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ADVANCED TECHNOLOGY SYSTEMS, INC.

Ref. Project No. 00-116-P

November 7, 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. 19 BATTERY COMBUSTION STACK ON SEPTEMBER 20, 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. 19 Battery Combustion Stack by Advanced Technology Systems, Inc. (ATS). Three two-hour test runs were conducted on September 20, 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 (°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 were 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

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, a heated Teflon-lined flexible 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 catches 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 was calculated to be greater than the minimum collection efficiency specified by the PA DEP (i.e., the ammonium catch of the Sample Fraction B was at most 10 percent of the ammonium catch from Sample Fraction A plus Sample Fraction B).

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:

A. M. Khosah

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

U.S. STEEL CLAIRTON WORKS
CLAIRTON, PENNSYLVANIA

TABLE 1

NO. 19 BATTERY COMBUSTION STACK
HYDROCHLORIC ACID, CHLORINE GAS AND AMMONIA GAS EMISSIONS DATA
SEPTEMBER 20, 2000

		Run 1	Run 2	Run 3	Average
Emissions Data					
Hydrochloric Acid (HCl)					
Concentration	(mg/dscm)	9.52E+00	1.01E+01	9.42E+00	9.68E+00
Mass Emission Rate	(lb/hr)	2.09E+00	2.43E+00	2.36E+00	2.29E+00
Chlorine Gas (Cl_2)					
Concentration	(mg/dscm)	< 2.01E-01	< 1.24E-01	< 9.70E-02	< 1.41E-01
Mass Emission Rate	(lb/hr)	< 4.42E-02	< 2.98E-02	< 2.43E-02	< 3.28E-02
Ammonia Gas (NH_3)					
Concentration	(mg/dscm)	3.14E-01	3.64E-02	2.09E-01	1.86E-01
Mass Emission Rate	(lb/hr)	6.90E-02	8.77E-03	5.24E-02	4.34E-02
Exhaust Stack Conditions					
Volumetric Flow Rate	(acfm)	1.32E+05	1.46E+05	1.53E+05	1.44E+05
	(scfm)	6.93E+04	7.62E+04	7.91E+04	7.49E+04
	(dscfm)	5.87E+04	6.44E+04	6.70E+04	6.34E+04
Temperature	(°F)	525	529	535	530
Moisture Content	(%)	15.2	15.5	15.3	15.3
Sampling Conditions					
Test Times	(EDT)	0731 to 0950	1013 to 1222	1245 to 1453	
Sampling Time - PM *	(minutes)	120	120	120	
Sample Volume - PM **	(dscf)	68.513	77.348	84.198	
Isokinetic Variation - PM ***	(%)	91.7	94.4	98.8	

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%

ATS
ADVANCED TECHNOLOGY SYSTEMS, INC.

U.S. STEEL CLAIRTON WORKS
CLAIRTON, PENNSYLVANIA

Hydrochloric Acid, Chlorine Gas and Ammonia Gas Emissions Testing Conducted at No. 19 Battery Combustion Stack on September 20, 2000

October 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

Page 1 of 2

CLIENT	U.S. Steel Clairton Works	TEST DATE	09-20-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	7
PLANT SITE	Clairton, PA	TEST NO.	CLR - #19BS - M26A - 1	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	497 QTZ
TEST UNIT	No. 19 Battery Combustion Stack	B.P. (in. Hg)	29.32	METER CORR. (Y)	1.0023	PROBE NO.	10-1
TEST CREW	JAN JPS KLA	STATIC P. (in. H2O)	-1.4	CALIBRATION DATE	9/20/99	NOZZLE DIA. (in.)	0.625
PROJECT NO.	00-116-P	STACK DIA. (in.)	192	PORT SIZE & TYPE	4" Nipples	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	68.3	0731	209.346	0.02	1.45	1.45	12.5	237	542	061	061	219	063	5 min./pt.
	48.0		207.600	0.01	0.73	0.73	7.5	250	549	063	061	175	051	5
	34.0		210.100	0.02	1.45	1.45	12.5	248	527	067	061	201	054	10
	22.7		212.700	0.01	0.73	0.73	7.5	235	518	068	062	218	059	15
	12.9		215.800	0.01	0.73	0.73	7.0	229	518	071	062	229	061	20
	4.1		217.800	0.02	1.45	1.45	12.0	225	511	073	063	236	062	25
		0801												30
B	68.3	0805	220.564	0.01	0.73	0.73	8.0	234	486	068	064	247	062	Sunny
	48.0		222.800	0.01	0.73	0.73	7.5	240	502	072	064	249	060	5
	34.0		224.8	0.01	0.74	0.74	7.6	241	527	074	064	249	061	10
	22.7		227.5	0.02	1.50	1.50	14.0	240	530	076	065	251	061	15
	12.9		230.7	0.01	0.74	0.74	7.2	238	532	074	065	253	064	20
	4.1	0835	233.0	0.01	0.74	0.74	7.0	223	502	075	066	251	064	25 235.300
	Page 1	Δ=60	Δ=	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			30
	Totals	min	dcf 30.954	0.013		0.977			(°F)	525	66.7 (°F)			Estimates:
	Test	Δ=	Δ=	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.5
	Totals	min 120	dcf 69.925	0.019		1.294			(°F)	525	71.1 (°F)			%H2O = 15

Dry Gas Composition

	Run 1	Run 2
CO2	4.5	
O2	10.5	
CO	—	
N2	85.0	

72.52
74.34

$= \left[\frac{\Sigma\sqrt{\Delta P}}{1}\right]^2$

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.005	< 0.02
After	18.00	0.005	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

@ $\%H_2O = 15.2$

$1 - 150 = 92$

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	513.6	454.6	59.0
2.	100 mL 0.1 N H2SO4	635.9	527.9	108.0
3.	100 mL 0.1 N H2SO4	597.2	549.6	47.6
4.	100 mL 0.1 N NaOH	574.8	507.5	67.3
5.	100 mL 0.1 N NaOH	499.0	544.7	-45.7
6.	~200 g Silica Gel	659.6	634.4	25.2
7.				
8.			Total=	261.4g

HIGH FLOW SOURCE SAMPLING DATA SHEET

Page 2 of 2

CLIENT	U.S. Steel Clairton Works	TEST DATE	09-20-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	7
PLANT SITE	Clairton, PA	TEST NO.	CLR - #19BS - M26A - 1	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	497-QTZ
TEST UNIT	No. 19 Battery Combustion Stack	B.P. (in. Hg)	29.32	METER CORR. (Y)	1.0023	PROBE NO.	10-1
TEST CREW	DAN JPS KLA	STATIC P. (in. H2O)	-1.4	CALIBRATION DATE	9/20/99	NOZZLE DIA. (in.)	0.625
PROJECT NO.	00-116-P	STACK DIA. (in.)	192	PORT SIZE & TYPE	4" Nipples	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	68.3	0838	235.300	0.01	0.74	0.74	7.0	232	548	072	067	253	064	5 min./pt.
	48.0		237.7	0.03	2.23	1.80	17.5	236	529	076	068	255	061	
	34.0		240.8	0.04	2.98	1.70	18.0	237	537	073	068	254	067	Max Vac Sunny
	22.7		244.1	0.03	2.23	1.70	18.0	239	543	072	069	256	071	
	12.9		247.5	0.03	2.23	1.70	18.0	235	544	072	070	256	074	
	4.1		250.7	0.02	1.50	1.70	18.0	232	517	073	070	256	075	
D	68.3	0920	254.169	0.02	1.50	1.50	13.0	250	495	073	071	261	070	Sunny
	48.0		257.3	0.03	2.23	1.70	18.0	246	514	077	071	257	069	5
	34.0		260.7	0.04	2.98	1.70	18.0	242	516	077	072	258	072	10
	22.7		264.1	0.03	2.23	1.70	18.0	240	512	077	073	259	074	15
	12.9		267.4	0.03	2.23	1.70	18.0	230	518	078	074	258	076	20
	4.1	0950	270.7	0.02	1.50	1.70	18.0	216	524	078	075	254	075	25
			274.271											30
														Estimates:
	Page 2	Δ = 60	Δ = 38.971	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =	(Tmeter) avg =				MW = 27.5
	Totals	min	dcf	0.027		1.612			(°F) 524.8	(°F) 75.5				%H2O = 15

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

74.6

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

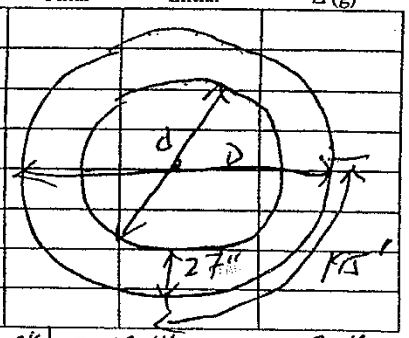
System Leak Check (60 sec)

	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.				



$\frac{\pi}{4}$ 15" D = 248"

.1 - 1 - (2*27") = 194" ≈ 192"

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	09-20-00	CONTROL BOX NO.	APEX- 4	HOT/COLD BOX NO.	5
PLANT SITE	Clairton, PA	TEST NO.	CLR - #19BS - M26A - 2	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	498 - QTZ
TEST UNIT	No. 19 Battery Combustion Stack	B.P. (in. Hg)	29.32	METER CORR. (Y)	1.0023	PROBE NO.	10 - 1
TEST CREW	DAN JPS KJA	STATIC P. (in. H2O)	-1.4	CALIBRATION DATE	9/20/99	NOZZLE DIA. (in.)	0.625
PROJECT NO.	00 - 116 - P	STACK DIA. (in.)	192	PORT SIZE & TYPE	4" Nipples	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
														↓ Change @
A	68.3	1013	274.967	0.02	1.52	1.5	9.0	209	554	078	079	222	077	5 min./pt.
	48.0		278.1	0.04	3.03	2.5	16.5	239	524	084	079	240	054	5 Umbilical in Sun
	34.0		282.0	0.02	1.52	1.7	9.5	249	531	084	080	246	060	10 H/C Box in Shade
	22.7		286.0	0.01	0.76	0.76	5.0	239	537	087	081	248	060	15
	12.9		288.5	0.01	0.76	0.76	5.0	217	540	089	081	250	060	20
	4.1		291.0	0.01	0.76	0.76	4.5	213	467	090	082	252	059	25
														30
B	68.3	1046	293.222	0.02	1.52	1.50	7.5	235	488	087	082	258	056	
	48.0		296.4	0.02	1.52	1.50	7.5	246	542	090	083	265	055	.
	34.0		299.6	0.01	0.76	0.76	4.6	248	548	090	083	264	058	.
	22.7		302.2	0.01	0.76	0.76	4.5	219	549	090	083	260	060	.
	12.9		304.5	0.01	0.76	0.76	4.5	231	546	091	084	265	061	.
	4.1		306.9	0.02	1.52	1.50	7.6	227	518	091	084	263	059	.
	Page 1	Δ=60	Δ= 35.104	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			→ 310.071
	Totals	min	dcf	0.016		1.230			528.7 (°F)		84.7 (°F)			Estimates:
	Test	Δ=120	Δ= 81.235	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.5
	Totals	min	dcf	0.0225		1.71			529 (°F)		87 (°F)			%H2O = 15

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

75.76

98% I

$= \left[\frac{\sum \sqrt{\Delta P_i}}{n}\right]^2$

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	7.0	0.007	< 0.02
After	16.5	0.019	< 0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

$\%H_2O = 15.5$

$\%ISO = 94$

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	661.3	492.1	169.2
2.	100 mL 0.1 N H2SO4	603.6	513.4	90.2
3.	100 mL 0.1 N H2SO4	568.7	551.6	17.1
4.	100 mL 0.1 N NaOH	531.6	527.7	3.9
5.	100 mL 0.1 N NaOH	574.8	573.8	1.0
6.	~200 g Silica Gel	616.9	598.5	18.4
7.				
8.			TOTAL	299.8 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	09-20-00	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	5
PLANT SITE	Clairton, PA	TEST NO.	CLR - #19BS - M26A - 2	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	498 - QTZ
TEST UNIT	No. 19 Battery Combustion Stack	B.P. (in. Hg)	29.32	METER CORR. (Y)	1.0023	PROBE NO.	10 - 1
TEST CREW	DAN JPS KJA	STATIC P. (in. H2O)	-1.4	CALIBRATION DATE	9/20/99	NOZZLE DIA. (in.)	0.625
PROJECT NO.	00 - 116 - P	STACK DIA. (in.)	192	PORT SIZE & TYPE	4" Nipples	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	68.3	1118	310.071	0.03	2.27	2.3	12.4	241	518	089	084	247	059	5 min./pt.
	48.0		314.1	0.03	2.27	2.3	12.4	242	542	089	084	240	058	
	34.0		318.0	0.04	3.07	2.9	16.0	239	550	090	084	233	059	
	22.7		322.3	0.03	2.27	2.3	12.5	236	556	089	084	241	060	Windy
	12.9		326.4	0.02	1.54	1.6	8.5	218	560	091	085	253	063	& Sunny
	4.1		330.1	0.02	1.54	1.5	8.0	204	516	093	085	244	064	
D	68.3	1152	333.281	0.02	1.54	1.5	8.0	227	488	089	085	244	064	
	48.0		336.1	0.03	2.27	2.3	12.5	228	530	091	085	234	063	
	34.0		339.9	0.03	2.27	2.3	12.5	242	532	091	085	240	065	
	22.7		344.1	0.04	3.07	2.9	16.5	236	532	092	086	222	068	
	12.9		348.3	0.04	3.07	2.9	16.5	225	539	089	086	228	075	
	4.1	1222	352.7	0.02	1.54	1.6	8.5	215	473	089	086	217	072	
			356.202											
	Page 2	Δ = 60	Δ = 46.131	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			Estimates:
	Totals	min	dcf	0.029		2.19			528 (°F)		88 (°F)			MW = 27.5
														%H2O = 15

Dry Gas Composition

	Run 1	Run 2
CO2	4%	
O2	11%	
CO	-	
N2	85%	

76.8%

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

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 09-20-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO. 8
PLANT SITE	Clairton, PA	TEST NO. CLR-#19BS-M26A- 3	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO. 462 QTZ
TEST UNIT	No. 19 Battery Combustion Stack	B.P. (in. Hg) 29.32	METER CORR. (Y)	1.0023	PROBE NO. 10-1
TEST CREW	IAN, JS, KA	STATIC P. (in. H2O) -1.40	CALIBRATION DATE	9/20/99	NOZZLE DIA. (in.) 0.625
PROJECT NO.	00-116-P	STACK DIA. (in.) 192	PORT SIZE & TYPE	4" Nipples	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	68.3	1245	356.928	0.02	1.55	1.55	6.0	246	520	85	85	241	65	5 min./pt.
	48.0			0.02	1.55	1.55	6.0	246	530	90	85	242	65	
	34.0			0.02	1.54	1.54	6.0	246	538	92	86	243	65	
	22.7			0.02	1.54	1.54	6.0	246	539	94	86	241	60	
	12.9			0.02	1.54	1.54	6.0	246	540	94	87	241	60	
	4.1	1315	376.084	0.01	0.80	0.80	4.0	245	500	93	87	241	60	
B	68.3	1317	376.084	0.03	2.35	2.35	8.0	245	519	92	87	240	57	
	48.0			0.02	1.57	1.57	7.0	245	540	93	88	240	57	
	34.0			0.02	1.57	1.57	7.0	244	550	94	88	241	53	
	22.7			0.02	1.52	1.52	6.0	243	554	95	88	241	53	
	12.9			0.01	0.76	0.76	3.5	243	546	96	88	241	53	
	4.1	1347	396.223	0.02	1.53	1.53	6.0	243	500	96	88	241	53	
	Page 1	Δ=60	Δ=39.295	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			
	Totals	min	dcf	0.019		1.225			531 (°F)		90 (°F)			Estimates:
	Test	Δ=120	Δ=89.052	(ΔP) avg =	(ΔH) avg =				(Tstack) avg =		(Tmeter) avg =			MW = 27.5
	Totals	min	dcf	0.025		1.82			535 (°F)		91 (°F)			%H2O = 15

Dry Gas Composition

	Run 1	Run 2
CO2	4.5%	
O2	11%	
CO	-	
N2	84.5%	

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

System Leak Check (60 sec)

	Vacuum (in. Hg)	DGM Rate (cfm)	Required (cfm)
Before	5.00	0.007	<0.02
After	12.00	0.010	<0.02

Pitot Leak Check (15 sec)

	Positive	Negative
Before	OK	OK
After	OK	OK

%H2O = 15.3

%ISO = ~~100~~ 99

No.	Impinger Contents	Final	Initial	Δ (g)
1.	50 mL 0.1 N H2SO4	585.8	417.3	168.5
2.	100 mL 0.1 N H2SO4	602.3	491.3	111.0
3.	100 mL 0.1 N H2SO4	545.5	540.1	5.4
4.	100 mL 0.1 N NaOH	509.4	508.2	1.2
5.	100 mL 0.1 N NaOH	555.9	548.0	7.9
6.	~200 g Silica Gel	672.2	644.5	27.7
7.				
8.			TOTAL	321.7 g

HIGH FLOW SOURCE SAMPLING DATA SHEET

CLIENT	U.S. Steel Clairton Works	TEST DATE	09-20-2000	CONTROL BOX NO.	APEX-4	HOT/COLD BOX NO.	8
PLANT SITE	Clairton, PA	TEST NO.	CLR-#19BS-M26A-3	ORIFICE FACTOR (ΔH@)	2.003	FILTER NO.	462 QTZ
TEST UNIT	No. 19 Battery Combustion Stack	B.P. (in. Hg)	29.32	METER CORR. (Y)	1.0023	PROBE NO.	10-1
TEST CREW	DAN, JS, KA	STATIC P. (in. H2O)	-1.40	CALIBRATION DATE	9/20/99	NOZZLE DIA. (in.)	0.625
PROJECT NO.	00-116-P	STACK DIA. (in.)	192	PORT SIZE & TYPE	4" Nipples	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	68.3	1350	396.223	0.04	3.13	3.13	12.0	244	525	92	89	243	52	5 min./pt.
	48.0			0.04	3.13	3.13	12.0	244	551	92	89	243	52	
	34.0			0.04	3.13	3.13	12.0	243	557	92	89	244	51	
	22.7			0.04	3.13	3.13	12.0	244	558	92	89	243	51	
	12.9			0.03	2.25	2.25	9.0	243	562	92	88	244	51	
	4.1	1420	422.183	0.03	2.25	2.25	9.0	243	521	95	89	244	51	
D	68.3	1423	422.183	0.03	2.25	2.25	9.0	245	524	91	89	244	50	
	48.0			0.03	2.25	2.25	9.0	245	533	94	88	244	50	
	34.0			0.03	2.32	2.32	9.0	245	536	95	89	244	50	
	22.7			0.03	2.32	2.32	9.0	244	535	93	89	244	50	
	12.9			0.02	1.57	1.57	7.0	244	544	93	89	243	50	
	4.1	1453	445.980	0.02	1.57	1.57	7.0	243	521	93	89	243	49	
	Page 2	Δ = 60	Δ = 49.757	(ΔP) avg =	(ΔH) avg =	2.41			(Tstack) avg =		(Tmeter) avg =			Estimates:
	Totals	min	dcf	0.031					539 (°F)		91 (°F)			MW = 27.5
														%H2O = 15

Dry Gas Composition

	Run 1	Run 2
CO2		
O2		
CO		
N2		

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

System Leak Check (60 sec)

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

Pitot Leak Check (15 sec)

	Positive	Negative
Before	PER PAGE	ONE
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.				

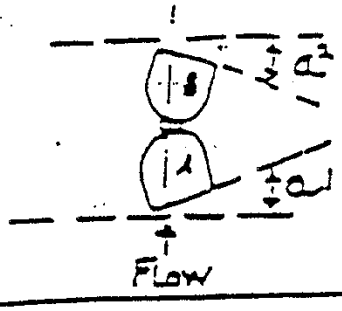
APEX GLASS NOZZLE CALIBRATION DATA SHEET

Printed: 09/18/00

Nozzle No.	Size (inches)					Calibrated	
	Avg.		A	B	C	By	Date
52	0.440		0.440	0.440	0.440	KA	05/01/00
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	09/18/00
46	0.625		0.625	0.625	0.625	KA	09/18/00
43	0.750		0.750	0.750	0.750	KA	01/05/00

GEOMETRIC PITOT CALIBRATION

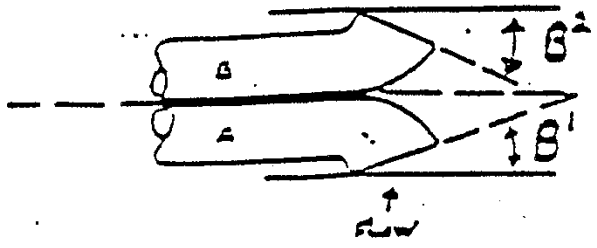
Caliper #: XFS-59
Probe #: 10-1
Date: 02-10-00
Initials: KBH

① 

α^1 = 1°
α^2 = 2° → $\alpha^1, \alpha^2 = <10°$

β^1 = 1°
β^2 = 1° → $\beta^1, \beta^2 = <5°$

F = 0.975"

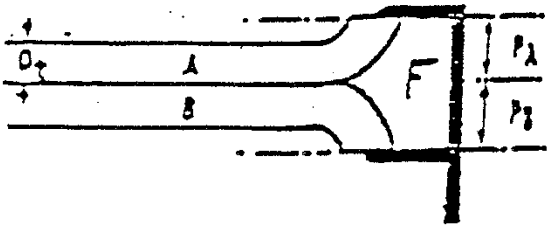
② 

μ = 0.017" $\mu = \leq 0.1250"$ ($\gamma_{TAN} \times F = \mu$)

V = 0.000" $V = \leq 0.03125"$ ($\theta_{TAN} \times F = V$)

W = 0.195" $W \geq 0"$

X = 0.321" $X \geq 0.750"$ (3/4" using 1/2" scale)

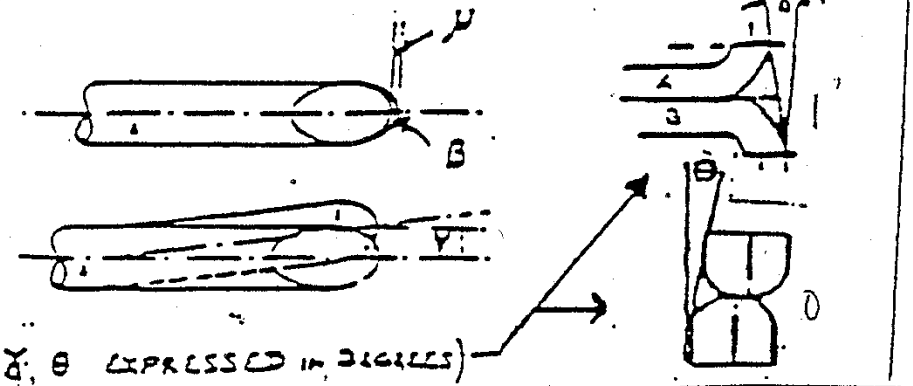
③ 

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

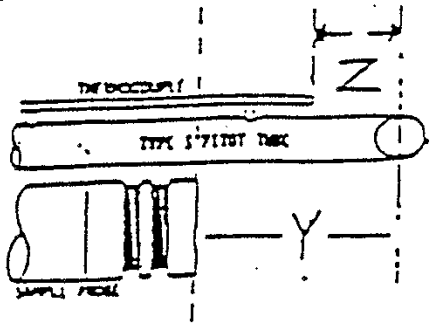
Y = 6.215" $Y \geq 3.0"$

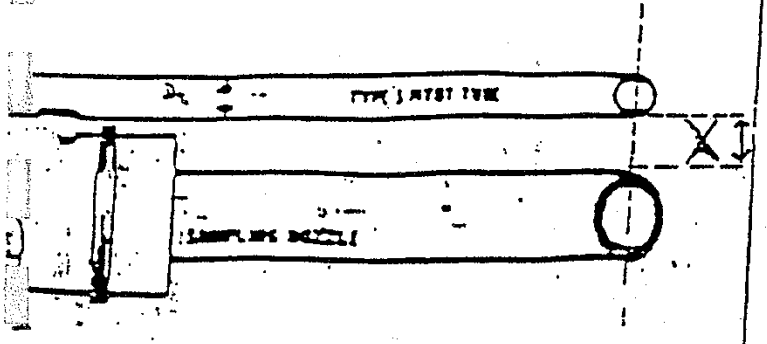
Z = 2.417" $Z > 2.0"$

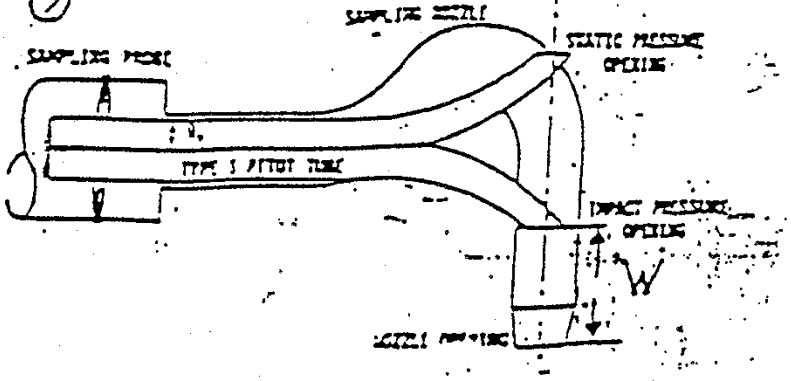
D_t = 0.376" $D_t > .1875"$

④ 

γ, θ EXPRESSED IN DEGREES

⑥ 

⑤ 

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 09-24-99
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		331.550			3.0	8.0
	MIDWAY			71		95	80		
	STOP	5.000	5:25		336.644				
	DELTA *	5.000	5.42		5.094				
Dry Gas Meter Leak Check	START	0.056	0		336.713			0.0	1.0
	STOP	0.358	10:00		337.112				
	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 10-20-98
BAROMETRIC PRESSURE (in. Hg) 29.24

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		752.023			1.5	18.0
	MIDWAY			67		83	74		
	STOP	5.000	7:43		757.099				
	DELTA *	5.000	7.72		5.076				
2	START	0.000	0		757.099			1.5	18.0
	MIDWAY			67		83	74		
	STOP	5.000	7:43		762.172				
	DELTA *	5.000	7.72		5.073				
3	START	0.000	0		762.172			1.5	18.0
	MIDWAY			67		83	75		
	STOP	5.000	7:43		767.253				
	DELTA *	5.000	7.72		5.081				
Dry Gas	START	0.130	0		767.398			0.0	18.0
Meter Leak	STOP	0.302	10:00		767.658				
Check	DELTA *	0.172	10.0		0.260				

{DELTA Vw (cf) - DELTA Vd (dcf)} / 10 (min.) = 0.0088 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)	29.24	29.24	29.24	
Time (min)	7.72	7.72	7.72	
Tw (°F)	67	67	67	
Vw (cf)	5.000	5.000	5.000	
Ti (°F)	83	83	83	
To (°F)	74	74	75	
ΔH (in. H2O)	1.50	1.50	1.50	
Vm (dcf)	5.076	5.073	5.081	
Y (Pre-test)				1.0023
ΔH@ (in. H2O)	2.016	2.016	2.012	2.015
Y (Post-test)	1.0027	1.0033	1.0027	1.0029
ΔY (%)				0.1%

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

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

4000 Tech Center Drive
Monroeville, PA 15146
412 825 2400
fax: 412 825 2407
IH & Environmental Laboratory

UEC
USX Engineers
& Consultants, Inc.

October 4, 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 September 26, 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 - 10/03/2000

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. # : 3858 SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 4156 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	
35806	CLR-19BS-M26A-3A	CHLORIDE	09/20/00	*	*	*	09/29/00	47							2.0 mg/L	E
35807	CLR-19BS-M26A-3B	CHLORIDE	09/20/00	*	*	*	09/29/00	3.1							2.0 mg/L	E
35808	CLR-19BS-M26A-3C	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35809	CLR-19BS-M26A-3D	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35810	CLR-H2SO4-BLK	CHLORIDE	09/21/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35811	CLR-NAOH-BLK	CHLORIDE	09/21/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35812	CLR-19BS-M26A-1A	CHLORIDE	09/20/00	*	*	*	09/29/00	47							2.0 mg/L	E
35813	CLR-19BS-M26A-1B	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35814	CLR-19BS-M26A-1C	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35815	CLR-19BS-M26A-1D	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35816	CLR-19BS-M26A-2A	CHLORIDE	09/20/00	*	*	*	09/29/00	51							2.0 mg/L	E
35817	CLR-19BS-M26A-2B	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E
35818	CLR-19BS-M26A-2C	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E

COMMENTS: SAMPLES ARE BLANK CORRECTED.

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. # : 3858 SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 4156 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	
35819	CLR-19BS-M26A-2D	CHLORIDE	09/20/00	*	*	*	09/29/00	<2.0							2.0 mg/L	E

COMMENTS: SAMPLES ARE BLANK CORRECTED.

ANALYST : N. Kaftel Date: 10-3-00

APPROVED: Stephanie A Guilyard Date: 10/5/00

Stephanie A. Guilyard, IHIT, Project Manager

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

4000 Tech Center Drive
Monroeville, PA 15146
412 825 2400
fax: 412 825 2407
IH & Environmental Laboratory

UEC
USX Engineers
& Consultants, Inc.

RECEIVED NOV 0 2 2000

October 9, 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 September 26, 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

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 - 10/05/2000

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. # : 3858 SITE LOCATION : US STEEL CLAIRTON WORKS

TRACKING NUMBER: 4156

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	
35806	CLR-19BS-M26A-3A	AMMONIUM-WATER	09/20/00	*	*	*	09/26/00			1.1					0.1	E
35807	CLR-19BS-M26A-3B	AMMONIUM-WATER	09/20/00	*	*	*	09/26/00			0.2					0.1	E
35810	CLR-H2SO4-BLK	AMMONIUM-WATER	09/21/00	*	*	*	09/26/00			< 0.1					0.1	E
35812	CLR-19BS-M26A-1A	AMMONIUM-WATER	09/20/00	*	*	*	09/26/00			1.6					0.1	E
35813	CLR-19BS-M26A-1B	AMMONIUM-WATER	09/20/00	*	*	*	09/26/00			0.2					0.1	E
35816	CLR-19BS-M26A-2A	AMMONIUM-WATER	09/20/00	*	*	*	09/26/00			0.2					0.1	E
35817	CLR-19BS-M26A-2B	AMMONIUM-WATER	09/20/00	*	*	*	09/26/00			< 0.1					0.1	E

COMMENTS: REVISION: Results for samples PRN35806 and PRN35807 have been corrected. Please note changes to these samples.

ANALYST James J. Miller Date: 10-5-2000

APPROVED Stephanie A Guilyard Date: 10/16/00
Stephanie A. Guilyard, IHIT, Project Manager

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

RECEIVED NOV 0 2 2000

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

Sodium Thiosulfate
$Na_2S_2O_3 \cdot 3.5H_2O$
prior to analysis

CHAIN OF CUSTODY RECORD

PROJECT NUMBER 00-116-P ; P.O. #3858
PROJECT NAME U.S. Steel Clairton Works
ANALYTICAL LAB VEC III and Environmental Laboratories
DELIVER TO Sample Receiving
COMMENTS
No. 19 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 wet chemistry method	REMARKS OR OBSERVATIONS
	CLR-#19BS-M26A-1A	09-20-00	0731 →	1	Comp.	✓	✓	0.1N H_2SO_4 - Sample volume = 382.3 mL
	CLR-#19BS-M26A-1B		0950 EDT	1		✓	✓	0.1N H_2SO_4 - Sample volume = 167.1 mL
*	CLR-#19BS-M26A-1C			1		✓		* 0.1N NaOH - Sample volume = 195.3 mL
*	CLR-#19BS-M26A-1D			1		✓		* 0.1N NaOH - Sample volume = 83.9 mL
	CLR-#19BS-M26A-2A	09-20-00	1013 →	1	Comp.	✓	✓	0.1N H_2SO_4 - Sample volume = 421.9 mL
	CLR-#19BS-M26A-2B		1222 EDT	1		✓	✓	0.1N H_2SO_4 - Sample volume = 136.4 mL
*	CLR-#19BS-M26A-2C			1		✓		* 0.1N NaOH - Sample volume = 135.3 mL
*	CLR-#19BS-M26A-2D			1		✓		* 0.1N NaOH - Sample volume = 128.4 mL

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	ICE CHEST #
John P. Shimshock	09-25-00	1515 EDT		09-25-00	1515	
Judy Ohrtman	9.26-00	9:25 AM	Judy Ohrtman	9.26-00	8:15 AM	CHEST TEMP.
						TAG #

ATS 10/98

PAGE 1 OF →

639 Alpha Drive
RIDC Park
Harmarville, PA 15238
TRACKING NUMBER: 4156

Work Requested by : Mr. John Shimshock
Phone No. : 412-967-1900
CUSTOMER P.O. # : 3858

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 g Sodium Thiosulfate $Na_2S_2O_3 \cdot 3.5H_2O$ prior to analysis

CHAIN OF CUSTODY RECORD

PROJECT NUMBER ~~XX~~ 116-P ; P.O. # 3858
PROJECT NAME U.S. Steel Clairton Works
ANALYTICAL LAB WEC Air and Environmental Laboratories
DELIVER TO Sample Receiving
COMMENTS
No. 9 Battery Combustion Stack

Legend:
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	ANALYSES TO BE CONDUCTED: Chloride ion via ion chromatography	ANALYSES TO BE CONDUCTED: Ammonium ion via wet chemistry method		REMARKS OR OBSERVATIONS
CLR-#1985-M26A-3A	09-20-00	1245 →	1	Comp.	✓	✓		0.1 N H_2SO_4 - Sample volume = 456.1 ml
CLR-#1985-M26A-3B	↓	1453 EDT	1	↓	✓	✓		0.1 N H_2SO_4 - Sample volume = 129.3 ml
* CLR-#1985-M26A-3C	↓	↓	1	↓	✓		*	0.1 N NaOH - Sample volume = 115.7 ml
* CLR-#1985-M26A-3D	↓	↓	1	↓	✓		*	0.1 N NaOH - Sample volume = 123 ml
CLR-H2SO4-BLK	09-21-00	1600 EDT	1	Grab	✓	✓		0.1 N H_2SO_4
CLR-NAOH-BLK	↓	↓	1	↓	✓		*	0.1 N NaOH

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	ICE CHEST #
John P. Shemchuck	09-25-00	1515 EDT	Kelly Eg	09-25-00	1515	1
			Judy Ashley	9-26-00	8:15	CHEST TEMP. 4°C
Judy Ashley	9-26-00	9:25 AM				
						TAG #

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
TEST SITE: NO. 19 BATTERY COMBUSTION STACK

TEST DATE: 9/20/00
TEST NO.: CLR- #19BS-M26A-1

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.32
B.	Process Gas Static Pressure (in. H2O)	-1.40
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	192
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.625
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.019
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic variation	0.019
K.	Average ΔH (in. H2O)	1.29
L.	Average Process Gas Temperature (°F)	525
M.	Average Dry Gas Meter Temperature (°F)	71
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	4.5
	Oxygen (%)	10.5
	Nitrogen (%)	85.0
	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)	261.4
Q.	Metered Gas Volume (dcf)	69.925

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.22	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.41	[A+(K/13.6)]
T.	Duct Area (ft.^2)	2.01E+02	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	2.13E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	985	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	531	[M+460]
X.	Dry Gas Volume Sampled (dscf)	68.513	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	12.325	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	15.2	[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 (%)	15.2	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.152		18	2.744
CO2	0.045	0.848	44	1.678
O2	0.105	0.848	32	2.848
N2	0.850	0.848	28	20.171
CO	0.000	0.848	28	0.000
H2	0.000	0.848	2	0.000
CH4	0.000	0.848	16	0.000
C2H6	0.000	0.848	30	0.000
Ar	0.000	0.848	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.44	
DD.	Average Process Gas Velocity (ft/sec)	1.10E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	1.32E+05	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	6.93E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	5.87E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	91.7	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0109	
JJ.	Front-Half Residue Weight (g)	0.0295	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0404	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0091	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	4.58E+00	[NN*GG*60/7000]

U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
NO. 19 BATTERY COMBUSTION STACK
SEPTEMBER 20, 2000
U.S. EPA CONDITIONAL TEST METHOD 027 SAMPLING
CALCULATION OF THE IMPINGER COLLECTION EFFICIENCIES

Test No.	Sample ID (CLR-#19BS -M26A-)	Sample Type	Ammonium Conc. (mg / L)	Sample Volume (mL)	Ammonium Catch (mg)	Collection Efficiency (%)
1	1A	0.1 N H2SO4 - Impingers 1 & 2	1.6	382.3	0.61	94.5
	1B	0.1 N H2SO4 - Impinger 3	0.2	167.1	0.03	
2	2A	0.1 N H2SO4 - Impingers 1 & 2	0.2	421.9	0.08	100.0
	2B	0.1 N H2SO4 - Impinger 3	< 0.1	136.4	< 0.01	
3	3A	0.1 N H2SO4 - Impingers 1 & 2	1.1	456.1	0.50	94.8
	3B	0.1 N H2SO4 - Impinger 3	0.2	129.3	0.03	
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

U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
NO. 19 BATTERY COMBUSTION STACK
SEPTEMBER 20, 2000
U.S. EPA REFERENCE METHOD 26A SAMPLING
CALCULATION OF THE IMPINGER COLLECTION EFFICIENCIES

Test No.	Sample ID (CLR-#19BS -M26A-)	Sample Type	Chloride Conc. (mg / L)	Sample Volume (mL)	Chloride Catch (mg)	Collection Efficiency (%)
1	1A	0.1 N H2SO4 - Impingers 1 & 2	47	382.3	17.97	100.0
	1B	0.1 N H2SO4 - Impinger 3	< 2.0	167.1	< 0.33	
	1C	0.1 N NaOH - Impinger 4	< 2.0	195.3	< 0.39	NA
	1D	0.1 N NaOH - Impinger 5	< 2.0	83.9	< 0.17	
2	2A	0.1 N H2SO4 - Impingers 1 & 2	51	421.9	21.52	100.0
	2B	0.1 N H2SO4 - Impinger 3	< 2.0	136.4	< 0.27	
	2C	0.1 N NaOH - Impinger 4	< 2.0	135.3	< 0.27	NA
	2D	0.1 N NaOH - Impinger 5	< 2.0	128.0	< 0.26	
3	3A	0.1 N H2SO4 - Impingers 1 & 2	47	456.1	21.44	98.1
	3B	0.1 N H2SO4 - Impinger 3	3.1	129.3	0.40	
	3C	0.1 N NaOH - Impinger 4	< 2.0	115.7	< 0.23	NA
	3D	0.1 N NaOH - Impinger 5	< 2.0	123.0	< 0.25	
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

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
TEST SITE: NO. 19 BATTERY COMBUSTION STACK
TEST DATE: 9/20/00
TEST NO.: CLR- #19BS-M26A-1

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		18.47	
QQ.	Concentration (mg/dscm)		9.52E+00	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		2.09E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.39	
TT.	Concentration (mg/dscm)	<	2.01E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	4.42E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)		0.61	
WW.	Concentration (mg/dscm)		3.14E-01	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)		6.90E-02	[WW*0.02832*GG*60/454000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
TEST SITE: NO. 19 BATTERY COMBUSTION STACK
TEST DATE: 9/20/00
TEST NO.: CLR- #19BS-M26A-2

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.32
B.	Process Gas Static Pressure (in. H2O)	-1.40
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	192
F.	Duct Width (in.) - for rectangular duct	0
G.	Duct Depth (in.) - for rectangular duct	0
H.	Nozzle Diameter (in.)	0.625
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.023
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.023
K.	Average ΔH (in. H2O) variation	1.71
L.	Average Process Gas Temperature (°F)	529
M.	Average Dry Gas Meter Temperature (°F)	87
N.	Dry Gas Composition (should total to 100%)	
	Carbon Dioxide (%)	4.0
	Oxygen (%)	11.0
	Nitrogen (%)	85.0
	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)	299.8
Q.	Metered Gas Volume (dcf)	81.235

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.22	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.45	[A+(K/13.6)]
T.	Duct Area (ft.^2)	2.01E+02	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	2.13E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	989	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	547	[M+460]
X.	Dry Gas Volume Sampled (dscf)	77.348	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	14.136	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	15.5	[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 (%)	15.5	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.155		18	2.781
CO2	0.040	0.845	44	1.488
O2	0.110	0.845	32	2.976
N2	0.850	0.845	28	20.123
CO	0.000	0.845	28	0.000
H2	0.000	0.845	2	0.000
CH4	0.000	0.845	16	0.000
C2H6	0.000	0.845	30	0.000
Ar	0.000	0.845	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.37	
DD.	Average Process Gas Velocity (ft/sec)	1.21E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	1.46E+05	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	7.62E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	6.44E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	94.4	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0086	
JJ.	Front-Half Residue Weight (g)	0.0315	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0401	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0080	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	4.41E+00	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA — TEST DATE: 9/20/00

TEST SITE: NO. 19 BATTERY COMBUSTION STACK — TEST NO.: CLR- #19BS-M26A-2

Hydrochloric Acid (corrected for blank)				
PP.	Total Catch (mg)		22.12	
QQ.	Concentration (mg/dscm)		1.01E+01	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		2.43E+00	[QQ*0.02832*GG*60/454000]
Chlorine Gas Acid (corrected for blank)				
SS.	Total Catch (mg)	<	0.27	
TT.	Concentration (mg/dscm)	<	1.24E-01	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.98E-02	[TT*0.02832*GG*60/454000]
Ammonia Gas Acid (corrected for blank)				
VV.	Total Catch (mg)		0.08	
WW.	Concentration (mg/dscm)		3.64E-02	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)		8.77E-03	[WW*0.02832*GG*60/454000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA
TEST DATE: 9/20/00
TEST SITE: NO. 19 BATTERY COMBUSTION STACK
TEST NO.: CLR- #19BS-M26A-3

Input Parameters (excluding analytical data)

A.	Barometric Pressure (in. Hg)	29.32	
B.	Process Gas Static Pressure (in. H2O)	-1.40	
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	192	
F.	Duct Width (in.) - for rectangular duct	0	
G.	Duct Depth (in.) - for rectangular duct	0	
H.	Nozzle Diameter (in.)	0.625	
I.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for flows	0.025	
J.	Average ΔP (in. H2O) = [(ΔP^0.5)avg]^2 - for isokinetic	0.025	
K.	Average ΔH (in. H2O) variation	1.82	
L.	Average Process Gas Temperature (°F)	535	
M.	Average Dry Gas Meter Temperature (°F)	91	
N.	Dry Gas Composition (should total to 100%)		
	Carbon Dioxide (%)	4.5	
	Oxygen (%)	11.0	
	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)	321.7	
Q.	Metered Gas Volume (dcf)	89.052	

Calculated Parameters (excluding analytical data)

R.	Absolute Process Gas Pressure (in. Hg)	29.22	[A+(B/13.6)]
S.	Absolute Meter Pressure (in. Hg)	29.45	[A+(K/13.6)]
T.	Duct Area (ft.^2)	2.01E+02	[Pi*E²/(4*144) or F*G/144]
U.	Nozzle Area (ft.^2)	2.13E-03	[Pi*H²/(4*144)]
V.	Average Absolute Process Gas Temperature (R)	995	[L+460]
W.	Average Absolute Dry Gas Meter Temperature (R)	551	[M+460]
X.	Dry Gas Volume Sampled (dscf)	84.198	[Q*D*(528/W)*(S/29.92)]
Y.	H2O Vapor Condensed (scf)	15.168	[P*0.04715]
Z.	Calculated Percent H2O in Gas Stream (%)	15.3	[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 (%)	15.3	[Calculated %H2O <= Theoretical Max. %H2O]
CC.	Process Gas Molecular Weight:		

Gas	% Volume / 100	* (1 - %H2O/100)	* Mol. Weight	= Wt./Mol
H2O	0.153		18	2.748
CO2	0.045	0.847	44	1.678
O2	0.110	0.847	32	2.983
N2	0.845	0.847	28	20.048
CO	0.000	0.847	28	0.000
H2	0.000	0.847	2	0.000
CH4	0.000	0.847	16	0.000
C2H6	0.000	0.847	30	0.000
Ar	0.000	0.847	40	0.000

	Process Gas Molecular Weight (lb/lb-mol)	27.46	
DD.	Average Process Gas Velocity (ft/sec)	1.26E+01	[85.49*C*[(I*V)/(R*CC)]^0.5]
EE.	Process Gas Volumetric Flow Rate (acfm)	1.53E+05	[DD*T*60]
FF.	Process Gas Volumetric Flow Rate (scfm)	7.91E+04	[EE*(528/V)*(R/29.92)]
GG.	Process Gas Volumetric Flow Rate (dscfm)	6.70E+04	[FF*(1-(BB/100))]
HH.	Isokinetic Variation (%)	98.8	[100*V*{(0.002669*P)+(Q*D*S/W)}] /

Particulate Matter Results (corrected for blank)

II.	Filter Weight (g)	0.0113	
JJ.	Front-Half Residue Weight (g)	0.0324	
KK.	Back-Half H2O-Condensibles Weight (g)	0.0000	
LL.	Total Weight (g)	0.0437	[II+JJ+KK]
NN.	Concentration (gr/dscf)	0.0080	[(7000/454)*LL/X]
OO.	Mass Flow Rate (lb/hr)	4.59E+00	[NN*GG*60/7000]

PROCESS GAS TESTING CALCULATIONS - ISOKINETIC SAMPLING

CLIENT: U.S. STEEL CLAIRTON WORKS - CLAIRTON, PA | TEST DATE: 9/20/00

TEST SITE: NO. 19 BATTERY COMBUSTION STACK | TEST NO.: CLR- #19BS-M26A-3

Hydrochloric Acid (corrected for blank)

PP.	Total Catch (mg)		22.45	
QQ.	Concentration (mg/dscm)		9.42E+00	[PP/(X*0.02832)]
RR.	Mass Flow Rate (lb/hr)		2.36E+00	[QQ*0.02832*GG*60/454000]

Chlorine Gas Acid (corrected for blank)

SS.	Total Catch (mg)	<	0.23	
TT.	Concentration (mg/dscm)	<	9.70E-02	[SS/(X*0.02832)]
UU.	Mass Flow Rate (lb/hr)	<	2.43E-02	[TT*0.02832*GG*60/454000]

Ammonia Gas Acid (corrected for blank)

VV.	Total Catch (mg)		0.50	
WW.	Concentration (mg/dscm)		2.09E-01	[VV/(X*0.02832)]
XX.	Mass Flow Rate (lb/hr)		5.24E-02	[WW*0.02832*GG*60/454000]