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November 29, 2022

Mr. Mitch Greger
Maryland Department of the Environment
Air Quality Compliance Program
Air and Radiation Management Administration
1800 Washington Boulevard, Suite 715
Baltimore, MD 21230-1720

SUBJECT: **Montgomery County Resource Recovery Facility**
2022 RATA Test Report

Dear Mitch:

Enclosed please find the Relative Accuracy Test Audit (RATA) report for the Montgomery County Resource Recovery Facility (MCRRF). The testing was performed by Testar, Inc., on September 19-20 and November 9, 2022. RATA testing was completed on the continuous emission monitoring system (CEMS) in accordance with 40 CFR Part 60, Appendices B and F. A summary of the results is attached to this letter.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If you have any questions regarding these documents, please contact me at (301) 691-9004.

Best regards,

Michael Pope
Facility Manager

Attachments (Flash Drive)

cc: EPA Region III
Joe Walsh
Lonnie Heflin
Joe LaDana
John Schott

ANNUAL RELATIVE ACCURACY TEST REPORT #22050R

Text and Appendices

PERFORMED FOR:

COVANTA ENERGY GROUP, INC.

Morristown, New Jersey

at the

Montgomery County Resource Recovery Facility

Dickerson, Maryland

Units 1, 2, and 3 SDA Inlets and Stacks

September 2022

by

TESTAR Engineering, PC

5100 Unicon Drive, Suite 102

Wake Forest, North Carolina 27587

License Number C-3896

919/957-9500

PE CERTIFICATION
REPORT #22050R

I hereby certify that I have personally examined and am familiar with the information submitted herein. Based upon my own knowledge and my inquiry of those individuals responsible for obtaining the information presented, the foregoing information is true, accurate and complete. I am aware that this information is being requested for the purpose of determining compliance with local, state, and federal laws and may be submitted to appropriate governmental regulatory agencies for those purposes. I am aware that there are significant penalties for submitting false information to such agencies, including the possibility of fine and imprisonment.

Signature: _____ Date: 11/15/22

Gary L. Williams, PE, QSTI
Director

Professional Engineer, State of North Carolina

Seal Number 025432

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1 INTRODUCTION

1.1 General

Covanta Energy Group, Inc. contracted TESTAR Engineering, PC to conduct an Annual Relative Accuracy Test Audit (RATA) on the existing CEM systems serving Units 1, 2, and 3 at the Montgomery County Resource Recovery Facility in Dickerson, Maryland. The relative accuracy test results satisfied the requirements of 40 CFR Part 60, Appendix B and F. The testing program was conducted between September 19 and 21, and November 09, 2022 by TESTAR Engineering under the supervision of Mr. Steve Adams of Covanta Energy Group, Inc.

1.2 Test Personnel

Table 1-1 presents the personnel that were involved in the testing program.

Table 1-1
Test Personnel

Affiliation	Personnel Responsibility
Covanta Energy Group, Inc.	Steve Adams Test Coordinator
TESTAR Engineering, PC	William Snipes Project Director
	Chris Wrenn Project Director
	Charles Nahrebecki CEM Test Engineer
	Brad Ouzts Test Engineer
	Jorge Vazquez Test Engineer
	Sean Daley Test Engineer
	Jeff Aims Field Laboratory Manager

2 SUMMARY OF RESULTS

2.1 Report Organization

The results of the testing project are summarized in Section 2. The process tested is discussed in Section 3. The sampling and analytical methods utilized are discussed in Section 4 while the Quality Assurance/Quality Control results are presented in Section 5. Appendix A contains detailed results of the testing program. Appendix B contains Reference Method Field Data for O_2, CO_2, SO_2, NO_x, and CO. Appendix C contains Reference Method Field Data for hydrogen chloride, air flow and moisture. Appendix D contains the Source Data CEMS Printouts for O_2, CO_2, SO_2, NO_x, CO, HCl, and Metric Tonnes per hour of CO_2. Appendix E contains all reference method calibration data. Refer to the Table of Contents and the List of Tables for a complete reference with appropriate page numbers.

2.2 Presentation of Results

Table 2-1 presents the results of the Relative Accuracy Test Audit (RATA) conducted on Unit 1. Table 2-2 presents the results of the Relative Accuracy Test Audit (RATA) conducted on Unit 2. Table 2-3 presents the results of the Relative Accuracy Test Audit (RATA) conducted on Unit 3. A more detailed summary of sampling gas parameters is presented in Appendix A.

2.3 Incomplete RATA, Unit 2 Inlet, HCl

All field data from RATA test runs conducted on September 20 and 22, 2022, on Unit 2 inlet (economizer) HCl system is included in Appendices B and C.

Table 2-1
RATA Test Summary, Unit 1

Parameter	Serial Number	Location	Units	Result	Specification
Oxygen	N3P2200-O2	Unit 1 Inlet	Dry Volume %	0.1 %	≤ 1.0% Absolute Mean Difference [1]
	01440/4008	Unit 1 Stack	Dry Volume %	0.1 %	≤ 1.0% Absolute Mean Difference [1]
Carbon Dioxide	A0E 2901T	Unit 1 Stack	Dry Volume %	0.1 %	≤ 1.0% Absolute Mean Difference [1]
	A0E 2901T	Unit 1 Stack	MT/hr	1.9 %	≤ 20% Relative Accuracy [2]
Sulfur Dioxide	N3P2200-SO2	Unit 1 Inlet	ppm @ 7% O_2	2.3 %	≤ 20% Relative Accuracy [3]
	N3P2207-SO2	Unit 1 Stack	ppm @ 7% O_2	0.9 %	≤ 20% of the applicable standard [3]
	N3P2207-SO2	Unit 1 Stack	lb/hr	0.5 %	≤ 10% of the applicable standard [2]
Nitrogen Oxides	N3P2207-NOx	Unit 1 Stack	ppm @ 7% O_2	1.8 %	≤ 10% of the applicable standard [3]
	N3P2207-NOx	Unit 1 Stack	lb/hr	0.9 %	≤ 10% of the applicable standard [2]
Carbon Monoxide	N3P2207-CO	Unit 1 Stack	ppm @ 7% O_2	0.5 %	≤ 5% of the applicable standard [4]
	N3P2207-CO	Unit 1 Stack	lb/hr	0.8 %	≤ 10% of the applicable standard [2]
Hydrogen Chloride	4337	Unit 1 Inlet	ppm @ 7% O_2	5.7 %	≤ 20% Relative Accuracy [5]
	4340	Unit 1 Stack	ppm @ 7% O_2	5.1 %	≤ 20% Relative Accuracy [5]
Air Flow Rate	0808251-01	Unit 1 Stack	DSCFM	1.2 %	≤ 20% Relative Accuracy [2]

1 40CFR60, Appendix B, Performance Specification 3 for O_2 and CO_2, Section 13.2.
2 40CFR60, Appendix B, Performance Specification 6 for Continuous Emission Rate Monitoring Systems, Section 13.2.
3 40CFR60, Appendix B, Performance Specification 2 for NO_x and SO_2, Section 13.2.
4 40CFR60, Appendix B, Performance Specification 4A for CO, Section 13.2.
5 40CFR60, Appendix B, Performance Specification 18 for HCl, Section 13.4. If the reference method average concentration is below 75% of the applicable standard, the criteria is 15 percent of the applicable standard

Table 2-2
RATA Test Summary, Unit 2

Parameter	Serial Number	Location	Units	Result	Specification
Oxygen	A2M7220T-O2	Unit 2 Inlet	Dry Volume %	0.0 %	≤ 1.0% Absolute Mean Difference [1]
	01440/4007	Unit 2 Stack	Dry Volume %	0.3 %	≤ 1.0% Absolute Mean Difference [1]
Carbon Dioxide	A0E 2902T	Unit 2 Stack	Dry Volume %	0.5 %	≤ 1.0% Absolute Mean Difference [1]
	A0E 2902T	Unit 2 Stack	MT/hr	5.2 %	≤ 20% Relative Accuracy [2]
Sulfur Dioxide	A2M7220T-SO2	Unit 2 Inlet	ppm @ 7% O_2	11.5 %	≤ 20% Relative Accuracy [3]
	A2M7219T-SO2	Unit 2 Stack	ppm @ 7% O_2	3.5 %	≤ 20% of the applicable standard [3]
	A2M7219T-SO2	Unit 2 Stack	lb/hr	0.9 %	≤ 10% of the applicable standard [2]
Nitrogen Oxides	A2M7219T-NOx	Unit 2 Stack	ppm @ 7% O_2	4.9 %	≤ 10% of the applicable standard [3]
	A2M7219T-NOx	Unit 2 Stack	lb/hr	1.7 %	≤ 10% of the applicable standard [2]
Carbon Monoxide	A2M7219T-CO	Unit 2 Stack	ppm @ 7% O_2	1.0 %	≤ 5% of the applicable standard [3]
	A2M7219T-CO	Unit 2 Stack	lb/hr	1.3 %	≤ 10% of the applicable standard [2]
Hydrogen Chloride	4338	Unit 2 Inlet	ppm @ 7% O_2	14.0 %	≤ 20% Relative Accuracy [5]
	4341	Unit 2 Stack	ppm @ 7% O_2	11.4 %	≤ 20% Relative Accuracy [5]
Air Flow Rate	0808251-02	Unit 2 Stack	DSCFM	4.6 %	≤ 20% Relative Accuracy [2]

1 40CFR60, Appendix B, Performance Specification 3 for O_2 and CO_2, Section 13.2.
2 40CFR60, Appendix B, Performance Specification 6 for Continuous Emission Rate Monitoring Systems, Section 13.2.
3 40CFR60, Appendix B, Performance Specification 2 for NO_x and SO_2, Section 13.2.
4 40CFR60, Appendix B, Performance Specification 4A for CO, Section 13.2.
5 40CFR60, Appendix B, Performance Specification 18 for HCl, Section 13.4. If the reference method average concentration is below 75% of the applicable standard, the criteria is 15 percent of the applicable standard

Table 2-3
RATA Test Summary, Unit 3

Parameter	Serial Number	Location	Units	Result	Specification
Oxygen	N3P2202-O2	Unit 3 Inlet	Dry Volume %	0.4 %	≤ 1.0% Absolute Mean Difference [1]
	01440/4005	Unit 3 Stack	Dry Volume %	0.3 %	≤ 1.0% Absolute Mean Difference [1]
Carbon Dioxide	A0E 2903T	Unit 3 Stack	Dry Volume %	0.4 %	≤ 1.0% Absolute Mean Difference [1]
	A0E 2903T	Unit 3 Stack	MT/hr	9.1 %	≤ 20% Relative Accuracy [2]
Sulfur Dioxide	N3P2202-SO2	Unit 3 Inlet	ppm @ 7% O_2	2.5 %	≤ 20% Relative Accuracy [3]
	N3P2208-SO2	Unit 3 Stack	ppm @ 7% O_2	0.8 %	≤ 20% of the applicable standard [3]
	N3P2208-SO2	Unit 3 Stack	lb/hr	0.3 %	≤ 10% of the applicable standard [2]
Nitrogen Oxides	N3P2208-NOx	Unit 3 Stack	ppm @ 7% O_2	3.3 %	≤ 10% of the applicable standard [3]
	N3P2208-NOx	Unit 3 Stack	lb/hr	1.3 %	≤ 10% of the applicable standard [2]
Carbon Monoxide	N3P2208-CO	Unit 3 Stack	ppm @ 7% O_2	1.1 %	≤ 5% of the applicable standard [3]
	N3P2208-CO	Unit 3 Stack	lb/hr	1.8 %	≤ 10% of the applicable standard [2]
Hydrogen Chloride	4339	Unit 3 Inlet	ppm @ 7% O_2	3.9 %	≤ 20% Relative Accuracy [5]
	4342	Unit 3 Stack	ppm @ 7% O_2	7.7 %	≤ 20% Relative Accuracy [5]
Air Flow Rate	0808251-03	Unit 3 Stack	DSCFM	4.5 %	≤ 20% Relative Accuracy [2]

1 40CFR60, Appendix B, Performance Specification 3 for O_2 and CO_2, Section 13.2.
2 40CFR60, Appendix B, Performance Specification 6 for Continuous Emission Rate Monitoring Systems, Section 13.2.
3 40CFR60, Appendix B, Performance Specification 2 for NO_x and SO_2, Section 13.2.
4 40CFR60, Appendix B, Performance Specification 4A for CO, Section 13.2.
5 40CFR60, Appendix B, Performance Specification 18 for HCl, Section 13.4. If the reference method average concentration is below 75% of the applicable standard, the criteria is 15 percent of the applicable standard

3 PROCESS DESCRIPTION AND OPERATION

The Montgomery County Resource Recovery Facility processes up to 1,800 tons of solid waste each day, generating up to 63 megawatts of electricity. The facility was designed and built and is operated by Covanta of Montgomery, Inc. Each of the three (3) Martin GmbH waterwall furnaces processes up to 600 tons of waste per day. Waste is combusted at furnace temperatures exceeding 1,800 degrees Fahrenheit and reduced to an inert ash residue. Before leaving the facility, combustion air is directed through technologically advanced air pollution control equipment consisting of dry flue gas scrubbers, nitrogen oxide and mercury control systems, and fabric filter baghouses. During the relative accuracy testing the units were operating at greater than 50% of capacity.

The CEMS serving Units 1, 2, and 3 consist of SO_2, NO_x, CO, and O_2 analyzers, a dry extractive sampling system, opacity monitors, and a microcomputer based DAHS. Descriptions of the analyzers are listed in Table 3-1.

Table 3-1
Source CEMS Analyzers

Pollutant Monitor	Unit	Location	Range	Analyzer	Serial Number
O_2	1	Inlet	0 - 25%	CAI ZRE	N3P2200-O2
HCl	1	Inlet	0 - 1800 ppm	Envea MIR9000	4337
SO_2	1	Inlet	0 - 500 ppm	CAI ZRE	N3P2200-SO2
O_2	1	Stack	0 - 25%	Servomex 1440	01440/4008
CO_2	1	Stack	0 - 20%	CAI ZRE	A0E 2901T
SO_2	1	Stack	0 - 200 ppm	CAI ZRE	N3P2207-SO2
NO_x	1	Stack	0 - 500 ppm	CAI ZRE	N3P2207-NOx
CO	1	Stack	0 - 2000 ppm	CAI ZRE	N3P2207-CO
HCl	1	Stack	0 - 100 ppm	Envea MIR9000	4340
Flow	1	Stack	0 - 225 KSCFM	Trace CEMS 500	0808251-01
O_2	2	Inlet	0 - 25%	CAI ZRE	A2M7220T-O2
HCl	2	Inlet	0 - 1800 ppm	Envea MIR9000	4338
SO_2	2	Inlet	0 - 500 ppm	CAI ZRE	A2M7220T-SO2
O_2	2	Stack	0 - 25%	Servomex 1440	01440/4007
CO_2	2	Stack	0 - 20%	CAI ZRE	A0E 2902T
SO_2	2	Stack	0 - 200 ppm	CAI ZRE	A2M7219T-SO2
NO_x	2	Stack	0 - 500 ppm	CAI ZRE	A2M7219T-NOx
CO	2	Stack	0 - 2000 ppm	CAI ZRE	A2M7219T-CO
HCl	2	Stack	0 - 100 ppm	Envea MIR9000	4341
Flow	2	Stack	0 - 225 KSCFM	Trace CEMS 500	0808251-02
O_2	3	Inlet	0 - 25%	CAI ZRE	N3P2202-O2
HCl	3	Inlet	0 - 1800 ppm	Envea MIR9000	4339
SO_2	3	Inlet	0 - 500 ppm	CAI ZRE	N3P2202-SO2
O_2	3	Stack	0 - 25%	Servomex 1440	01440/4005
CO_2	3	Stack	0 - 20%	CAI ZRE	A0E 2903T
SO_2	3	Stack	0 - 200 ppm	CAI ZRE	N3P2208-SO2
NO_x	3	Stack	0 - 500 ppm	CAI ZRE	N3P2208-NOx
CO	3	Stack	0 - 2000 ppm	CAI ZRE	N3P2208-CO
HCl	3	Stack	0 - 100 ppm	Envea MIR9000	4342
Flow	3	Stack	0 - 225 KSCFM	Trace CEMS 500	0808251-03

4 SAMPLING AND ANALYTICAL METHODS

An annual Relative Accuracy Test Audit (RATA) of oxygen (O_2), carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), hydrogen chloride (HCl), and air flow rate was conducted on the inlets and outlets of Units 1, 2, and 3.

4.1 Relative Accuracy Test Equipment

The extractive measurement system and all sampling and data reduction procedures conformed with the requirements of Performance Specifications 2, 3, 4A, 6, and EPA Methods 3A, 6C, 7E, and 10 of 40 CFR 60, and the Quality Assurance Procedures of Appendix F.

The effluent gas sample was conditioned to eliminate interference from water vapor and particulate matter before being introduced into each analyzer. All components of the sampling system that contacted the sample were either glass, stainless steel, or Teflon. A heated probe and particulate filter, heated sample lines, primary moisture removal trap, sample pump, secondary moisture removal system, and distribution manifold board were used to deliver a sample of flue gas to the analyzers. The sampling probe and filter housing was constructed of Type 316 stainless steel and was heated to maintain the sample temperature above the dew point.

The condenser was a glass coil condenser in an ice bath that provided excellent condensate separation and optimum drying of the sample gas. A peristaltic pump continuously removed condensate from a knockout at the base of the coil.

The dry sample exiting the condenser was then transported through unheated 3/8-inch O.D. Teflon tubing by way of a Teflon-lined sample pump to the flow distribution manifold board, where the flow to the analyzers was monitored and controlled.

A three-way valve located on the manifold board delivered calibration gas to two locations: (1) immediately upstream of the analyzers for calibration error checks, and (2) at the outlet of the probe for the sampling system bias and calibration drift checks.

Table 4-1 lists the gas analyzers that will be used during this test program.

Table 4-1
Reference Method Analyzers

Parameter	Analyzer	Model	Serial #	Range	Operational Principle
O_2 Inlet	Servomex	1400	01420/B16	0 – 25 %	Paramagnetic
SO_2 Inlet	Ametek/Western Research	921	AC-921-SO48	0 – 500 ppm	Ultraviolet Differential Absorption
O_2 Outlet	M & C	PMA 22	00002082	0 – 25 %	Paramagnetic
CO_2 Outlet	California Analytical	ZRE	N3P2182	0 – 20 %	Paramagnetic
SO_2 Outlet	Ametek/Western Research	921	AD-921-SO29	0 – 100 ppm	Ultraviolet Differential Absorption
NO_x Outlet	TECO	42i-HL	0811329590	0 – 250 ppm	Chemiluminescence
CO Outlet	TECO	48C	48C-65777-350	0 – 100 ppm	Gas Filter Correlation

4.2 Relative Accuracy Test Procedures

The reference test method procedures used for the RATA test program are instrumental test methods. They were conducted in accordance with 40 CFR 60, Appendix B, Performance Specifications 2, 3, 4A, and 6. Relative accuracies were calculated according to the appropriate emission standards. To satisfy the RATA requirements of 40 CFR 60, Appendix B and F, the relative accuracy must not exceed 20 percent of the mean of the reference method or 20 percent of the applicable standard for SO_2 since the source qualifies as a low emitter with an applicable emission standard of ~0.1 Lb/MMBtu. To satisfy the RATA requirements of 40 CFR 60, Appendix B, the relative accuracy must not exceed 20 percent of the mean of the reference method or 10 percent of the applicable standard for NO_x, and must not exceed 10 percent of the mean of the reference method, 5% of the applicable standard, or a mean difference of $\pm$5 ppm plus the confidence coefficient for CO. To satisfy the RATA requirements of 40 CFR 60, Appendix B and F, the relative accuracy must not exceed 20 percent of the mean of the reference method or 20 percent of the applicable standard for HCl. If the reference method average concentration is below 75% of the applicable standard, the criteria is 15 percent of the applicable standard for HCl. The relative accuracy for O_2 and CO_2 must not exceed an absolute mean difference of $\pm$1.0%. The relative accuracy for MT/hr must not exceed $\pm$20% Relative Accuracy.

The RATA was conducted while each unit operated at greater than 50% of capacity. The traverse sampling points were located so as to establish a "measurement line" through the centroidal area of the duct. The test points for the RATAs were located at 16.7%, 50.0%, and 83.3% of the internal diameter of the duct. Figure 4-1 presents a schematic of the sampling point locations for the SDA Inlet. Figure 4-2 presents a schematic of the sampling point locations for the Stack.

EPA Test Methods 3A, 6C, 7E, and 10 as the reference method for measuring O_2, CO_2, SO_2, NO_x, and CO. This method is an instrumental procedure. A sample is continuously extracted from

the effluent stack gas stream. A portion of the sample stream is conveyed to each analyzer for the determination of O_2, CO_2, SO_2, NO_x, and CO.

For each EPA Reference Method determination, the flue gas was sampled at three traverse points. The difference between the reference method sample and the monitor's reading was evaluated from a minimum of nine test runs.

4.3 Moisture and Molecular Weight Determinations

EPA Method 3A was used to determine the flue gas molecular weight (including oxygen and carbon dioxide). EPA Method 4 was used to determine the flue gas moisture content. Data from EPA Methods 3A and 4 were used to calculate the volumetric flow rate of the stack gas. The volumetric flow rate was then used to calculate MT/hr of CO_2.

4.4 Flow Rate Measurements

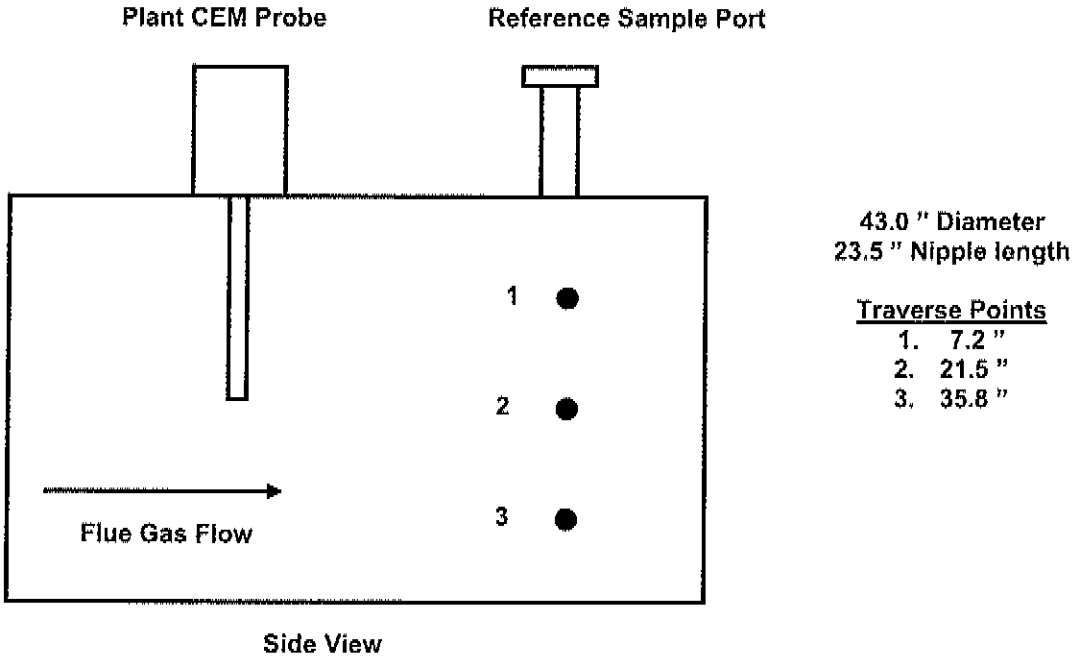
EPA Method 4 was utilized to obtain moisture data concurrently with each RATA test. Each EPA Method 4 test run was conducted over a period of time including one, two, or three RATA test runs. EPA Method 2 was utilized to obtain volumetric air flow rate data for each RATA test including EPA Methods 2, 3A, and 4. The EPA Method 4 sampling train consisted of a probe, four chilled impingers, and a dry gas metering console. At the end of each test run, the moisture was measured and a volumetric flow rate was calculated using the EPA Method 2, 3A, and 4 data.

4.5 EPA Method 26 – Hydrogen Chloride

Hydrogen chloride concentrations were determined utilizing EPA Method 26 modified to use large impingers. The EPA Method 26 sampling train consisted of a heated glass probe, a heated filter, two chilled impingers each with 100mL of 0.1N H_2SO_4, one chilled impinger with 100mL of 0.1N H_2SO_4, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 26. Sampling was conducted at a single point and at a constant rate. The probe and filter temperatures were maintained between 248°F and 273°F. Readings were taken every five (5) minutes.

At the end of each test run, the contents of the first and second impingers were poured back into the H_2SO_4 reagent jar. The silica gel was returned to its original container. The moisture catch in the components was determined gravimetrically. The filter backhalf and impingers were rinsed with DI water into the H_2SO_4 reagent jar.

The samples were analyzed in accordance with EPA Method 26 for hydrogen chloride.



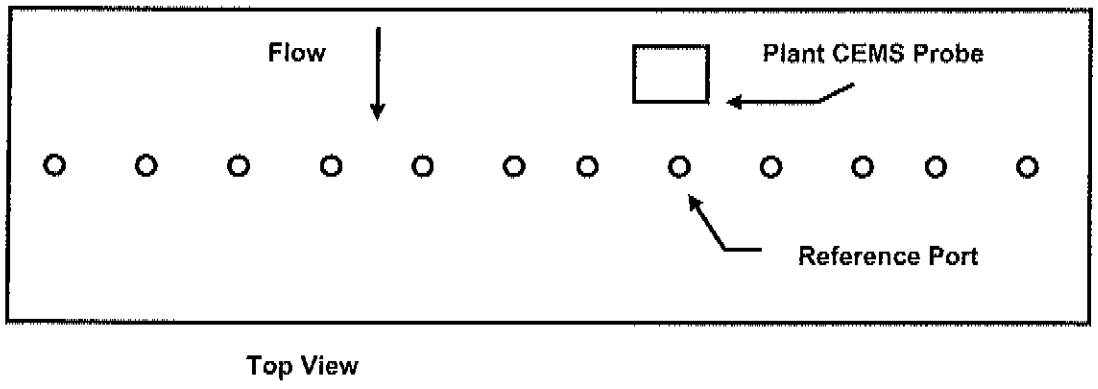


Figure 4-1. Units 1, 2, and 3 Inlet Sampling Location

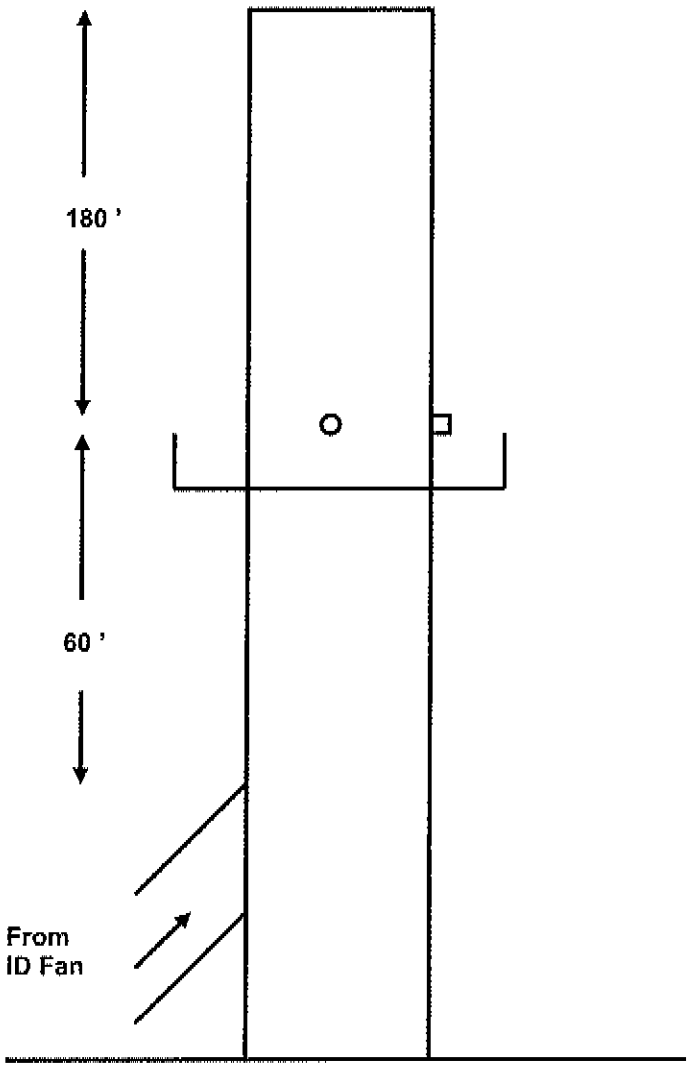


Figure 4-2. Units 1, 2, and 3 Stack Sampling Location

5 QA/QC RESULTS

5.1 QA/QC Policy Procedures

TESTAR Engineering is committed to adhering to Quality Assurance/Quality Control (QA/QC) procedures and objectives that meet or exceed the relevant EPA guidance. Our procedures include calibration of equipment as appropriate, proper glassware pre-cleaning to prevent contamination of samples, proper sample recovery, documented sample custody, blank samples, duplicate analyses, matrix spike recovery, and validated computer generated results. We also adhere to other method specific criteria such as maintaining isokinetic conditions during particulate type testing and posttest leak checks.

TESTAR Engineering uses oil manometers to determine velocity differential pressures thus eliminating potential errors from magnehelic gauges. The manometers are leveled and zeroed prior to taking any measurements. All equipment used onsite undergoes a pretest audit and operational check for accuracy. Dry gas meters are checked by using an orifice to determine the meter gamma. The audit gamma must be within 3% of the full test gamma for the meter to be acceptable. Likewise, all thermocouples are checked at ambient temperature versus an ASTM reference thermometer or a thermometer that has been checked against an ASTM reference thermometer. The reading must agree within 2°F. Additionally, the barometer is checked against a reference barometer prior to each project and must agree within 0.1" Hg.

After each testing project, the dry gas meter undergoes a posttest audit using an orifice that results in a delta H approximately equal to the average delta H encountered during the test runs. The gamma must agree within 5% of the full test gamma.

5.2 Sample Custody and Preservation

Proper sample custody and preservation techniques ensure that the samples collected and analyzed are the same, that the sample did not change in concentration prior to analysis, and that the sample was not tampered with prior to analysis. To ensure accurate results, TESTAR Engineering collects and transports samples in clean containers that are inert to the matrix enclosed, that will not contaminate the sample, and that prevent photochemical reactions when appropriate. All samples contain unique identifiers that include the client name, facility name, project number, collection date, unique run number, sample fraction, and matrix. Liquid levels are marked in order to determine is any leakage occurred during transport. Samples are accompanied by sample custody forms identifying the client, facility, project number, sample, fractions, collection date, etc. When custody is relinquished to the laboratory, the receiving sample custodian signs the form.

5.3 Sample Blanks, Duplicates, and Matrix Spikes

Several types of blanks are utilized depending upon the project QA objectives. Typical blanks include field blanks, reagent blanks, and trip blanks. Blanks help to identify the source of contamination if contamination is suspected based upon the result validation procedure. Trip blanks are typically not analyzed unless the field blank shows significant contamination. Field blanks and reagent blanks are analyzed during most testing programs involving metals unless requested not to do so by the client. Field blanks are analyzed during most programs involving organics such as dioxins/furans.

Duplicates and matrix spikes are analyzed for projects involving metals testing. At least 10% of the samples are analyzed in duplicate for metals and at least one matrix spike is performed. All mercury analyses are performed in duplicate.

5.4 Data Validation and Presentation

The field test engineer is responsible for reviewing and validating data as it is obtained. Additionally the onsite project manager reviews data for consistency, completeness, and accuracy prior to leaving the site. This validation procedure is based upon their knowledge of the process being tested and/or similar sources as well as checks built into the software being utilized. This allows for error correction or for the testing to be repeated immediately rather than at a later undetermined date. The data undergoes another review by a Project Director upon return to headquarters. Analytical data is reviewed by the QA Director upon submittal by the analytical laboratory to resolve any conflicts or concerns as soon as possible rather than after the results have been calculated.

Data is collected using computerized spreadsheets in the field and the results are calculated using validated computer programs to prevent erroneous calculations.

5.5 QA/QC Results

The calibration and quality assurance procedures of EPA Methods 3A, 6C, 7E, and 10 were followed throughout the test program and are summarized in Table 5-1. The results of sampling system bias and calibration drift tests for each test run are calculated and presented in Appendix B. The cylinder gas manufacturer's analyses of the O_2, CO_2, SO_2, NO_x, and CO calibration gases were conducted according to EPA Protocol 1 requirements. The certificates of analysis are included in the test report. A summary of the calibration gases used during the test program is presented in Table 5-2.

Table 5-1
Summary of QA/QC Procedures

Test Method	QA/QC Procedure	QA/QC Objective	QA/QC Results	Status of QA/QC
EPA M3A, 6C, 7E, and 10	Initial Calibration Error Test	< ±2 %	< ±2 %	Acceptable
	System Bias Test	< ±5 %	< ±5 %	Acceptable
	Drift Test	< ±3 %	< ±3 %	Acceptable
Pre-test	NOx Converter Checks	≥ 90 % conversion efficiency	97.9 %	Acceptable
Post-test	NOx Converter Checks	≥ 90 % conversion efficiency	97.6 %	Acceptable
EPA MM26	Reagent Blank	ND	< 0.413	Acceptable
	Spike Recovery	90 - 110 %	98.4 – 103.7 %	Acceptable
	In-house Audit	< 10 %	-7.7 – 2.19 %	Acceptable

Table 5-2
Reference Method Calibration Gas Values

Parameter	Span Level	Calibration Gas Value	Expiration Date	Calibration Gas Serial Number
Carbon Dioxide	Mid	8.874 %	05/23/30	CC137166
	High	17.96 %	03/22/30	ALM-032215
Oxygen	Mid	9.975 %	05/23/30	CC137166
	High	22.00 %	03/22/30	ALM-032215
Sulfur Dioxide Outlet	Mid	44.36 ppm	05/31/26	CC453963
	High	94.05 ppm	03/14/30	CC401693
Sulfur Dioxide Inlet	Mid	238.2 ppm	02/22/30	CC115893
	High	480.7 ppm	06/25/27	CC496401
Nitrogen Dioxide	Converter Gas	50.39 ppm	05/16/25	CC511444
Nitrogen Oxides	Mid	122.6 ppm	05/31/26	CC453963
	High	241.9 ppm	03/14/30	CC401693
Carbon Monoxide	Mid	45.24 ppm	05/31/26	CC453963
	High	95.26 ppm	03/14/30	CC401693