δ=39.547	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			Estimates:
	Totals	min	dcf	0.07		1.42			543 (°F)		101 (°F)			MW = 27.6
														%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2	13%	
O2	3.5%	
CO	—	
N2	83.5%	

$$= \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]$$

System Leak Check (60 sec)

2	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before			< 0.02
After			< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before		
After		

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4			
2.	100 mL 0.1 N H2SO4			
3.	100 mL 0.1 N H2SO4			
4.	100 mL 0.1 N NaOH			
5.	100 mL 0.1 N NaOH			
6.	~ 200 g Silica Gel			
7.				
8.				

APEX GLASS NOZZLE CALIBRATION DATA SHEET Printed: 05/17/00

Nozzle No.	Size (inches)					Calibrated	
	Avg.		A	B	C	By	Date
1	0.125		0.125	0.125	0.125	KA	03-12-96
2	0.156		0.156	0.156	0.156	KA	03-12-96
3	0.156		0.156	0.156	0.156	KA	09-04-96
44	0.156		0.156	0.156	0.156	KA	09-04-96
11	0.180		0.180	0.180	0.180	KA	07-20-98
5	0.190		0.190	0.190	0.190	KA	05/01/00
27	0.190		0.190	0.190	0.190	KA	05/01/00
28	0.190		0.190	0.190	0.190	KA	05/01/00
29	0.190		0.190	0.190	0.190	KA	05/01/00
31	0.190		0.190	0.190	0.190	KA	05-19-99
4	0.219		0.219	0.219	0.219	KA	05/15/00
6	0.219		0.219	0.219	0.219	KA	05/15/00
7	0.219		0.219	0.219	0.219	KA	05/15/00
15	0.219		0.219	0.219	0.219	KA	05/15/00
42	0.219		0.219	0.219	0.219	KA	01/05/00
40	0.220		0.220	0.220	0.220	KA	05-19-99
10	0.225		0.225	0.225	0.225	KA	05-19-99
8	0.240		0.240	0.240	0.240	KA	01/05/00
9	0.240		0.240	0.240	0.240	KA	01/05/00
41	0.240		0.240	0.240	0.240	KA	01/05/00
50	0.260		0.260	0.260	0.260	KA	05-19-99
51	0.260		0.260	0.260	0.260	KA	01/05/00
12	0.281		0.281	0.281	0.280	KA	07-18-97
13	0.281		0.281	0.281	0.281	KA	10-20-98
14	0.281		0.281	0.280	0.281	KA	03-12-97
16	0.290		0.290	0.290	0.290	KA	07-24-96
17	0.290		0.290	0.290	0.290	KA	03-10-98
18	0.290		0.290	0.290	0.290	KA	07-05-96
45	0.290		0.290	0.290	0.290	KA	01/05/00
20	0.310		0.310	0.310	0.310	KA	03-10-98
33	0.310		0.310	0.310	0.310	KA	04-14-98
35	0.320		0.320	0.320	0.320	KA	01/05/00
21	0.344		0.344	0.344	0.344	KA	05/01/00
22	0.344		0.344	0.344	0.344	KA	05/01/00
23	0.347		0.347	0.347	0.347	KA	03-10-98
24	0.375		0.375	0.375	0.375	KA	02/18/00
25	0.375		0.375	0.375	0.375	KA	03-12-96
26	0.406		0.406	0.406	0.406	KA	04-19-96
30	0.406		0.406	0.406	0.406	KA	07-20-98
47	0.415		0.415	0.415	0.415	KA	11-25-96
34	0.425		0.425	0.425	0.424	KA	06-10-97
55	0.425		0.425	0.425	0.424	KA	01/05/00
52	0.440		0.440	0.440	0.440	KA	05/01/00

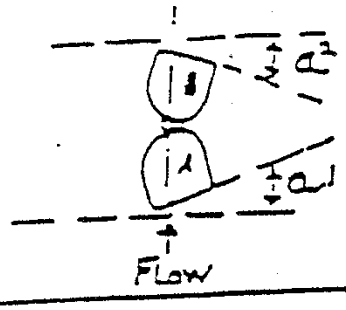
APEX GLASS NOZZLE CALIBRATION DATA SHEET Printed: 05/17/00

Nozzle No.	Size (inches)					Calibrated	
	Avg.		A	B	C.	By	Date
53	0.440		0.440	0.440	0.440	KA	02/27/00
19	0.450		0.450	0.450	0.450	KA	04-14-98
36	0.490		0.490	0.490	0.490	KA	06-10-97
37	0.490		0.490	0.490	0.490	KA	07-05-96
38	0.495		0.495	0.495	0.495	KA	07-05-96
39	0.500		0.500	0.500	0.500	KA	07-05-96
46	0.625		0.625	0.625	0.625	KA	03-10-98
43	0.750		0.750	0.750	0.750	KA	01/05/00
49	1.060		1.060	1.060	1.060	KA	11-25-96

Caliper # XFS-59
Pre-check ✓
Post Check

Probe #: 7-1
Date: 01-10-'00
Initials: KBA

①

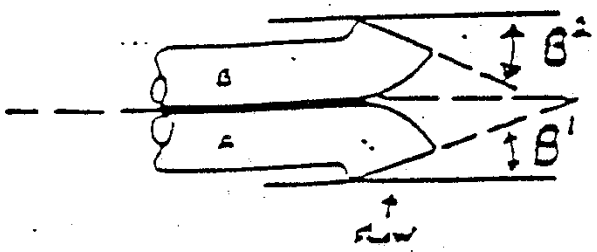


α^2 = 2°
α^1 = 1°
α^1, α^2 = <10°

B^1 = 1°
B^2 = 1°
B^1, B^2 = <5°

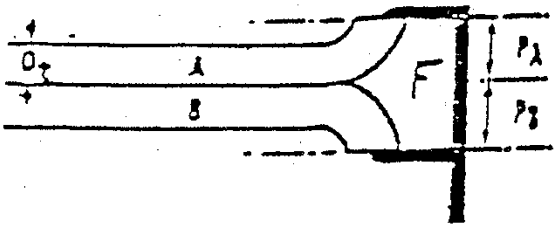
F = 1.000"

②



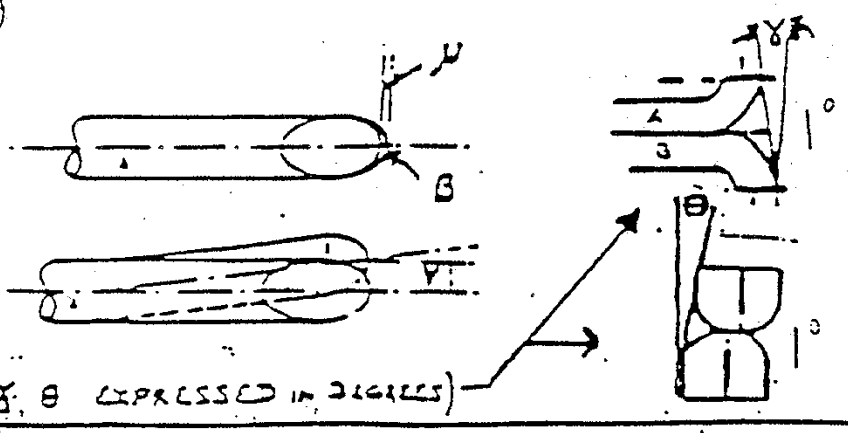
μ = 0.017" — μ = ≤ 0.1250" (γ TAN x F)
V = 0.017" — V = ≤0.03125" (θ TAN x F)
W = 0.480" — W ≥ 0"
X = 0.910" — X ≥ 0.750" (3/4" using 1.0" scale)
Y = 6.211" — Y ≥ 3.0"
Z = 2.495" — Z > 2.0"
D_t = 0.376" — D_t > .1875"

③



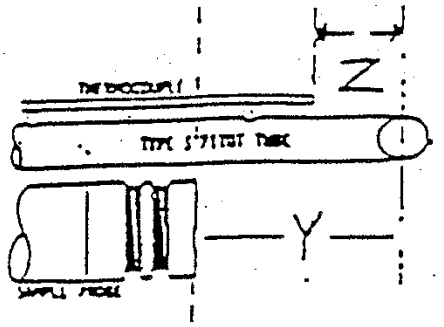
1.05 D_t < d < 1.50 D_t
P_A = P_B
2.10 D_t < d < 3.00 D_t

④



(γ, θ EXPRESSED IN DEGREES)

⑥



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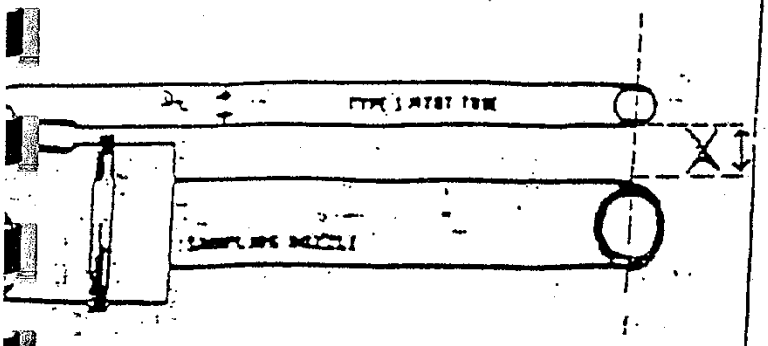
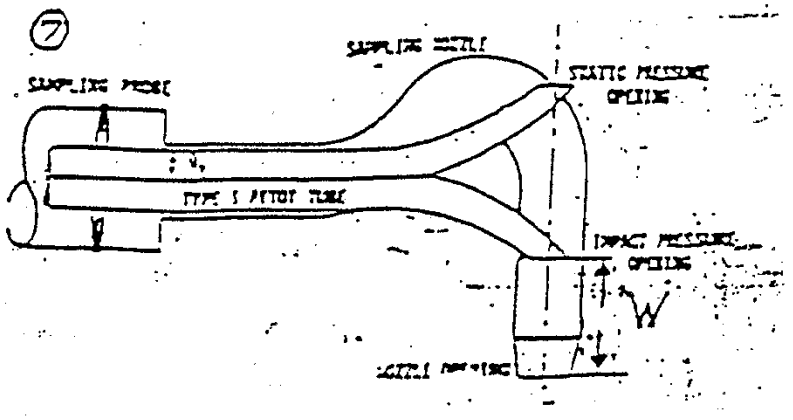


⑦



CERTIFICATE OF CALIBRATION

This certifies that your AL-20 AMERICAN WET TEST gas meter,
serial no. P-1146
has been calibrated with a bell prover.
AMERICAN 10 foot, # 3157
It is treaceable to the N.I.S.T., reference no. 1249811.

Calibration by Carl Poe Co., Inc.
99 Reinerman Houston, TX 77007
713-861-3816

2-8-96
Date

Mark Poe
Signature

DRY GAS METER CALIBRATION DATA SHEET

CONTROL BOX NO. Apex-4
CALIBRATION DATE 09-20-99
BAROMETRIC PRESSURE (in. Hg) 29.10

CHECK ONE: PRE-TEST ✓ POST-TEST
CALIBRATION OFFICER JPS

RUN NO.		WET TEST METER Gas Volume Vw (cf)	Elapsed Time (min.)	Meter Temp. Tw (°F)	DRY GAS METER Gas Volume Vd (dcf)	Inlet Temp. Ti (°F)	Outlet Temp. To (°F)	Orifice Diff. Pres. ΔH (in. H2O)	Vacuum (in. H2O)
1	START	0.000	0		318.302			1.0	8.0
	MIDWAY			71		88	78		
	STOP	5.000	9:20		323.417				
	DELTA *	5.000	9.33		5.115				
2	START	0.000	0		324.438			2.0	8.0
	MIDWAY			71		92	79		
	STOP	5.000	6:39		329.522				
	DELTA *	5.000	6.65		5.084				
3	START	0.000	0		331.550			3.0	8.0
	MIDWAY			71		95	80		
	STOP	5.000	5:25		336.644				
	DELTA *	5.000	5.42		5.094				
Dry Gas	START	0.050	0		336.713			0.0	1.0
Meter Leak	STOP	0.358	10:00		337.112				
Check	DELTA *	0.308	10.0		0.399				

{DELTA Vw (cf) - DELTA Vd (dcf)} / 10 (min.) = 0.0091 cfm <= 0.02 cfm

*: Express final elapsed time in decimal format

Differential Pressure Gauges (check one): ✓ Inclined Manometers _____ Magnehelic Gauges

	Run #1	Run #2	Run #3	Avg.
BP (in. Hg)	29.10	29.10	29.10	
Time (min)	9.33	6.65	5.42	
Tw (°F)	71	71	71	
Vw (cf)	5.000	5.000	5.000	
Ti (°F)	88	92	95	
To (°F)	78	79	80	
ΔH (in. H2O)	1.00	2.00	3.00	
Vm (dcf)	5.115	5.084	5.094	
ΔH@ (in. H2O)	1.988	2.016	2.005	2.003
Y (Pre-test)	0.9971	1.0053	1.0044	1.0023

$$\Delta H@ = \frac{0.0317 * \Delta H * [(Tw+460) * Time]^2}{BP * (To + 460) * (Vw)^2}$$

$$Y = \frac{Vw * BP * [(Ti+460+To+460)/2]}{Vm * [BP+(\Delta H/13.6)] * (Tw+460)}$$

DRY GAS METER CALIBRATION DATA SHEET

CONTROL BOX NO. Apex-4
CALIBRATION DATE 06-19-08
BAROMETRIC PRESSURE (in. Hg) 29.29

CHECK ONE: PRE-TEST ✓ POST-TEST
CALIBRATION OFFICER JPS

RUN NO.		WET TEST METER Gas Volume Vw (cf)	Elapsed Time (min.)	Meter Temp. Tw (°F)	DRY GAS METER Gas Volume Vd (dcf)	Inlet Temp. Ti (°F)	Outlet Temp. To (°F)	Orifice Diff. Pres. ΔH (in. H2O)	Vacuum (in. H2O)
1	START	0.000	0		679.438			1.3	8.0
	MIDWAY			73		91	77		
	STOP	5.000	8:06		684.421				
	DELTA *	5.000	8.10		4.983				
2	START	0.000	0		684.421			1.3	8.0
	MIDWAY			73		94	78		
	STOP	5.000	8:06		689.424				
	DELTA *	5.000	8.10		4.997				
3	START	0.000	0		689.424			1.3	8.0
	MIDWAY			73		96	79		
	STOP	5.000	8:05		694.431				
	DELTA *	5.000	8.08		5.007				
Dry Gas	START	0.190	0		694.632			0.0	9.0
Meter Leak	STOP	0.330	10:00		694.848				
Check	DELTA *	0.140	10.0		0.216				

{DELTA Vw (cf) - DELTA Vd (dcf)} / 10 (min.) = 0.0076 cfm <= 0.02 cfm

*: Express final elapsed time in decimal format

Differential Pressure Gauges (check one): ✓ Inclined Manometers _____ Magnehelic Gauges

	Run #1	Run #2	Run #3	Avg.
BP (in. Hg)	29.29	29.29	29.29	
Time (min)	8.10	8.10	8.08	
Tw (°F)	73	73	73	
Vw (cf)	5.000	5.000	5.000	
Ti (°F)	91	94	96	
To (°F)	77	78	79	
ΔH (in. H2O)	1.30	1.30	1.30	
Vm (dcf)	4.983	4.997	5.007	
Y (Pre-test)				1.0023
ΔH@ (in. H2O)	1.953	1.950	1.937	1.947
Y (Post-test)	1.0208	1.0217	1.0224	1.0216
ΔY (%)				1.9%

$$\Delta H@ = \frac{0.0317 * \Delta H * [(Tw+460) * Time]^2}{BP * (To + 460) * (Vw)^2}$$

$$Y = \frac{Vw * BP * [(Ti+460+To+460)/2]}{Vm * [BP+(\Delta H/13.6)] * (Tw+460)}$$

4000 Tech Center Drive
Monroeville, PA 15146
412 825 2400
Fax: 412 825 2407

IH & Environmental Laboratory

UEC
USX Engineers
& Consultants, Inc.

RECEIVED JUN 30 2000

June 20, 2000

Advanced Technology Systems, Inc.
ATTN: Mr. John Shimshock
639 Alpha Drive
RIDC Park
Harmarville, PA 15238

Attached are the analytical result(s) of the analysis on sample(s) submitted to the UEC Laboratories on June 5, 2000. Should you have any questions regarding this report, please contact us. An invoice will be issued shortly.

These results are submitted persuant to USX Engineers & Consultants, Inc.'s current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions, and no responsibility or liability is assumed for the manner in which the results are used or interpreted.

The results were derived with the following methods.

ANALYTE	METHOD
CHLORIDE	EPA 26A

We appreciate the opportunity to be of service and look forward to our continued assistance to you.

NOTE: Samples will be stored for only one month following the report date.

Sincerely,

Stephanie A. Guilyard

Stephanie A. Guilyard, IHIT, Project Manager

Enclosures

USX Engineers & Consultants Inc.
IH & Environmental Laboratories
4000 Tech Center Drive
Monroeville, PA 15146
PHONE: (412)825-2400 FAX: (412)825-2407
AIHA Accreditation #322

REPORT OF TEST RESULTS

DATE - 06/19/2000
PAGE - 1

Customer: CD-002D	ATTENTION: Mr. John Shimshock
Advanced Technology Systems, Inc. 639 Alpha Drive RIDC Park Harmarville, PA 15238	Work Requested by : Mr. John Shimshock Phone No. : 412-967-1900 CUSTOMER P.O. # : 3734 SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 2339 A

UEC ID	CLIENT ID	ANALYTE	DATE SAMPLED	SAMPLE TIME (min)	PUMP RATE (LPM)	AIR VOL. SAMPLED (L)	ANALYSIS DATE	mg/L	mg/Kg	PPM	µg/L	µg/Kg	pH	%	LOD	
19372	CLR-#2BS-M26A-3A	CHLORIDE	06/01/00	*	*	*	06/16/00	44							2.0 mg/L	E
19373	CLR-#2BS-M26A-3B	CHLORIDE	06/01/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19374	CLR-#2BS-M26A-3C	CHLORIDE	06/01/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19375	CLR-#2BS-M26A-3D	CHLORIDE	06/01/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19376	CLR-H2SO4-BLK	CHLORIDE	06/02/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19377	CLR-NAOH-BLK	CHLORIDE	06/02/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19378	CLR-#2BS-M26A-1A	CHLORIDE	05/31/00	*	*	*	06/16/00	39							2.0 mg/L	E
19379	CLR-#2BS-M26A-1B	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19380	CLR-#2BS-M26A-1C	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19381	CLR-#2BS-M26A-1D	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19382	CLR-#2BS-M26A-2A	CHLORIDE	05/31/00	*	*	*	06/16/00	48							2.0 mg/L	E
19383	CLR-#2BS-M26A-2B	CHLORIDE	05/31/00	*	*	*	06/16/00	9.3							2.0 mg/L	E
19384	CLR-#2BS-M26A-2C	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E

NOTES: * = Information not supplied by client. < = less than. A - FILTER OR SINGLE STAGE MONITOR C - TUBE OR 2 STAGE MONITOR E - LIQUIDS OR SOLIDS J - FILTER + TUBE
= Information not requested by client. N/A = Not Applicable. B - TUBE D - BULK MATERIALS OR WIPES I - FILTER + TUBE
Time, flow rate and/or sample volume data are based on client supplied information, unless otherwise noted.

USX Engineers & Consultants Inc.
IH & Environmental Laboratories
4000 Tech Center Drive
Monroeville, PA 15146
PHONE: (412)825-2400 FAX: (412)825-2407
AIHA Accreditation #322

REPORT OF TEST RESULTS

Customer: CD-002D	ATTENTION: Mr. John Shimshock
Advanced Technology Systems, Inc. 639 Alpha Drive RIDC Park Harmarville, PA 15238	Work Requested by : Mr. John Shimshock Phone No. : 412-967-1900 CUSTOMER P.O. # : 3734 SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 2339 A

UEC ID	CLIENT ID	ANALYTE	DATE SAMPLED	SAMPLE TIME (min)	PUMP RATE (LPM)	AIR VOL. SAMPLED (L)	ANALYSIS DATE	mg/L	mg/Kg	PPM	µg/L	µg/Kg	pH	%	LOD	
19385	CLR-#2BS-M26A-2D	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E

ANALYST : N. Kaltyel Date: 6-19-00

APPROVED: Stephanie A. Guilyard Date: 6/21/00

Stephanie A. Guilyard, IHIT, Project Manager

NOTES: * = Information not supplied by client. < = less than. A - FILTER OR SINGLE STAGE MONITOR C - TUBE OR 2 STAGE MONITOR E - LIQUIDS OR SOLIDS J - FILTER + TUBE
= Information not requested by client. N/A = Not Applicable. B - TUBE D - BULK MATERIALS OR WIPES I - FILTER + TUBE
Time, flow rate and/or sample volume data are based on client supplied information, unless otherwise noted.

4000 Tech Center Drive
Monroeville, PA 15146
412 825 2400
Fax: 412 825 2407

IH & Environmental Laboratory

UEC
USX Engineers
& Consultants, Inc.

June 20, 2000

Advanced Technology Systems, Inc.
ATTN: Mr. John Shimshock
639 Alpha Drive
RIDC Park
Harmarville, PA 15238

Attached are the analytical result(s) of the analysis on sample(s) submitted to the UEC Laboratories on June 5, 2000. Should you have any questions regarding this report, please contact us. An invoice will be issued shortly.

These results are submitted persuant to USX Engineers & Consultants, Inc.'s current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions, and no responsibility or liability is assumed for the manner in which the results are used or interpreted.

The results were derived with the following methods.

ANALYTE	METHOD
AMMONIUM-WATER	EPA 350.2 (MOD)
CHLORIDE	EPA 26A

We appreciate the opportunity to be of service and look forward to our continued assistance to you.

NOTE: Samples will be stored for only one month following the report date.

Sincerely,

Stephanie A Guilyard

Stephanie A. Guilyard, IHIT, Project Manager

Enclosures

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.
639 ALPHA DRIVE, R.I.D.C. PARK
PITTSBURGH, PA 15238
(412)967-1900 FAX (412)967-1911

* : Please add 25 mg sodium thiosulfate $Na_2S_2O_3 \cdot 3.5H_2O$ prior to analysis

CHAIN OF CUSTODY RECORD

PROJECT NUMBER 00-062-P ; P.O. #3734
PROJECT NAME U.S. Steel Clairton Works
ANALYTICAL LAB UEC IH and Environmental Laboratories
DELIVER TO Sample Receiving
COMMENTS
No. 2 Battery Combustion Stack

ANALYSES TO BE CONDUCTED

A: Impingers 1+2
B: Impinger 3
C: Impinger 4
D: Impinger 5

SAMPLE IDENTIFICATION NUMBER	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	NUMBER OF CONTAINERS	COMPOSITE OR GRAB	Chloride ion via ion chromatography	ammonium ion via ion chromatography	REMARKS OR OBSERVATIONS
CLR-#2BS-M26A-1A	05-31-00	0820 →	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 445.4 mL
CLR-#2BS-M26A-1B	↓	1026 EDT	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 143.2 mL
* CLR-#2BS-M26A-1C	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 146.2 mL
* CLR-#2BS-M26A-1D	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 152.9 mL
CLR-#2BS-M26A-2A	05-31-00	1045 →	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 410.6 mL
CLR-#2BS-M26A-2B	↓	1250 EDT	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 130.6 mL
* CLR-#2BS-M26A-2C	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 137.4 mL
* CLR-#2BS-M26A-2D	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 135.4 mL

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	ICE CHEST #
John P. Shimshock	06-02-00	1445 EDT	Kelly [signature]	06/02/00	1446	
			Judy Strehler	6-2-00	3:45 pm	CHEST TEMP.
Judy Strehler	6-5-00	2:15 pm				
						TAG #

ATS 10/98

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.
639 ALPHA DRIVE, R.I.D.C. PARK
PITTSBURGH, PA 15238
(412)967-1900 FAX (412)967-1911

(D-0025)

* : Please add 25mg sodium thiosulfate $Na_2S_2O_3 \cdot 3.5H_2O$ prior to analysis

CHAIN OF CUSTODY RECORD

PROJECT NUMBER 00-062-P ; P.O. # 3734
PROJECT NAME U.S. Steel Clairton Works
ANALYTICAL LAB UEC IH and Environmental Laboratories
DELIVER TO Sample Receiving
COMMENTS
No. 2 Battery Combustion Stack

ANALYSES TO BE CONDUCTED

SAMPLE IDENTIFICATION NUMBER	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	NUMBER OF CONTAINERS	COMPOSITE OR GRAB	Chloride ion via	ion chromatography		Ammonium ion via	ion chromatography						REMARKS OR OBSERVATIONS
CLR-#2BS-M26A-3A	06-01-00	1310 →	1	Comp.	✓			✓							0.1N H_2SO_4 - Sample volume = 371.7 mL
CLR-#2BS-M26A-3B	↓	1578 EDT	1	Comp.	✓			✓							0.1N H_2SO_4 - Sample volume = 180.9 mL
* CLR-#2BS-M26A-3C	↓	↓	1	Comp.	✓									*	0.1N NaOH - Sample volume = 160.2 mL
* CLR-#2BS-M26A-3D	↓	↓	1	Comp.	✓									*	0.1N NaOH - Sample volume = 153.5 m
CLR-H2SO4-B2K	06-02-00	1400 EDT	1	Grab	✓			✓							0.1N H_2SO_4
* CLR-NAOH-B2K	↓	↓	1	Grab	✓									*	0.1N NaOH

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	ICE CHEST #
John P. Sunshock	06-02-00	1445 EDT	Kelly [illegible]	06/02/00	1446	
			Judy Strehler	6-2-00	3:45 pm	CHEST TEMP.
Judy Strehler	6-5-00	2:15 pm				
						TAG #

ATS 10/98

U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
NO. 2 BATTERY COMBUSTION STACK
MAY 31, 2000 AND JUNE 1, 2000
U.S. EPA REFERENCE METHOD 26A SAMPLING
CALCULATION OF THE IMPINGER COLLECTION EFFICIENCIES

Test No.	Sample ID (CLR-#2BS-M26A-)	Sample Type	Chloride Conc. (mg / L)	Sample Volume (mL)	Chloride Catch (mg)	Collection Efficiency (%)
1	1A	0.1 N H2SO4 - Impingers 1 & 2	39	445.4	17.37	100.0
	1B	0.1 N H2SO4 - Impinger 3	< 2.0	143.2	< 0.29	
	1C	0.1 N NaOH - Impinger 4	< 2.0	146.2	< 0.29	NA
	1D	0.1 N NaOH - Impinger 5	< 2.0	152.9	< 0.31	
2	2A	0.1 N H2SO4 - Impingers 1 & 2	48	410.6	19.71	93.8
	2B	0.1 N H2SO4 - Impinger 3	9.3	130.6	1.21	
	2C	0.1 N NaOH - Impinger 4	< 2.0	137.1	< 0.27	NA
	2D	0.1 N NaOH - Impinger 5	< 2.0	135.0	< 0.27	
3	3A	0.1 N H2SO4 - Impingers 1 & 2	44	371.7	16.35	100.0
	3B	0.1 N H2SO4 - Impinger 3	< 2.0	180.9	< 0.36	
	3C	0.1 N NaOH - Impinger 4	< 2.0	160.2	< 0.32	NA
	3D	0.1 N NaOH - Impinger 5	< 2.0	153.5	< 0.31	
Blank	Blank	0.1 N H2SO4	< 2.0			
Blank	Blank	0.1 N NaOH	< 2.0			

<u>0.1 N H2SO4</u>

Collection Eff. = (%) 100 * {1 - [XB Chloride Catch (mg) / XA Chloride Catch (mg)] }
where X = 1, 2 or 3

<u>0.1 N NaOH</u>

Collection Eff. = (%) 100 * {1 - [XD Chloride Catch (mg) / XC Chloride Catch (mg)] }
where X = 1, 2 or 3

For chloride concentrations less than the analytical detection limit (< 2.0) ---->
Chloride catch = 0

U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
NO. 2 BATTERY COMBUSTION STACK
MAY 31, 2000 AND JUNE 1, 2000
U.S. EPA CONDITIONAL TEST METHOD 027 SAMPLING
CALCULATION OF THE IMPINGER COLLECTION EFFICIENCIES

Test No.	Sample ID (CLR-#2BS-M26A-)	Sample Type	Ammonium Conc. (mg / L)	Sample Volume (mL)	Ammonium Catch (mg)	Collection Efficiency (%)
1	1A	0.1 N H2SO4 - Impingers 1 & 2	< 0.1	445.4	< 0.04	NA
	1B	0.1 N H2SO4 - Impinger 3	< 0.1	143.2	< 0.01	
2	2A	0.1 N H2SO4 - Impingers 1 & 2	< 0.1	410.6	< 0.04	NA
	2B	0.1 N H2SO4 - Impinger 3	< 0.1	130.6	< 0.01	
3	3A	0.1 N H2SO4 - Impingers 1 & 2	< 0.1	371.7	< 0.04	NA
	3B	0.1 N H2SO4 - Impinger 3	0.2	180.9	0.04	
Blank	Blank	0.1 N H2SO4	< 0.1			

<u>0.1 N H2SO4</u>

Collection Eff. = (%) 100 * {1 - [XB Ammonium Catch (mg) / XA Ammonium Catch (mg)] }
where X = 1, 2 or 3

For ammonium concentrations less than the analytical detection limit (< 0.1) ---->
Ammonium catch = 0

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 5/31/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-1

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.62
B.	Process Gas Static Pressure (in. H2O)	-1.30
C.	Pitot Tube Coefficient	0.84
D.	Dry Gas Meter Calibration Factor	1.0023
»»»	Is the Duct Round (Y/N)?	Y
E.	Duct Diameter (in.) - for round duct	114
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.440
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.07
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.07
K.	Average ΔH (in. H2O) variation	1.32
L.	Average Process Gas Temperature (°F)	535
M.	Average Dry Gas Meter Temperature (°F)	83
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	3.5
	Oxygen (%)	12.0
	Nitrogen (%)	84.5
	Carbon Monoxide (%)	0.0
	Hydrogen (%)	0.0
	Methane (%)	0.0
	Ethane (%)	0.0
	Argon (%)	0.0
O.	Sample Time (min)	120
P.	Total H2O Mass Collected in Impingers (g)	231.0
Q.	Metered Gas Volume (dcf)	74.505

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.52	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.72	[A+(K/13.6)]
T.	Duct Area (ft.^2)	7.09E+01	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	1.06E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	995	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	543	[M+460]
X.	Dry Gas Volume Sampled (dscf)	72.121	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	10.892	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	13.1	[100*Y/(X+Y)]
AA.	Theoretical Maximum Percent H2O in Gas Stream (%) (empirical equation derived from EPA QA Handbook Vol. III, S3.3.6, T6.1A)	#N/A	[100*Saturated Water Vapor Pressure / Stack Pressure]
BB.	Actual Percent H2O in Gas Stream (%)	13.1	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.131		18	2.362
CO2	0.035	0.869	44	1.338
O2	0.120	0.869	32	3.336
N2	0.845	0.869	28	20.556
CO	0.000	0.869	28	0.000
H2	0.000	0.869	2	0.000
CH4	0.000	0.869	16	0.000
C2H6	0.000	0.869	30	0.000
Ar	0.000	0.869	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.59	
DD.	Average Process Gas Velocity (ft/sec)	2.10E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	8.93E+04	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	4.68E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	4.06E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	99.3	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0033	
JJ.	Front-Half Residue Weight (g)	0.0036	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0069	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0015	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	5.14E-01	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 5/31/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-1

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		17.86	
QQ.	Concentration (mg/dscm)		8.74E+00	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		1.33E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.29	
TT.	Concentration (mg/dscm)	<	1.43E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.18E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)	<	0.04	
WW.	Concentration (mg/dscm)	<	2.06E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)	<	3.13E-03	[WW*0.02832*GG*60/454000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 5/31/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-2

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.62
B.	Process Gas Static Pressure (in. H2O)	-1.30
C.	Pitot Tube Coefficient	0.84
D.	Dry Gas Meter Calibration Factor	1.0023
»»»	Is the Duct Round (Y/N)?	Y
E.	Duct Diameter (in.) - for round duct	114
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.440
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.07
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.07
K.	Average ΔH (in. H2O) variation	1.29
L.	Average Process Gas Temperature (°F)	535
M.	Average Dry Gas Meter Temperature (°F)	92
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	3.5
	Oxygen (%)	12.0
	Nitrogen (%)	84.5
	Carbon Monoxide (%)	0.0
	Hydrogen (%)	0.0
	Methane (%)	0.0
	Ethane (%)	0.0
	Argon (%)	0.0
O.	Sample Time (min)	120
P.	Total H2O Mass Collected in Impingers (g)	236.9
Q.	Metered Gas Volume (dcf)	73.645

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.52	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.71	[A+(K/13.6)]
T.	Duct Area (ft.^2)	7.09E+01	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	1.06E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	995	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	552	[M+460]
X.	Dry Gas Volume Sampled (dscf)	70.121	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	11.170	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	13.7	[100*Y/(X+Y)]
AA.	Theoretical Maximum Percent H2O in Gas Stream (%) (empirical equation derived from EPA QA Handbook Vol. III, S3.3.6, T6.1A)	#N/A	[100*Saturated Water Vapor Pressure / Stack Pressure]
BB.	Actual Percent H2O in Gas Stream (%)	13.7	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.137		18	2.473
CO2	0.035	0.863	44	1.328
O2	0.120	0.863	32	3.312
N2	0.845	0.863	28	20.409
CO	0.000	0.863	28	0.000
H2	0.000	0.863	2	0.000
CH4	0.000	0.863	16	0.000
C2H6	0.000	0.863	30	0.000
Ar	0.000	0.863	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.52	
DD.	Average Process Gas Velocity (ft/sec)	2.03E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	8.62E+04	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	4.51E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	3.89E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	100.8	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0041	
JJ.	Front-Half Residue Weight (g)	0.0026	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0067	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0015	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	4.91E-01	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
TEST SITE: NO. 2 BATTERY COMBUSTION STACK

TEST DATE: 5/31/00
TEST NO.: CLR- #2BS-M26A-2

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		21.51	
QQ.	Concentration (mg/dscm)		1.08E+01	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		1.58E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.27	
TT.	Concentration (mg/dscm)	<	1.38E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.01E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)	<	0.04	
WW.	Concentration (mg/dscm)	<	1.95E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)	<	2.84E-03	[WW*0.02832*GG*60/454000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 6/1/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-3

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.51
B.	Process Gas Static Pressure (in. H2O)	-1.30
C.	Pitot Tube Coefficient	0.84
D.	Dry Gas Meter Calibration Factor	1.0023
»»»	Is the Duct Round (Y/N)?	Y
E.	Duct Diameter (in.) - for round duct	114
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.440
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.06
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.06
K.	Average ΔH (in. H2O) variation	1.17
L.	Average Process Gas Temperature (°F)	540
M.	Average Dry Gas Meter Temperature (°F)	98
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	3.5
	Oxygen (%)	13.0
	Nitrogen (%)	83.5
	Carbon Monoxide (%)	0.0
	Hydrogen (%)	0.0
	Methane (%)	0.0
	Ethane (%)	0.0
	Argon (%)	0.0
O.	Sample Time (min)	120
P.	Total H2O Mass Collected in Impingers (g)	233.8
Q.	Metered Gas Volume (dcf)	72.203

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.41	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.60	[A+(K/13.6)]
T.	Duct Area (ft.^2)	7.09E+01	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	1.06E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	1000	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	558	[M+460]
X.	Dry Gas Volume Sampled (dscf)	67.737	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	11.024	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	14.0	[100*Y/(X+Y)]
AA.	Theoretical Maximum Percent H2O in Gas Stream (%) (empirical equation derived from EPA QA Handbook Vol. III, S3.3.6, T6.1A)	#N/A	[100*Saturated Water Vapor Pressure / Stack Pressure]
BB.	Actual Percent H2O in Gas Stream (%)	14.0	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.140		18	2.519
CO2	0.035	0.860	44	1.324
O2	0.130	0.860	32	3.578
N2	0.835	0.860	28	20.108
CO	0.000	0.860	28	0.000
H2	0.000	0.860	2	0.000
CH4	0.000	0.860	16	0.000
C2H6	0.000	0.860	30	0.000
Ar	0.000	0.860	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.53	
DD.	Average Process Gas Velocity (ft/sec)	1.95E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	8.31E+04	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	4.32E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	3.71E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	102.1	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0051	
JJ.	Front-Half Residue Weight (g)	0.0022	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0073	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0017	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	5.29E-01	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA

TEST SITE: NO. 2 BATTERY COMBUSTION STACK

TEST DATE: 6/1/00

TEST NO.: CLR- #2BS-M26A-3

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		16.82	
QQ.	Concentration (mg/dscm)		8.77E+00	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		1.22E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.32	
TT.	Concentration (mg/dscm)	<	1.67E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.32E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)		0.03	
WW.	Concentration (mg/dscm)		1.78E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)		2.47E-03	[WW*0.02832*GG*60/454000]

ATS

639 Alpha Drive
Pittsburgh, Pennsylvania 15238
Telephone (412) 967-1900
FAX (412) 967-1911

ADVANCED TECHNOLOGY SYSTEMS, INC.

ATS Project No. 00-062-P

September 12, 2000

Mr. William C. Graeser
Manager – Environmental and Quality Assurance
U.S. Steel Clairton Works
400 State Street
Clairton, PA 15025

RE: LETTER REPORT – HYDROCHLORIC ACID, CHLORINE GAS AND AMMONIA GAS EMISISONS TESTING CONDUCTED AT NO. 2 BATTERY COMBUSTION STACK ON MAY 31, 2000 AND JUNE 1, 2000

Dear Mr. Graeser:

This letter, with attachments, constitutes the report that summarizes the results of the hydrochloric acid (HCl), chlorine gas (Cl_2) and ammonia gas (NH_3) emissions testing conducted at No. 2 Battery Combustion Stack by Advanced Technology Systems, Inc. (ATS). Three two-hour test runs were conducted on May 31, 2000 and June 1, 2000 simultaneous with the compliance test program at this stack (particulate matter and visible emissions were measured as part of the compliance test program).

The test results have been summarized in the attached Table 1. Hydrochloric acid, chlorine gas and ammonia gas concentrations are listed in units of milligrams per dry standard cubic meter (mg/dscm). Hydrochloric acid, chlorine gas and ammonia gas mass emission rates are listed in units of pounds per hour (lb/hr). Table 1 also presents pertinent exhaust gas and sampling parameters including exhaust gas flow rates in units of actual cubic feet per minute (acfm), standard cubic feet per minute (scfm), and dry standard cubic feet per minute (dscfm), exhaust gas temperature (^{o}F), and moisture content of the exhaust gas (percent by volume), gas volume sampled for each test run in units of dry standard cubic feet (dscf) and the isokinetic variation value for each test run. The isokinetic variation value is equal to the ratio of the average linear gas velocity sampled through the probe nozzle to the average exhaust gas velocity. All isokinetic variation values are between 90 percent and 110 percent, which is the acceptable range of values. Actual test sampling times have also been included in Table 1.

Hydrochloric acid, chlorine gas and ammonia gas emission testing was performed in accordance with U.S. EPA Reference Methods 1 through 4 and 26A, U.S. EPA Conditional Test Method 027 and the requirements of the Pennsylvania Department of Environmental Protection (PA DEP) Source Testing Manual (Draft Revision 3.1, May 3, 1999). Detailed information regarding the procedures used to measure the exhaust gas stream velocity and volumetric flow rate (i.e., U.S. EPA Reference Methods 1 through 4) can be found in the summary report for the compliance test program. Hydrochloric acid and chlorine gas sampling was performed in accordance with U.S. EPA Reference Method 26A. Ammonia gas sampling was performed, where possible, in accordance with U.S. EPA Conditional Test Method 027. (The test procedures specified in Method 027 were modified slightly for this test program based on the expected exhaust gas temperatures of 450°F. The modifications were made

after ATS consulted with Ms. Rima Howell of the U.S. EPA, who is the pertinent contact for Method 027. It should also be noted that the U.S. EPA had not promulgated Method 027 at the time of this test program, however, this method was apparently the only test method available from the U.S. EPA designed for measuring ammonia gas emissions from stationary sources.) Process gas samples were withdrawn isokinetically from the stack, with particulate matter collected in a glass nozzle, a heated glass-lined probe, and on a heated quartz filter. Vapor phase hydrochloric acid, chlorine gas and ammonia gas were collected in a series of chilled impingers. The impinger type and sequence is listed below:

No.	Impinger Type	Contents
1.	Modified Greenburg-Smith	50 mL 0.1 N sulfuric acid (for HCl and NH_3 collection)
2.	Greenburg-Smith	100 mL 0.1 N sulfuric acid (for HCl & NH_3 collection)
3.	Greenburg-Smith	100 mL 0.1 N sulfuric acid (for HCl & NH_3 collection)
4.	Modified Greenburg-Smith	100 mL 0.1 N sodium hydroxide (for Cl_2 collection)
5.	Modified Greenburg-Smith	100 mL 0.1 N sodium hydroxide (for Cl_2 collection)
6.	Modified Greenburg-Smith	200 g Silica Gel

A gas volume greater than 50 dry standard cubic feet (dscf) – the minimum gas volume required by the PA DEP for the compliance test program - was sampled for each test run. The flow rate through each sample train was less than 1 dry standard cubic foot per minute as required by U.S. EPA Reference Method 26A.

Following each test run, the sample trains were processed in accordance with PA DEP requirements. Detailed information regarding the procedures used to recover the particulate matter catch (essentially U.S. EPA Reference Method 5 procedures) can be found in the summary report for the compliance test program. Following the gravimetric analysis of the impingers for moisture gain, the following four samples fractions were generated for each sample train:

Fraction	Description
A	Contents of Impinger Nos. 1 & 2 plus applicable distilled deionized water rinses (for HCl and NH_3)
B	Contents of Impinger No. 3 plus applicable distilled deionized water rinses (for HCl and NH_3).
C	Contents of Impinger No. 4 plus applicable distilled deionized water rinses (for Cl_2)
D	Contents of Impinger No. 5 plus applicable distilled deionized water rinses (for Cl_2)

For each sample train, each of the four fractions were analyzed separately as required by the PA DEP to allow for the calculation of the collection efficiency of the sample train for HCl, Cl_2 and NH_3 collection. The contents of Impinger No. 6 were discarded.

The actual test samples plus field blanks of the impinger scrubbing solutions (0.1 N sulfuric acid and 0.1 N sodium hydroxide) were submitted to the subcontract analytical laboratory for chloride ion analyses using ion chromatographic techniques in accordance with U.S. EPA Reference Method 26A.

Sample Fractions A and B and the 0.1 N sulfuric acid solution field blank were also analyzed for ammonium ion concentration using specific ion electrode analysis techniques. The analytical laboratory results showed the following:

- The chloride ion concentrations of the field blanks were less than the analytical detection limit;
- For all three test runs, the HCl collection efficiency of the sample train was calculated to be greater than the minimum collection efficiency specified by the PA DEP (i.e., the chloride catch of the Sample Fraction B was at most 10 percent of the chloride catch from Sample Fraction A plus Sample Fraction B);
- For all three test runs, the Cl_2 collection efficiency of the sample train could not be calculated since the chloride catch of Sample Fractions C and D were less than the analytical detection limit;
- The ammonium ion concentration of the field blank was less than the analytical detection limit; and
- For all three test runs, the NH_3 collection efficiency of the sample train could not be calculated since the ammonium catch of Sample Fractions A and B were less than or just slightly greater than the analytical detection limit.

Copies of the field data sheets, equipment calibration data, analytical laboratory results and emissions calculations are included in the appendix.

ATS appreciates the opportunity to provide U.S. Steel with process gas testing services. If you have any questions regarding this letter report, please call Dr. Robinson Khosah or me at (412) 967-1900 or e-mail me at the following address: jshimshock@atsengineers.com.

Very truly yours,

John P. Shimshock

John P. Shimshock, Ph.D.
Senior Project Scientist

Approved by:

R. P. Khosah

Robinson P. Khosah, Ph.D.
Vice President
Science and Technology Division

JPS/blc

ATS
ADVANCED TECHNOLOGY SYSTEMS, INC.

U.S. STEEL CLAIRTON WORKS
CLAIRTON, PENNSYLVANIA

TABLE 1

NO. 2 BATTERY COMBUSTION STACK
HYDROCHLORIC ACID, CHLORINE GAS AND AMMONIA GAS EMISSIONS DATA
MAY 31, 2000 AND JUNE 1, 2000

		Run 1	Run 2	Run 3	Average
Test Date		5/31/00	5/31/00	6/1/00	
Emissions Data					
Hydrochloric Acid (HCl)					
Concentration	(mg/dscm)	8.74E+00	1.08E+01	8.77E+00	9.44E+00
Mass Emission Rate	(lb/hr)	1.33E+00	1.58E+00	1.22E+00	1.38E+00
Chlorine Gas (Cl_2)					
Concentration	(mg/dscm)	< 1.43E-01	< 1.38E-01	< 1.67E-01	< 1.49E-01
Mass Emission Rate	(lb/hr)	< 2.18E-02	< 2.01E-02	< 2.32E-02	< 2.17E-02
Ammonia Gas (NH_3)					
Concentration	(mg/dscm)	< 2.06E-02	< 1.95E-02	1.78E-02	< 1.93E-02
Mass Emission Rate	(lb/hr)	< 3.13E-03	< 2.84E-03	2.47E-03	< 2.81E-03
Exhaust Stack Conditions					
Volumetric Flow Rate	(acfm)	8.93E+04	8.62E+04	8.31E+04	8.62E+04
	(scfm)	4.68E+04	4.51E+04	4.32E+04	4.50E+04
	(dscfm)	4.06E+04	3.89E+04	3.71E+04	3.89E+04
Temperature	(°F)	535	535	540	537
Moisture Content	(%)	13.1	13.7	14.0	13.6
Sampling Conditions					
Test Times	(EDT)	0820 to 1026	1045 to 1258	1310 to 1518	
Sampling Time *	(minutes)	120	120	120	
Sample Volume **	(dscf)	72.121	70.121	67.737	
Isokinetic Variation ***	(%)	99.3	100.8	102.1	

mg / dscm = milligrams per dry standard cubic meter
*: Minimum required sampling time is 2 hours (120 minutes)
**: Minimum required sample volume is 50 dscf
***: Acceptable range of values is 90.0% <= Isokinetic Variation < = 110.0%

U.S. STEEL CLAIRTON WORKS
CLAIRTON, PENNSYLVANIA

Hydrochloric Acid, Chlorine Gas and Ammonia Gas Emissions Testing Conducted at No. 2 Battery Combustion Stack on May 31, 2000 and June 1, 2000

September 2000

APPENDIX

Field Data Sheets, Equipment Calibration Data, Analytical Laboratory Results and Emissions Calculations

ATS
ADVANCED TECHNOLOGY SYSTEMS, INC.

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	4
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 1	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	485 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.3	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
A	40.6	0820	235.606	0.10	1.89	1.89	7.00	244	543	72	71	247	60	
	28.5			0.10	1.89	1.89	7.00	244	557	76	72	247	60	5 min./pt.
	20.2			0.08	1.51	1.51	6.00	244	566	80	73	246	58	
	13.5			0.07	1.32	1.32	5.00	243	571	82	74	246	54	
	7.6			0.05	0.95	0.95	3.00	243	535	84	75	246	54	
	2.4	0850	253.205	0.02	0.38	0.38	2.00	243	530	84	76	246	50	
B	40.6	0851	253.205	0.07	1.32	1.32	5.00	244	520	83	76	246	50	
	28.5			0.06	1.14	1.14	4.00	245	526	85	77	246	50	
	20.2			0.06	1.14	1.14	4.00	245	530	87	77	246	47	
	13.5			0.05	0.95	0.95	3.00	245	531	88	78	246	47	
	7.6			0.04	0.76	0.76	2.00	245	528	88	78	246	46	
	2.4		268.788	0.02	0.38	0.38	2.00	244	521	86	79	246	46	
	Page 1	Δ = 60	Δ = 33.182	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.06		1.08			538 (°F)		79 (°F)			Estimates:
	Test	Δ = 120	Δ = 74.505	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.07		1.32			535 (°F)		83 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2	3.5%	
O2	12%	
CO	—	
N2	84.5%	

$$= \left[\frac{\Sigma\sqrt{\Delta P_i}}{n}\right]$$

System Leak Check (60 sec)

2	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.004	< 0.02
After	7.50	0.009	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	632.0	508.7	123.3
2.	100 mL 0.1 N H2SO4	651.5	575.7	75.8
3.	100 mL 0.1 N H2SO4	494.4	487.9	6.5
4.	100 mL 0.1 N NaOH	477.2	476.5	0.7
5.	100 mL 0.1 N NaOH	551.4	546.4	5.0
6.	~ 200 g Silica Gel	635.5	615.8	19.7
7.				
8.			total =	231.0 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	4
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 1	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	485 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.30	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00-062-P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
C	40.6	0923	268.788	0.11	2.12	2.12	7.50	245	543	85	79	247	47	5 min./pt.
	28.5			0.10	1.90	1.90	7.00	245	570	87	79	247	47	
	20.2			0.09	1.71	1.71	7.00	245	579	89	80	247	48	
	13.5			0.09	1.71	1.71	7.00	244	588	90	80	247	48	
	7.6			0.07	1.39	1.39	5.00	244	477	91	81	247	48	
	2.4	0953	288.281	0.02	0.40	0.40	2.00	245	470	92	81	247	48	
D	40.6	0956	288.281	0.11	2.17	2.17	7.00	244	530	86	82	247	48	
	28.5			0.11	2.17	2.17	7.00	244	541	90	82	245	47	
	20.2			0.11	2.17	2.17	7.00	244	548	91	82	245	47	
	13.5			0.11	2.17	2.17	7.00	245	552	92	83	245	47	
	7.6			0.07	1.39	1.39	5.0	245	520	93	83	245	47	
	2.4	1026	310.111	0.02	0.40	0.40	2.0	245	475	93	83	245	47	
	Page 2	Δ = 60	Δ = 41.323	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			Estimates:
	Totals	min	dcf	0.08		1.55			532 (°F)		86 (°F)			MW = 27.6
														%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

$$= \left[\frac{\Sigma\sqrt{\Delta P}}{n}\right]^2$$

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before			< 0.02
After			< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before		
After		

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4			
2.	100 mL 0.1 N H2SO4			
3.	100 mL 0.1 N H2SO4			
4.	100 mL 0.1 N NaOH			
5.	100 mL 0.1 N NaOH			
6.	~ 200 g Silica Gel			
7.				
8.				

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	5
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 2	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	486 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA	STATIC P. (in. H2O)	-1.30	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
XD	40.6	1045	310.531	0.11	2.18	2.18	7.0	242	520	84	83	241	60	5 min./pt.
	28.5			0.11	2.18	2.18	7.0	242	527	88	84	241	60	
	20.2			0.11	2.16	2.16	7.0	242	534	90	84	242	57	
	13.5			0.10	1.96	1.96	7.0	242	539	92	84	241	57	
	7.6			0.07	1.37	1.37	5.0	243	520	95	85	241	54	
	2.4	1115	331.382	0.04	0.78	0.78	3.0	243	480	95	85	241	52	
BC	40.6	1120	33.382	0.10	1.96	1.96	6.0	243	564	92	86	242	51	
	28.5			0.10	1.96	1.96	6.0	243	574	97	87	242	51	
	20.2			0.09	1.76	1.76	6.0	243	576	97	87	242	50	
	13.5			0.08	1.57	1.57	5.0	243	585	99	88	242	47	
	7.6			0.06	1.13	1.13	4.0	244	525	99	88	243	47	
	2.4	1150	350.325	0.02	0.38	0.38	2.0	245	515	97	89	243	47	
	Page 1	Δ = 60	Δ = 39.794	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.08		1.55			538 (°F)		90 (°F)			Estimates:
	Test	Δ = 120	Δ = 73.645	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.065		1.29			535 (°F)		92 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2	3.5%	
O2	12%	
CO	—	
N2	84.5%	

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.003	< 0.02
After	7.00	0.002	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	605.3	479.9	125.4
2.	100 mL 0.1 N H2SO4	572.1	491.6	80.5
3.	100 mL 0.1 N H2SO4	580.3	578.7	1.6
4.	100 mL 0.1 N NaOH	545.5	543.6	1.9
5.	100 mL 0.1 N NaOH	531.7	524.0	7.7
6.	~ 200 g Silica Gel	656.1	636.3	19.8
7.				
8.			Total =	236.9 g

19.8

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	05-31-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	5
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 2	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	486 · QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.62	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA.	STATIC P. (in. H2O)	-1.	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
ØB	40.6	1154	350.325	0.07	1.39	1.39	4.0	245	520	95	89	244	48	5 min./pt.
	28.5			0.05	1.00	1.00	4.0	245	538	97	89	245	48	
	20.2			0.05	0.98	0.98	3.0	244	545	98	89	244	48	
	13.5			0.04	0.78	0.78	3.0	244	548	98	89	244	48	
	7.6			0.04	0.78	0.78	3.0	243	485	98	89	244	49	
	2.4	1224	365.562	0.02	0.39	0.39	2.0	243	460	98	89	244	49	
ØA	40.6	1228	365.562	0.09	1.79	1.79	6.0	245	540	95	89	244	48	
	28.5			0.09	1.79	1.79	6.0	245	580	98	89	246	47	
	20.2			0.07	1.37	1.37	5.0	246	589	100	90	246	47	
	13.5			0.06	1.17	1.17	4.0	246	530	100	90	246	47	
	7.6			0.06	1.17	1.17	4.0	246	530	101	90	246	48	
	2.4	1258	384.176	0.02	0.39	0.39	2.0	246	515	101	90	246	49	
														Estimates:
	Page 2	Δ = 60	Δ =	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.05		1.03			531 (°F)		94 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before			< 0.02
After			< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before		
After		

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4			
2.	100 mL 0.1 N H2SO4			
3.	100 mL 0.1 N H2SO4			
4.	100 mL 0.1 N NaOH			
5.	100 mL 0.1 N NaOH			
6.	~ 200 g Silica Gel			
7.				
8.				

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	06-01-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	7
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 3	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	487 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.51	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA.	STATIC P. (in. H2O)	-1.3	CALIBRATION DATE	9-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
A	40.6	1310	385.178	0.09	1.79	1.79	7.0	244	530	91	91	245	60	5 min./pt.
	28.5			0.09	1.79	1.79	7.0	244	542	94	91	245	60	
	20.2			0.06	1.19	1.19	5.0	244	549	95	91	245	60	
	13.5			0.06	1.19	1.19	5.0	244	559	98	91	245	58	
	7.6			0.04	0.77	0.77	4.0	244	567	101	92	245	58	
	2.4	1340	403.000	0.02	0.39	0.39	3.0	244	552	102	93	245	58	
B	40.6	1342	403.000	0.06	1.19	1.19	6.0	243	520	98	94	246	55	
	28.5			0.06	1.21	1.21	6.0	243	521	102	94	246	55	
	20.2			0.04	0.81	0.81	4.0	243	529	103	94	246	52	
	13.5			0.04	0.81	0.81	4.0	244	534	104	95	246	52	
	7.6			0.02	0.39	0.39	4.0	243	529	105	95	246	52	
	2.4	1412	417.834	0.02	0.39	0.39	2.0	243	500	104	95	246	52	
	Page 1	Δ = 60	Δ = 32.656	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.05		0.93			536 (°F)		95 (°F)			Estimates:
	Test	Δ = 120	Δ = 72.203	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.6
	Totals	min	dcf	0.06		1.17			540 (°F)		98 (°F)			%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

$= \left[\frac{\Sigma \sqrt{\Delta P}}{n}\right]^2$

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.005	< 0.02
After	8.00	0.006	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	531.5	478.1	53.4
2.	100 mL 0.1 N H2SO4	663.8	574.8	89.0
3.	100 mL 0.1 N H2SO4	594.6	557.5	37.1
4.	100 mL 0.1 N NaOH	584.8	571.6	13.2
5.	100 mL 0.1 N NaOH	553.6	538.3	15.3
6.	~200 g Silica Gel	654.7	628.9	25.8
7.				
8.			total =	233.8 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	06-01-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	7
PLANT SITE	Clairton, PA	TEST NO.	CLR - #2BS - M26A - 3	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	287 QTZ
TEST UNIT	No. 2 Battery Combustion Stack	B.P. (in. Hg)	29.51	METER CORR. (Y)	1.0023	PROBE NO.	7-1
TEST CREW	JS, KA.	STATIC P. (in. H2O)	-1.3	CALIBRATION DATE	09-20-99	NOZZLE DIA. (in.)	0.440
PROJECT NO.	00 - 062 - P	STACK DIA. (in.)	114	PORT SIZE & TYPE	4" Flanges	PITOT COEF.	0.84

Test Port	Traverse Point (in.)	Time (EDT)	DGM Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Required (in. H2O)	Orifice ΔH Actual (in. H2O)	Vacuum (in. Hg)	Probe Temp. (°F)	Stack Temp. (°F)	Meter Temp. In (°F)	Meter Temp. Out (°F)	Filter Temp. (°F)	Exit Temp. (°F)	Comments
C	40.6	1415	417.834	0.09	1.81	1.81	7.0	244	530	100	96	246	51	
	28.5			0.09	1.81	1.81	7.0	244	556	104	96	246	51	5 min./pt.
	20.2			0.09	1.76	1.76	7.0	245	569	105	97	246	49	
	13.5			0.07	1.36	1.36	7.0	244	576	106	97	246	49	
	7.6			0.04	0.78	0.78	5.0	244	580	106	97	246	48	
	2.4	1445	436.398	0.02	0.39	0.39	3.0	245	530	106	97	245	48	
D	40.6	1448	436.398	0.10	2.02	2.02	8.0	246	520	105	97	244	48	
	28.5			0.10	2.02	2.02	8.0	246	531	105	97	244	48	
	20.2			0.10	2.02	2.02	8.0	246	538	106	98	244	48	
	13.5			0.09	1.80	1.80	7.5	247	542	106	98	243	49	
	7.6			0.06	1.20	1.20	6.0	247	543	106	98	243	49	
	2.4	1518	457.381	0.04	0.80	0.80	5.0	247	510	106	98	243	48	
	Page 2	Δ = 60	Δ = 39.547	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			Estimates:
	Totals	min	dcf	0.07		1.42			543 (°F)		101 (°F)			MW = 27.6
														%H2O = 13

Dry Gas Composition

	Run 1	Run 2
CO2	13%	
O2	3.5%	
CO	—	
N2	83.5%	

$$= \left[\frac{\Sigma\sqrt{\Delta R}}{n}\right]$$

System Leak Check (60 sec)

2	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before			< 0.02
After			< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before		
After		

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4			
2.	100 mL 0.1 N H2SO4			
3.	100 mL 0.1 N H2SO4			
4.	100 mL 0.1 N NaOH			
5.	100 mL 0.1 N NaOH			
6.	~200 g Silica Gel			
7.				
8.				

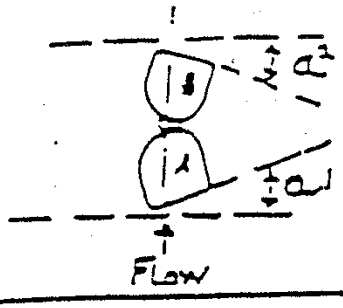
APEX GLASS NOZZLE CALIBRATION DATA SHEET Printed: 05/17/00

Nozzle No.	Size (inches)					Calibrated	
	Avg.		A	B	C	By	Date
1	0.125		0.125	0.125	0.125	KA	03-12-96
2	0.156		0.156	0.156	0.156	KA	03-12-96
3	0.156		0.156	0.156	0.156	KA	09-04-96
44	0.156		0.156	0.156	0.156	KA	09-04-96
11	0.180		0.180	0.180	0.180	KA	07-20-98
5	0.190		0.190	0.190	0.190	KA	05/01/00
27	0.190		0.190	0.190	0.190	KA	05/01/00
28	0.190		0.190	0.190	0.190	KA	05/01/00
29	0.190		0.190	0.190	0.190	KA	05/01/00
31	0.190		0.190	0.190	0.190	KA	05-19-99
4	0.219		0.219	0.219	0.219	KA	05/15/00
6	0.219		0.219	0.219	0.219	KA	05/15/00
7	0.219		0.219	0.219	0.219	KA	05/15/00
15	0.219		0.219	0.219	0.219	KA	05/15/00
42	0.219		0.219	0.219	0.219	KA	01/05/00
40	0.220		0.220	0.220	0.220	KA	05-19-99
10	0.225		0.225	0.225	0.225	KA	05-19-99
8	0.240		0.240	0.240	0.240	KA	01/05/00
9	0.240		0.240	0.240	0.240	KA	01/05/00
41	0.240		0.240	0.240	0.240	KA	01/05/00
50	0.260		0.260	0.260	0.260	KA	05-19-99
51	0.260		0.260	0.260	0.260	KA	01/05/00
12	0.281		0.281	0.281	0.280	KA	07-18-97
13	0.281		0.281	0.281	0.281	KA	10-20-98
14	0.281		0.281	0.280	0.281	KA	03-12-97
16	0.290		0.290	0.290	0.290	KA	07-24-96
17	0.290		0.290	0.290	0.290	KA	03-10-98
18	0.290		0.290	0.290	0.290	KA	07-05-96
45	0.290		0.290	0.290	0.290	KA	01/05/00
20	0.310		0.310	0.310	0.310	KA	03-10-98
33	0.310		0.310	0.310	0.310	KA	04-14-98
35	0.320		0.320	0.320	0.320	KA	01/05/00
21	0.344		0.344	0.344	0.344	KA	05/01/00
22	0.344		0.344	0.344	0.344	KA	05/01/00
23	0.347		0.347	0.347	0.347	KA	03-10-98
24	0.375		0.375	0.375	0.375	KA	02/18/00
25	0.375		0.375	0.375	0.375	KA	03-12-96
26	0.406		0.406	0.406	0.406	KA	04-19-96
30	0.406		0.406	0.406	0.406	KA	07-20-98
47	0.415		0.415	0.415	0.415	KA	11-25-96
34	0.425		0.425	0.425	0.424	KA	06-10-97
55	0.425		0.425	0.425	0.424	KA	01/05/00
52	0.440		0.440	0.440	0.440	KA	05/01/00

Caliper # XFS-59
Pre-check ✓
Post Check

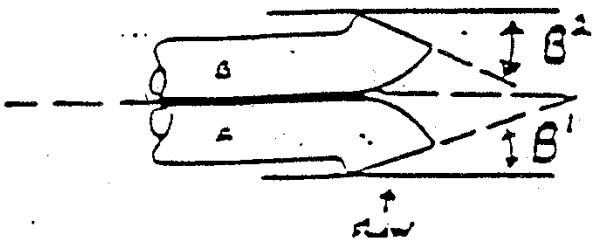
Probe #: 7-1
Date: 01-10-'00
Initials: KBA

①



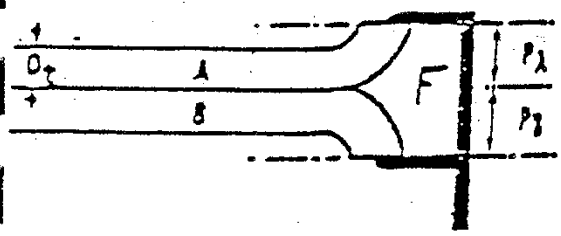
α^2 = 2°
α^1 = 1°
α^1, α^2 = <10°
β^1 = 1°
β^2 = 1°
β^1, β^2 = <5°
F = 1.000"

②



μ = 0.017" — μ = ≤ 0.1250" (γ TAN x F)
V = 0.017" — V = ≤0.03125" (θ TAN x F)
W = 0.480" — W ≥ 0"
X = 0.910" — X ≥ 0.750" (3/4" using 1/2" probe)

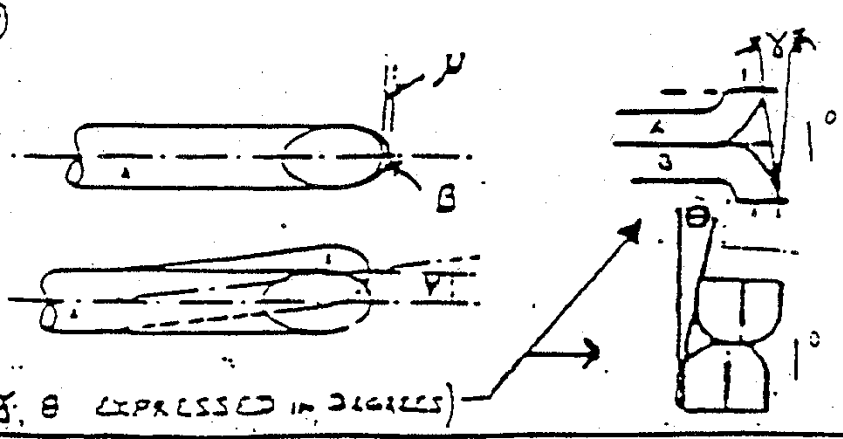
③



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

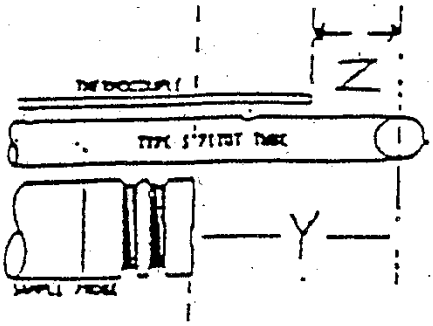
Y = 6.211" — Y ≥ 3.0"
Z = 2.495" — Z > 2.0"
D_t = 0.376" — D_t > .1875"

④



(γ, θ EXPRESSED IN DEGREES)

⑥



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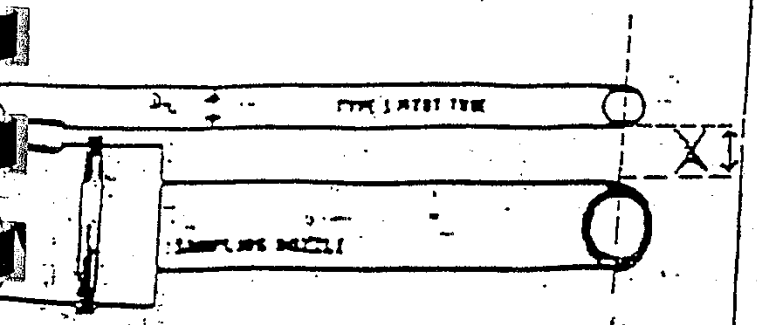

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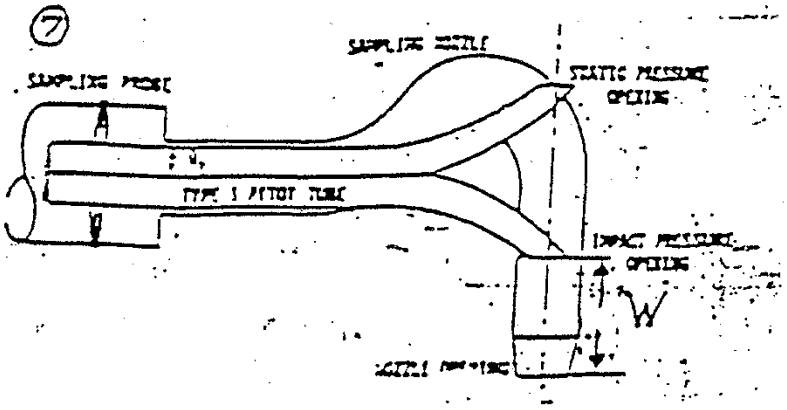

CERTIFICATE OF CALIBRATION

This certifies that your AL-20 AMERICAN WET TEST gas meter,
serial no. P-1146
has been calibrated with a bell prover.
AMERICAN 10 foot, # 3157
It is treaceable to the N.I.S.T., reference no. 1249811.

Calibration by Carl Poe Co., Inc.
99 Reinerman Houston, TX 77007
713-861-3816

2-8-96
Date

Mark Poe
Signature

DRY GAS METER CALIBRATION DATA SHEET

CONTROL BOX NO. Apex-4
CALIBRATION DATE 09-24-99
BAROMETRIC PRESSURE (in. Hg) 29.10

CHECK ONE: PRE-TEST ✓ POST-TEST
CALIBRATION OFFICER JPS

RUN NO.		WET TEST METER Gas Volume Vw (cf)	Elapsed Time (min.)	Meter Temp. Tw (°F)	DRY GAS METER Gas Volume Vd (dcf)	Inlet Temp. Ti (°F)	Outlet Temp. To (°F)	Orifice Diff. Pres. ΔH (in. H2O)	Vacuum (in. H2O)
1	START	0.000	0		318.302			1.0	8.0
	MIDWAY			71		88	78		
	STOP	5.000	9:20		323.417				
	DELTA *	5.000	9.33		5.115				
2	START	0.000	0		324.438			2.0	8.0
	MIDWAY			71		92	79		
	STOP	5.000	6:39		329.522				
	DELTA *	5.000	6.65		5.084				
3	START	0.000	0		331.850			3.0	8.0
	MIDWAY			71		95	80		
	STOP	5.000	5:25		336.644				
	DELTA *	5.000	5.42		5.094				
Dry Gas	START	0.050	0		336.713			0.0	1.0
Meter Leak	STOP	0.358	10:00		337.112				
Check	DELTA *	0.308	10.0		0.399				

{DELTA Vw (cf) - DELTA Vd (dcf)} / 10 (min.) = 0.0091 cfm <= 0.02 cfm

*: Express final elapsed time in decimal format

Differential Pressure Gauges (check one): ✓ Inclined Manometers ____ Magnehelic Gauges

	Run #1	Run #2	Run #3	Avg.
BP (in. Hg)	29.10	29.10	29.10	
Time (min)	9.33	6.65	5.42	
Tw (°F)	71	71	71	
Vw (cf)	5.000	5.000	5.000	
Ti (°F)	88	92	95	
To (°F)	78	79	80	
ΔH (in. H2O)	1.00	2.00	3.00	
Vm (dcf)	5.115	5.084	5.094	
ΔH@ (in. H2O)	1.988	2.016	2.005	2.003
Y (Pre-test)	0.9971	1.0053	1.0044	1.0023

$$\Delta H@ = \frac{0.0317 * \Delta H * [(Tw+460) * Time]^2}{BP * (To + 460) * (Vw)^2}$$

$$Y = \frac{Vw * BP * [(Ti+460+To+460)/2]}{Vm * [BP+(\Delta H/13.6)] * (Tw+460)}$$

DRY GAS METER CALIBRATION DATA SHEET

CONTROL BOX NO. Apex-4
CALIBRATION DATE 06-19-00
BAROMETRIC PRESSURE (in. Hg) 29.29

CHECK ONE: PRE-TEST ✓ POST-TEST
CALIBRATION OFFICER JPS

RUN NO.		WET TEST METER Gas Volume Vw (cf)	Elapsed Time (min.)	Meter Temp. Tw (°F)	DRY GAS METER Gas Volume Vd (dcf)	Inlet Temp. Ti (°F)	Outlet Temp. To (°F)	Orifice Diff. Pres. ΔH (in. H2O)	Vacuum (in. H2O)
1	START	0.000	0		679.438			1.3	8.0
	MIDWAY			73		91	77		
	STOP	5.000	8:06		684.421				
	DELTA *	5.000	8.10		4.983				
2	START	0.000	0		684.421			1.3	8.0
	MIDWAY			73		94	78		
	STOP	5.000	8:06		689.424				
	DELTA *	5.000	8.10		4.997				
3	START	0.000	0		689.424			1.3	8.0
	MIDWAY			73		96	79		
	STOP	5.000	8:05		694.431				
	DELTA *	5.000	8.08		5.007				
Dry Gas	START	0.190	0		694.632			0.0	9.0
Meter Leak	STOP	0.330	10:00		694.848				
Check	DELTA *	0.140	10.0		0.216				

{DELTA Vw (cf) - DELTA Vd (dcf)} / 10 (min.) = 0.0076 cfm <= 0.02 cfm

*: Express final elapsed time in decimal format

Differential Pressure Gauges (check one): ✓ Inclined Manometers _____ Magnehelic Gauges

	Run #1	Run #2	Run #3	Avg.
BP (in. Hg)	29.29	29.29	29.29	
Time (min)	8.10	8.10	8.08	
Tw (°F)	73	73	73	
Vw (cf)	5.000	5.000	5.000	
Ti (°F)	91	94	96	
To (°F)	77	78	79	
ΔH (in. H2O)	1.30	1.30	1.30	
Vm (dcf)	4.983	4.997	5.007	
Y (Pre-test)				1.0023
ΔH@ (in. H2O)	1.953	1.950	1.937	1.947
Y (Post-test)	1.0208	1.0217	1.0224	1.0216
ΔY (%)				1.9%

$$\Delta H@ = \frac{0.0317 * \Delta H * [(Tw+460) * Time]^2}{BP * (To + 460) * (Vw)^2}$$

$$Y = \frac{Vw * BP * [(Ti+460+To+460)/2]}{Vm * [BP+(\Delta H/13.6)] * (Tw+460)}$$

4000 Tech Center Drive
Monroeville, PA 15146
412 825 2400
Fax: 412 825 2407

IH & Environmental Laboratory

UEC
USX Engineers
& Consultants, Inc.

RECEIVED JUN 30 2000

June 20, 2000

Advanced Technology Systems, Inc.
ATTN: Mr. John Shimshock
639 Alpha Drive
RIDC Park
Harmarville, PA 15238

Attached are the analytical result(s) of the analysis on sample(s) submitted to the UEC Laboratories on June 5, 2000. Should you have any questions regarding this report, please contact us. An invoice will be issued shortly.

These results are submitted persuant to USX Engineers & Consultants, Inc.'s current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions, and no responsibility or liability is assumed for the manner in which the results are used or interpreted.

The results were derived with the following methods.

ANALYTE	METHOD
CHLORIDE	EPA 26A

We appreciate the opportunity to be of service and look forward to our continued assistance to you.

NOTE: Samples will be stored for only one month following the report date.

Sincerely,

Stephanie A. Guilyard

Stephanie A. Guilyard, IHIT, Project Manager

Enclosures

APEX GLASS NOZZLE CALIBRATION DATA SHEET

Printed: 05/17/00

Nozzle No.	Size (inches)					Calibrated	
	Avg.		A	B	C.	By	Date
53	0.440		0.440	0.440	0.440	KA	02/27/00
19	0.450		0.450	0.450	0.450	KA	04-14-98
36	0.490		0.490	0.490	0.490	KA	06-10-97
37	0.490		0.490	0.490	0.490	KA	07-05-96
38	0.495		0.495	0.495	0.495	KA	07-05-96
39	0.500		0.500	0.500	0.500	KA	07-05-96
46	0.625		0.625	0.625	0.625	KA	03-10-98
43	0.750		0.750	0.750	0.750	KA	01/05/00
49	1.060		1.060	1.060	1.060	KA	11-25-96

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Stephanie A Guilyard

Stephanie A. Guilyard, IHIT, Project Manager

Enclosures

USX Engineers & Consultants Inc.
IH & Environmental Laboratories
4000 Tech Center Drive
Monroeville, PA 15146
PHONE: (412)825-2400 FAX: (412)825-2407
AIHA Accreditation #322

REPORT OF TEST RESULTS

DATE - 06/19/2000
PAGE - 1

Customer: CD-002D

Advanced Technology Systems, Inc.
639 Alpha Drive
RIDC Park

Harmarville, PA 15238

ATTENTION: Mr. John Shimshock

Work Requested by : Mr. John Shimshock
Phone No. : 412-967-1900

CUSTOMER P.O. # : 3734
SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 2339 A

UEC ID	CLIENT ID	ANALYTE	DATE SAMPLED	SAMPLE TIME (min)	PUMP RATE (LPM)	AIR VOL. SAMPLED (L)	ANALYSIS DATE	mg/L	mg/Kg	PPM	µg/L	µg/Kg	pH	%	LOD	
19372	CLR-#2BS-M26A-3A	CHLORIDE	06/01/00	*	*	*	06/16/00	44							2.0 mg/L	E
19373	CLR-#2BS-M26A-3B	CHLORIDE	06/01/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19374	CLR-#2BS-M26A-3C	CHLORIDE	06/01/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19375	CLR-#2BS-M26A-3D	CHLORIDE	06/01/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19376	CLR-H2SO4-BLK	CHLORIDE	06/02/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19377	CLR-NAOH-BLK	CHLORIDE	06/02/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19378	CLR-#2BS-M26A-1A	CHLORIDE	05/31/00	*	*	*	06/16/00	39							2.0 mg/L	E
19379	CLR-#2BS-M26A-1B	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19380	CLR-#2BS-M26A-1C	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19381	CLR-#2BS-M26A-1D	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E
19382	CLR-#2BS-M26A-2A	CHLORIDE	05/31/00	*	*	*	06/16/00	48							2.0 mg/L	E
19383	CLR-#2BS-M26A-2B	CHLORIDE	05/31/00	*	*	*	06/16/00	9.3							2.0 mg/L	E
19384	CLR-#2BS-M26A-2C	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E

NOTES: * = Information not supplied by client. < = less than.
= Information not requested by client. N/A = Not Applicable.
Time, flow rate and/or sample volume data are based on client supplied information, unless otherwise noted.

A - FILTER OR SINGLE STAGE MONITOR
B - TUBE
C - TUBE OR 2 STAGE MONITOR
D - BULK MATERIALS OR WIPES
E - LIQUIDS OR SOLIDS
I - FILTER + TUBE
J - FILTER + TUBE

USX Engineers & Consultants Inc.
IH & Environmental Laboratories
4000 Tech Center Drive
Monroeville, PA 15146
PHONE: (412)825-2400 FAX: (412)825-2407
AIHA Accreditation #322

REPORT OF TEST RESULTS

Customer: CD-002D	ATTENTION: Mr. John Shimshock
Advanced Technology Systems, Inc. 639 Alpha Drive RIDC Park Harmarville, PA 15238	Work Requested by : Mr. John Shimshock Phone No. : 412-967-1900 CUSTOMER P.O. # : 3734 SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 2339 A

UEC ID	CLIENT ID	ANALYTE	DATE SAMPLED	SAMPLE TIME (min)	PUMP RATE (LPM)	AIR VOL. SAMPLED (L)	ANALYSIS DATE	mg/L	mg/Kg	PPM	µg/L	µg/Kg	pH	%	LOD	
19385	CLR-#2BS-M26A-2D	CHLORIDE	05/31/00	*	*	*	06/16/00	<2.0							2.0 mg/L	E

ANALYST : N. Kaltyel Date: 6-19-00

APPROVED: Stephanie A. Guilyard Date: 6/21/00

Stephanie A. Guilyard, IHIT, Project Manager

NOTES: * = Information not supplied by client. < = less than. A - FILTER OR SINGLE STAGE MONITOR C - TUBE OR 2 STAGE MONITOR E - LIQUIDS OR SOLIDS J - FILTER + TUBE
= Information not requested by client. N/A = Not Applicable. B - TUBE D - BULK MATERIALS OR WIPES I - FILTER + TUBE
Time, flow rate and/or sample volume data are based on client supplied information, unless otherwise noted.

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Monroeville, PA 15146
412 825 2400
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IH & Environmental Laboratory

UEC
USX Engineers
& Consultants, Inc.

June 20, 2000

Advanced Technology Systems, Inc.
ATTN: Mr. John Shimshock
639 Alpha Drive
RIDC Park
Harmarville, PA 15238

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The results were derived with the following methods.

ANALYTE	METHOD
AMMONIUM-WATER	EPA 350.2 (MOD)
CHLORIDE	EPA 26A

We appreciate the opportunity to be of service and look forward to our continued assistance to you.

NOTE: Samples will be stored for only one month following the report date.

Sincerely,

Stephanie A Guilyard

Stephanie A. Guilyard, IHIT, Project Manager

Enclosures

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.
639 ALPHA DRIVE, R.I.D.C. PARK
PITTSBURGH, PA 15238
(412)967-1900 FAX (412)967-1911

* : Please add 25 mg sodium thiosulfate $Na_2S_2O_3 \cdot 3.5H_2O$ prior to analysis

CHAIN OF CUSTODY RECORD

PROJECT NUMBER 00-062-P ; P.O. #3734
PROJECT NAME U.S. Steel Clairton Works
ANALYTICAL LAB UEC IH and Environmental Laboratories
DELIVER TO Sample Receiving
COMMENTS
No. 2 Battery Combustion Stack

ANALYSES TO BE CONDUCTED: Chloride ion via ion chromatography; Ammonium ion via ion chromatography

A: Impingers 1+2
B: Impinger 3
C: Impinger 4
D: Impinger 5

	SAMPLE IDENTIFICATION NUMBER	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	NUMBER OF CONTAINERS	COMPOSITE OR GRAB	Chloride ion via ion chromatography	Ammonium ion via ion chromatography	REMARKS OR OBSERVATIONS
	CLR-#2BS-M26A-1A	05-31-00	0820 →	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 445.4 mL
	CLR-#2BS-M26A-1B	↓	1520 EDT	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 143.2 mL
*	CLR-#2BS-M26A-1C	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 146.2 mL
*	CLR-#2BS-M26A-1D	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 152.9 mL
	CLR-#2BS-M26A-2A	05-31-00	1645 →	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 410.6 mL
	CLR-#2BS-M26A-2B	↓	1250 EDT	1	Comp.	✓	✓	0.1 N H_2SO_4 - Sample volume = 130.6 mL
*	CLR-#2BS-M26A-2C	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 137.1 mL
*	CLR-#2BS-M26A-2D	↓	↓	1	Comp.	✓		* 0.1 N NaOH - Sample volume = 135.4 mL

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	ICE CHEST #
John P. Shamrock	06-02-00	1445 EDT	Kelly [illegible]	06/02/00	1446	
			Judy Stubbles	6-2-00	3:45 pm	CHEST TEMP.
Judy Stubbles	6-5-00	2:15 pm				
						TAG #

ATS 10/98

ATS

ADVANCED TECHNOLOGY SYSTEMS, INC.
639 ALPHA DRIVE, R.I.D.C. PARK
PITTSBURGH, PA 15238
(412)967-1900 FAX (412)967-1911

(D-0025)

* : Please add 25mg sodium thiosulfate $Na_2S_2O_3 \cdot 3.5H_2O$ prior to analysis

CHAIN OF CUSTODY RECORD

PROJECT NUMBER ØØ-Ø62-P ; P.O. # 3734
PROJECT NAME U.S. Steel Clairton Works
ANALYTICAL LAB UEC. IH and Environmental Laboratories
DELIVER TO Sample Receiving
COMMENTS
No. 2 Battery Combustion Stack

SAMPLE IDENTIFICATION NUMBER	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	NUMBER OF CONTAINERS	COMPOSITE OR GRAB	Chloride ion via ion chromatography	Ammonium ion via ion chromatography	REMARKS OR OBSERVATIONS
CLR-#2BS-M26A-3A	Ø6-Ø1-ØØ	131Ø →	1	Comp.	✓	✓	Ø.1N H_2SO_4 - Sample volume = 371.7 mL
CLR-#2BS-M26A-3B	↓	1578 EDT	1	Comp.	✓	✓	Ø.1N H_2SO_4 - Sample volume = 18Ø.9 mL
* CLR-#2BS-M26A-3C	↓	↓	1	Comp.	✓		* Ø.1N NaOH - Sample volume = 16Ø.2 mL
* CLR-#2BS-M26A-3D	↓	↓	1	Comp.	✓		* Ø.1N NaOH - Sample volume = 153.5 mL
CLR-H2SO4-BLK	Ø6-Ø2-ØØ	14ØØ EDT	1	Grab	✓	✓	Ø.1N H_2SO_4
* CLR-NAOH-BLK	↓	↓	1	Grab	✓		* Ø.1N NaOH

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	ICE CHEST #
John P. Slemshock	Ø6-Ø2-ØØ	1445 EDT	Kelly Sy	06/02/00	1446	
Judy Strahler	6-5-00	2:15 pm	Judy Strahler	6-2-00	3:45 pm	CHEST TEMP.
						TAG #

ATS 10/98

PAGE 7 OF 7

U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
NO. 2 BATTERY COMBUSTION STACK
MAY 31, 2000 AND JUNE 1, 2000
U.S. EPA REFERENCE METHOD 26A SAMPLING
CALCULATION OF THE IMPINGER COLLECTION EFFICIENCIES

Test No.	Sample ID (CLR-#2BS-M26A-)	Sample Type	Chloride Conc. (mg / L)	Sample Volume (mL)	Chloride Catch (mg)	Collection Efficiency (%)
1	1A	0.1 N H2SO4 - Impingers 1 & 2	39	445.4	17.37	100.0
	1B	0.1 N H2SO4 - Impinger 3	< 2.0	143.2	< 0.29	
	1C	0.1 N NaOH - Impinger 4	< 2.0	146.2	< 0.29	NA
	1D	0.1 N NaOH - Impinger 5	< 2.0	152.9	< 0.31	
2	2A	0.1 N H2SO4 - Impingers 1 & 2	48	410.6	19.71	93.8
	2B	0.1 N H2SO4 - Impinger 3	9.3	130.6	1.21	
	2C	0.1 N NaOH - Impinger 4	< 2.0	137.1	< 0.27	NA
	2D	0.1 N NaOH - Impinger 5	< 2.0	135.0	< 0.27	
3	3A	0.1 N H2SO4 - Impingers 1 & 2	44	371.7	16.35	100.0
	3B	0.1 N H2SO4 - Impinger 3	< 2.0	180.9	< 0.36	
	3C	0.1 N NaOH - Impinger 4	< 2.0	160.2	< 0.32	NA
	3D	0.1 N NaOH - Impinger 5	< 2.0	153.5	< 0.31	
Blank	Blank	0.1 N H2SO4	< 2.0			
Blank	Blank	0.1 N NaOH	< 2.0			

<u>0.1 N H2SO4</u>

Collection Eff. = (%) 100 * {1 - [XB Chloride Catch (mg) / XA Chloride Catch (mg)] }
where X = 1, 2 or 3

<u>0.1 N NaOH</u>

Collection Eff. = (%) 100 * {1 - [XD Chloride Catch (mg) / XC Chloride Catch (mg)] }
where X = 1, 2 or 3

For chloride concentrations less than the analytical detection limit (< 2.0) ---->
Chloride catch = 0

U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
NO. 2 BATTERY COMBUSTION STACK
MAY 31, 2000 AND JUNE 1, 2000
U.S. EPA CONDITIONAL TEST METHOD 027 SAMPLING
CALCULATION OF THE IMPINGER COLLECTION EFFICIENCIES

Test No.	Sample ID (CLR-#2BS-M26A-)	Sample Type	Ammonium Conc. (mg / L)	Sample Volume (mL)	Ammonium Catch (mg)	Collection Efficiency (%)
1	1A	0.1 N H2SO4 - Impingers 1 & 2	< 0.1	445.4	< 0.04	NA
	1B	0.1 N H2SO4 - Impinger 3	< 0.1	143.2	< 0.01	
2	2A	0.1 N H2SO4 - Impingers 1 & 2	< 0.1	410.6	< 0.04	NA
	2B	0.1 N H2SO4 - Impinger 3	< 0.1	130.6	< 0.01	
3	3A	0.1 N H2SO4 - Impingers 1 & 2	< 0.1	371.7	< 0.04	NA
	3B	0.1 N H2SO4 - Impinger 3	0.2	180.9	0.04	
Blank	Blank	0.1 N H2SO4	< 0.1			

<u>0.1 N H2SO4</u>

Collection Eff. = (%) 100 * {1 - [XB Ammonium Catch (mg) / XA Ammonium Catch (mg)] }
where X = 1, 2 or 3

For ammonium concentrations less than the analytical detection limit (< 0.1) ---->
Ammonium catch = 0

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 5/31/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-1

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.62
B.	Process Gas Static Pressure (in. H2O)	-1.30
C.	Pitot Tube Coefficient	0.84
D.	Dry Gas Meter Calibration Factor	1.0023
»»»	Is the Duct Round (Y/N)?	Y
E.	Duct Diameter (in.) - for round duct	114
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.440
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.07
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.07
K.	Average ΔH (in. H2O) variation	1.32
L.	Average Process Gas Temperature (°F)	535
M.	Average Dry Gas Meter Temperature (°F)	83
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	3.5
	Oxygen (%)	12.0
	Nitrogen (%)	84.5
	Carbon Monoxide (%)	0.0
	Hydrogen (%)	0.0
	Methane (%)	0.0
	Ethane (%)	0.0
	Argon (%)	0.0
O.	Sample Time (min)	120
P.	Total H2O Mass Collected in Impingers (g)	231.0
Q.	Metered Gas Volume (dcf)	74.505

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.52	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.72	[A+(K/13.6)]
T.	Duct Area (ft.^2)	7.09E+01	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	1.06E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	995	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	543	[M+460]
X.	Dry Gas Volume Sampled (dscf)	72.121	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	10.892	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	13.1	[100*Y/(X+Y)]
AA.	Theoretical Maximum Percent H2O in Gas Stream (%) (empirical equation derived from EPA QA Handbook Vol. III, S3.3.6, T6.1A)	#N/A	[100*Saturated Water Vapor Pressure / Stack Pressure]
BB.	Actual Percent H2O in Gas Stream (%)	13.1	[Calculated %H2O <= Theoretical Max. %H2O]

CC. Process Gas Molecular Weight:

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.131		18	2.362
CO2	0.035	0.869	44	1.338
O2	0.120	0.869	32	3.336
N2	0.845	0.869	28	20.556
CO	0.000	0.869	28	0.000
H2	0.000	0.869	2	0.000
CH4	0.000	0.869	16	0.000
C2H6	0.000	0.869	30	0.000
Ar	0.000	0.869	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.59	
DD.	Average Process Gas Velocity (ft/sec)	2.10E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	8.93E+04	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	4.68E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	4.06E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	99.3	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0033	
JJ.	Front-Half Residue Weight (g)	0.0036	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0069	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0015	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	5.14E-01	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
TEST SITE: NO. 2 BATTERY COMBUSTION STACK

TEST DATE: 5/31/00
TEST NO.: CLR- #2BS-M26A-1

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		17.86	
QQ.	Concentration (mg/dscm)		8.74E+00	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		1.33E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.29	
TT.	Concentration (mg/dscm)	<	1.43E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.18E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)	<	0.04	
WW.	Concentration (mg/dscm)	<	2.06E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)	<	3.13E-03	[WW*0.02832*GG*60/454000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 5/31/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-2

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.62
B.	Process Gas Static Pressure (in. H2O)	-1.30
C.	Pitot Tube Coefficient	0.84
D.	Dry Gas Meter Calibration Factor	1.0023
»»»	Is the Duct Round (Y/N)?	Y
E.	Duct Diameter (in.) - for round duct	114
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.440
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.07
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.07
K.	Average ΔH (in. H2O) variation	1.29
L.	Average Process Gas Temperature (°F)	535
M.	Average Dry Gas Meter Temperature (°F)	92
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	3.5
	Oxygen (%)	12.0
	Nitrogen (%)	84.5
	Carbon Monoxide (%)	0.0
	Hydrogen (%)	0.0
	Methane (%)	0.0
	Ethane (%)	0.0
	Argon (%)	0.0
O.	Sample Time (min)	120
P.	Total H2O Mass Collected in Impingers (g)	236.9
Q.	Metered Gas Volume (dcf)	73.645

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.52	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.71	[A+(K/13.6)]
T.	Duct Area (ft.^2)	7.09E+01	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	1.06E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	995	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	552	[M+460]
X.	Dry Gas Volume Sampled (dscf)	70.121	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	11.170	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	13.7	[100*Y/(X+Y)]
AA.	Theoretical Maximum Percent H2O in Gas Stream (%) (empirical equation derived from EPA QA Handbook Vol. III, S3.3.6, T6.1A)	#N/A	[100*Saturated Water Vapor Pressure / Stack Pressure]
BB.	Actual Percent H2O in Gas Stream (%)	13.7	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.137		18	2.473
CO2	0.035	0.863	44	1.328
O2	0.120	0.863	32	3.312
N2	0.845	0.863	28	20.409
CO	0.000	0.863	28	0.000
H2	0.000	0.863	2	0.000
CH4	0.000	0.863	16	0.000
C2H6	0.000	0.863	30	0.000
Ar	0.000	0.863	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.52	
DD.	Average Process Gas Velocity (ft/sec)	2.03E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	8.62E+04	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	4.51E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	3.89E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	100.8	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0041	
JJ.	Front-Half Residue Weight (g)	0.0026	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0067	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0015	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	4.91E-01	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 5/31/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-2

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		21.51	
QQ.	Concentration (mg/dscm)		1.08E+01	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		1.58E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.27	
TT.	Concentration (mg/dscm)	<	1.38E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.01E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)	<	0.04	
WW.	Concentration (mg/dscm)	<	1.95E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)	<	2.84E-03	[WW*0.02832*GG*60/454000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 6/1/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-3

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.51
B.	Process Gas Static Pressure (in. H2O)	-1.30
C.	Pitot Tube Coefficient	0.84
D.	Dry Gas Meter Calibration Factor	1.0023
»»»	Is the Duct Round (Y/N)?	Y
E.	Duct Diameter (in.) - for round duct	114
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.440
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.06
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.06
K.	Average ΔH (in. H2O) variation	1.17
L.	Average Process Gas Temperature (°F)	540
M.	Average Dry Gas Meter Temperature (°F)	98
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	3.5
	Oxygen (%)	13.0
	Nitrogen (%)	83.5
	Carbon Monoxide (%)	0.0
	Hydrogen (%)	0.0
	Methane (%)	0.0
	Ethane (%)	0.0
	Argon (%)	0.0
O.	Sample Time (min)	120
P.	Total H2O Mass Collected in Impingers (g)	233.8
Q.	Metered Gas Volume (dcf)	72.203

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.41	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.60	[A+(K/13.6)]
T.	Duct Area (ft.^2)	7.09E+01	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	1.06E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	1000	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	558	[M+460]
X.	Dry Gas Volume Sampled (dscf)	67.737	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	11.024	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	14.0	[100*Y/(X+Y)]
AA.	Theoretical Maximum Percent H2O in Gas Stream (%) (empirical equation derived from EPA QA Handbook Vol. III, S3.3.6, T6.1A)	#N/A	[100*Saturated Water Vapor Pressure / Stack Pressure]
BB.	Actual Percent H2O in Gas Stream (%)	14.0	[Calculated %H2O <= Theoretical Max. %H2O]

CC. Process Gas Molecular Weight:

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.140		18	2.519
CO2	0.035	0.860	44	1.324
O2	0.130	0.860	32	3.578
N2	0.835	0.860	28	20.108
CO	0.000	0.860	28	0.000
H2	0.000	0.860	2	0.000
CH4	0.000	0.860	16	0.000
C2H6	0.000	0.860	30	0.000
Ar	0.000	0.860	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.53	
DD.	Average Process Gas Velocity (ft/sec)	1.95E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	8.31E+04	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	4.32E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	3.71E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	102.1	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0051	
JJ.	Front-Half Residue Weight (g)	0.0022	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0073	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0017	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	5.29E-01	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 6/1/00

TEST SITE: NO. 2 BATTERY COMBUSTION STACK — TEST NO.: CLR- #2BS-M26A-3

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		16.82	
QQ.	Concentration (mg/dscm)		8.77E+00	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		1.22E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.32	
TT.	Concentration (mg/dscm)	<	1.67E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.32E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)		0.03	
WW.	Concentration (mg/dscm)		1.78E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)		2.47E-03	[WW*0.02832*GG*60/454000]