Cokenergy LLC
3210 Watling Street MC 2-991
East Chicago, IN 46312

October 17, 2018

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
Box 7611, Ben Franklin Station
Washington, DC 20044-7611
Re: DOJ No. 90-5-2-1-08555/1

Air Enforcement Division Director
U.S. Environmental Protection Agency
Office of Civil Enforcement
Air Enforcement Division
U.S. Environmental Protection Agency
1200 Pennsylvania Ave, NW Mail Code: 2242A
Washington, DC 20460

Compliance Tracker
Air Enforcement and Compliance Assurance Branch
U.S. Environmental Protection Agency – Region 5
77 West Jackson Blvd. AE-18J
Chicago, IL 60604-3590

Susan Tennenbaum
U.S. Environmental Protection Agency - Region 5
C-14J
77 West Jackson Blvd
Chicago, IL 60640

Phil Perry
Indiana Department of Environmental Management
Chief, Air Compliance and Enforcement Branch
100 North Senate Avenue
MC-61-53, IGCN 1003
Indianapolis, IN 46204-2251

Elizabeth A. Zlatos
Indiana Department of Environmental Management
Office of Legal Counsel
100 North Senate Avenue
MC-60-01, IGCN 1307
Indianapolis, IN 46204-2251

RE: Consent Decree, *United States, et. al. v. Indiana Harbor Coke Company, et. al.*
Cokenergy, LLC (Part 70 Permit No. T089-36965-00383)
Cokenergy Flow Monitor Initial Certification and Relative Accuracy Test Audit Report

To Whom It May Concern:

Pursuant to the proposed Consent Decree (CD) entered in federal court on August 13, 2018, Cokenergy is submitting this Relative Accuracy Test Audit (RATA) report for the volumetric flow monitoring system installed on the Cokenergy main stack (Stack 201) in accordance with CD paragraph 19. The RATA was completed on September 12, 2018 and the 7-day calibration drift test was completed between September 8 and September 14, 2018.

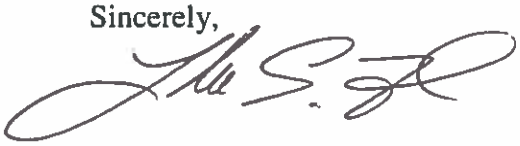
The results from the calibration drift test ranged from 0% to 0.4%, well within the ≤ 3% of span standard. The RATA results for the flow monitor were 6.40% and 4.09% for the sulfur dioxide (SO_2) emission rate, both well within the ≤ 20% standard from the applicable performance specification.

I certify under penalty of law that this information was 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 directions and inquiry of the person(s) who manage the system, or the person(s) 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, please contact me at (219) 397-4626.

Sincerely,



Luke E. Ford
Director EH&S

cc: East Chicago Public Libraries

East Chicago Public Library
2401 E. Columbus Drive
East Chicago, Indiana 46312

East Chicago Public Library
1008 W. Chicago Avenue
East Chicago, Indiana 46312

Electronic Copies to:
R5airenforcement@epa.gov
tennenbaum.susan@epa.gov
bzlatos@idem.in.gov

Justin Kirby
jlkirby@suncoke.com

Katie Batten
kmbatten@suncoke.com

file: X:// 673

CONTINUOUS EMISSIONS MONITORING SYSTEM RELATIVE ACCURACY DETERMINATION AND CERTIFICATION TEST

Performed At
Primary Energy
Cokenergy Facility
HRCC Stack 201
East Chicago, Indiana

Test Dates
September 12, 2018 (RATA)
September 8 through 14, 2018 (Calibration Drift testing)

Report No.
TRC Environmental Corporation Report 305091

Report Submittal Date
October 15, 2018

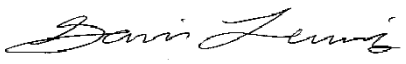
TRC Environmental Corporation
7521 Brush Hill Road
Burr Ridge, Illinois 60527
USA

T 312-533-2042
F 312-533-2070

Report Certification

I certify that to the best of my knowledge:

- Testing data and all corresponding information have been checked for accuracy and completeness.
- Sampling and analysis have been conducted in accordance with the approved protocol and applicable reference methods (as applicable).
- All deviations, method modifications, or sampling and analytical anomalies are summarized in the appropriate report narrative(s).



Gavin Lewis
Project Manager

October 15, 2018
Date

TRC was operating in conformance with the requirements of ASTM D7036-04 during this test program.

Bruce Randall
TRC Emission Testing Technical Director

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CONTINUOUS EMISSIONS MONITORING SYSTEM RELATIVE ACCURACY DETERMINATION AND CERTIFICATION TEST

1.0 INTRODUCTION

Cokenergy installed a volumetric flow monitoring system as part of their existing Continuous Emissions Monitoring System (CEMS) on the HRCC Stack 201.

The purpose of this test program was to certify the HRCC Stack 201 CEMS. TRC Environmental Corporation (TRC) performed the relative accuracies tests on September 12, 2018 while the unit was operating at greater than 50% of normal load. Primary Energy personnel performed the seven-day calibration drift tests on September 8 through 14. All tests were performed in accordance with methods described in the Code of Federal Regulations, Title 40, Part 60 (40CFR60), Appendix B, Performance Specifications 2 and 3. The test program was conducted according to the Indiana Department of Environmental Management (IDEM) Relative Accuracy Test Audit Notification Protocol dated August 1, 2018.

1.1 Project Contact Information

Participants		
Test Facility	Primary Energy Cokenergy Facility East Chicago, Indiana	Mr. Luke Ford Director EH&S 219-397-4626 (phone) lford@primaryenergy.com
Test Coordinator	Primary Energy 3210 Watling Street East Chicago, Indiana 46312 Permit No. T089-36965-00383	
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. Gavin Lewis Project Manager 312-533-2025 (phone) 312-533-2070 (fax) glewis@trcsolutions.com

William Manny, Ryan Novosel and Gavin Lewis of TRC conducted the testing. Documentation of the on-site ASTM D7036-04 Qualified Individual(s) (QI) can be located in the appendix to this report.

No personnel from the IDEM observed the testing.

2.0 SUMMARY OF RESULTS

The results of these tests are presented in the following tables. Tables 2.1 and 2.2 present a summary of the actual performance of each component of the CEMS system, as compared to United States Environmental Protection Agency (USEPA) 40 CFR Part 60 specifications.

Table 2.1 – Gaseous Results

Load	Parameter	Units	Performance Specifications (40CFR60)		CEMS Performance
			Specification No.	Acceptance Criteria	Relative Accuracy
> 50%	SO_2	ppmvd	2	RA ≤ 20% of the Reference Method	2.68 %
> 50%	SO_2	lb/hr	2	RA ≤ 20% of the Reference Method	4.09 %
> 50%	O_2	% dry	3	RA ≤ 1.0% difference for $\%O_2$	0.20 %vol diff

Table 2.2 – Volumetric Flowrate, Performance Specification 6

Serial Number: 031518-000-1118-UMCR		Span: 0 – 1,000 kscfm	
Criteria	Test Date(s)	Required Performance	Actual Performance
Calibration Error	09/08/18 – 09/14/18	≤ 3.0% of high level value for each of 7 days	≤ 0.4 %
Relative Accuracy	09/12/18	RA ≤ 20% of the Reference Method (dscfm)	6.40 %

3.0 DISCUSSION OF RESULTS

The complete test results from this program are tabulated in Section 6.0.

The data acquisition and handling system (DAHS) computer printout for the same time periods as the RM testing was used to determine the relative accuracy. The watches of the test crew were synchronized with the CEMS prior to testing.

No problems were encountered with the testing equipment during the course of the test program. Source operation appeared normal during the entire test program and operated at more than 50 percent of full load. The CEMS operation appeared normal with no apparent problems during sampling. No changes or problems were encountered that required modification of any procedures presented in the test plan. No adverse test or environmental conditions were encountered during the conduct of this test program. CEMS operating data was recorded by plant personnel and appended to the report.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed in accordance with the methods presented in the following sections. Where applicable, the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994 was used to supplement procedures.

4.1 Calibration Drift Test

Calibration Drift tests were performed by Primary Energy personnel. A summary of the test data is presented in Section 6.1 and supporting documentation is appended to the report.

4.2 Relative Accuracy Tests

4.2.1 CEMS RATA Test Matrix

Parameter	Reference Methods (RM)	No. of Test Runs	Test Run Length (min)
SO_2	6C (1, 2, 3A, 4 for lb/hr)	10	21
O_2 (CO_2 for flow only)	3A	10	21
Flow	1, 2 and 4	10	≥ 5

4.2.2 Determination of Sample Point Locations by USEPA Method 1

This method is applicable to gas streams flowing in ducts, stacks, and flues and is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rates from stationary sources. In order to qualify as an acceptable sample location, it must be located at a position at least two stack or duct equivalent diameters downstream and a half equivalent diameter upstream from any flow disturbance.

The cross-section of the measurement site was divided into a number of equal areas, and the traverse points were then located in the center of these areas. The minimum number of points were determined from Figure 1-2 (non-particulate) of USEPA Method 1.

4.2.3 Volumetric Flow Rate Determination by USEPA Method 2

This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

The gas velocity head (ΔP) and temperature were measured at traverse points defined by USEPA Method 1. The velocity head was measured with a Type S (Stausscheibe or reverse type) pitot tube and oil-filled manometer; and the gas temperature was measured with a Type K thermocouple. The average gas velocity in the flue was calculated based on: the gas density (as determined by USEPA Methods 3 and 4); the flue gas pressure; the average of the square roots of the velocity heads at each traverse point, and the average flue gas temperature.

4.2.4 Determination of the Concentration of Gaseous Pollutants Using a Multi-Pollutant Sampling System

Concentrations of the pollutants in the following sub-sections were determined using one sampling system. The number of points at which sample was collected was determined in accordance with 40CFR60 specifications.

A straight-extractive sampling system was used. Gas samples were collected for seven (7) minutes at each of three points (0.4, 1.2 and 2.0 meters) along the stack diameter during each test run. A data logger continuously recorded pollutant concentrations and generated one-minute averages of those concentrations. All calibrations and system checks were conducted using USEPA Protocol gases. Three-point linearity checks were performed prior to sampling, and in the event of a failing system bias or drift test (and subsequent corrective action). System bias and drift checks were performed using the low-level gas and either the mid- or high-level gas prior to and following each test run.

The Low Concentration Analyzers (those that routinely operate with a calibration span of less than 20 ppm) used by TRC are ambient-level analyzers. Per Section 3.12 of Method 7E, a Manufacturer's Stability Test is not required for ambient-level analyzers. Analyzer interference tests were conducted in accordance with the regulations in effect at the time that TRC placed an analyzer model in service.

4.2.4.1 CO_2 Determination by USEPA Method 3A

This method is applicable for the determination of carbon dioxide (CO_2) concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The CO_2 analyzer was equipped with a non-dispersive infrared (IR) detector.

4.2.4.2 O_2 Determination by USEPA Method 3A

This method is applicable for the determination of O_2 concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The O_2 analyzer was equipped with a paramagnetic-based detector.

4.2.4.3 SO_2 Determination by USEPA Method 6C

This method is applicable for the determination of SO_2 concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The SO_2 analyzer was equipped with an ultraviolet (UV) detector.

4.2.5 Moisture Determination by USEPA Method 4

This method is applicable for the determination of the moisture content of stack gas.

A gas sample was extracted at a constant rate from the source. Moisture was removed from the sample stream by a series of pre-weighed impingers immersed in an ice bath. A minimum of 21 dry standard cubic feet of flue gas was collected during each sample run.

5.0 QUALITY ASSURANCE PROCEDURES

TRC integrates our Quality Management System (QMS) into every aspect of our testing service. We follow the procedures specified in current published versions of the test Method(s) referenced in this report. Any modifications or deviations are specifically identified in the body of the report. We routinely participate in independent, third party audits of our activities, and maintain:

- Accreditation from the Louisiana Environmental Laboratory Accreditation Program (LELAP);
- Accreditation from the Stack Testing Accreditation Council (STAC) and the American Association for Laboratory Accreditation (A2LA) that our operations conform with the requirements of ASTM D 7036 as an Air Emission Testing Body (AETB).

These accreditations demonstrate that our systems for training, equipment maintenance and calibration, document control and project management will fully ensure that project objectives are achieved in a timely and efficient manner with a strict commitment to quality.

All calibrations are performed in accordance with the test Method(s) identified in this report. If a Method allows for more than one calibration approach, or if approved alternatives are available, the calibration documentation in the appendices specifies which approach was used. All measurement devices are calibrated or verified at set intervals against standards traceable to the National Institute of Standards and Technology (NIST). NIST traceability information is available upon request.

ASTM D7036-04 specifies that: *"AETBs shall have and shall apply procedures for estimating the uncertainty of measurement. Conformance with this section may be demonstrated by the use of approved test protocols for all tests. When such protocols are used, reference shall be made to published literature, when available, where estimates of uncertainty for test methods may be found."* TRC conforms with this section by using approved test protocols for all tests.

6.0 TEST RESULTS SUMMARIES

6.1 Calibration Drift Test Results Summary

Owner: Primary Energy
Plant: Cokenergy Facility
Source ID: HRCC Stack 201

CEM Component: **Volumetric Flow**
Instrument Span: 0 - 1,000 kscfm
Test Dates: 09/08/18 - 09/14/18
Certification Criteria: 40 CFR 60, Appendix B

Day	Load Level	Date	Time	Reference Value	CEM Value	Difference	Calibration Error %
1	Zero	09/08/18	5:33:10	0.00	3.00	3.00	0.3
2	Zero	09/09/18	5:33:09	0.00	2.00	2.00	0.2
3	Zero	09/10/18	5:33:14	0.00	3.90	3.90	0.4
4	Zero	09/11/18	5:33:12	0.00	3.70	3.70	0.4
5	Zero	09/12/18	5:33:12	0.00	3.90	3.90	0.4
6	Zero	09/13/18	5:33:12	0.00	3.70	3.70	0.4
7	Zero	09/14/18	5:33:11	0.00	3.60	3.60	0.4
1	Span	09/08/18	5:36:10	750.00	749.50	0.50	0.1
2	Span	09/09/18	5:36:08	750.00	749.20	0.80	0.1
3	Span	09/10/18	5:36:15	750.00	750.30	0.30	0.0
4	Span	09/11/18	5:36:14	750.00	750.10	0.10	0.0
5	Span	09/12/18	5:36:13	750.00	750.10	0.10	0.0
6	Span	09/13/18	5:36:12	750.00	750.00	0.00	0.0
7	Span	09/14/18	5:36:13	750.00	750.00	0.00	0.0

Drift Specification: Flow CEM: $\leq$ 3% of span maximum

6.2 Relative Accuracy Summaries

RATA Type: **Sulfur Dioxide (SO_2), ppm**
Regulation: **40CFR60**
RM Used: **6C**

Customer:	Primary Energy				Project #:	305091	
Unit ID:	HRCC				CEM Model:	Thermo Scientific 43i-HL	
Sample Loc:	Stack 201				CEM Serial #:	1152150034	
Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM SO_2 ppmvd	CEM SO_2 ppmvd	(RM-CEM) Difference (di)
1	1	9/12/18	7:15	7:35	155.5	160.1	-4.6
1	2	9/12/18	8:00	8:20	151.7	154.3	-2.6
1	3	9/12/18	8:40	9:00	155.5	158.0	-2.5
1	4	9/12/18	9:20	9:40	144.9	148.6	-3.7
0	5	9/12/18	10:00	10:20	139.3	143.9	-4.6
1	6	9/12/18	10:45	11:05	132.6	135.5	-2.9
1	7	9/12/18	11:25	11:45	134.6	138.7	-4.1
1	8	9/12/18	12:05	12:25	135.1	138.2	-3.1
1	9	9/12/18	12:45	13:05	128.3	130.4	-2.1
1	10	9/12/18	13:25	13:45	123.3	125.3	-2.0

n	9	
t(0.975)	2.306	
Mean RM Value	140.167	RM avg
Mean CEM Value	143.233	CEM avg
Mean Difference	-3.067	d avg
Standard Deviation	0.899	sd
Confidence Coefficient	0.691	CC
RA based on RM	2.68	%

RATA Type: **Sulfur Dioxide (SO_2), lb/hr**
Regulation: **40CFR60**
RM Used: **2-4, 6C**

Customer:		Primary Energy			Project #:	305091	
Unit ID:		HRCC			CEM Model:	Thermo Scientific 43i-HL	
Sample Loc:		Stack 201			CEM Serial #:	1152150034	
Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM SO_2 lb/hr	CEM SO_2 lb/hr	(RM-CEM) Difference (di)
1	1	9/12/18	7:15	7:35	995.5	953.3	42.2
0	2	9/12/18	8:00	8:20	985.6	915.4	70.2
1	3	9/12/18	8:40	9:00	978.4	935.2	43.2
1	4	9/12/18	9:20	9:40	899.6	873.7	25.9
1	5	9/12/18	10:00	10:20	867.5	854.9	12.6
1	6	9/12/18	10:45	11:05	837.5	805.9	31.6
1	7	9/12/18	11:25	11:45	844.0	825.2	18.8
1	8	9/12/18	12:05	12:25	855.6	826.7	28.9
1	9	9/12/18	12:45	13:05	807.9	781.9	26.0
1	10	9/12/18	13:25	13:45	760.6	738.5	22.1

n	9	
t(0.975)	2.306	
Mean RM Value	871.844	RM avg
Mean CEM Value	843.922	CEM avg
Mean Difference	27.922	d avg
Standard Deviation	10.071	sd
Confidence Coefficient	7.741	CC
RA based on RM	4.09	%

RATA Type: **Oxygen (O_2), % by volume**
Regulation: **40CFR60**
RM Used: **3A**

Customer:	Primary Energy	Project #:	305091
Unit ID:	HRCC	CEM Model:	Brand Gaus 4705
Sample Loc:	Stack 201	CEM Serial #:	11401

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM O_2 % v/v dry	CEM O_2 % v/v dry	(RM-CEM) Difference (di)
1	1	9/12/18	7:15	7:35	12.6	12.8	-0.2
1	2	9/12/18	8:00	8:20	12.7	12.9	-0.2
1	3	9/12/18	8:40	9:00	12.8	13.0	-0.2
1	4	9/12/18	9:20	9:40	13.0	13.2	-0.2
1	5	9/12/18	10:00	10:20	13.0	13.2	-0.2
1	6	9/12/18	10:45	11:05	13.1	13.3	-0.2
1	7	9/12/18	11:25	11:45	13.2	13.4	-0.2
1	8	9/12/18	12:05	12:25	13.4	13.6	-0.2
1	9	9/12/18	12:45	13:05	13.5	13.7	-0.2
0	10	9/12/18	13:25	13:45	13.5	13.7	-0.2

n	9	
t(0.975)	2.306	
Mean RM Value	13.033	RM avg
Mean CEM Value	13.233	CEM avg
Mean Difference	-0.200	d avg
Standard Deviation	0.000	sd
Confidence Coefficient	0.000	CC
RA (Absolute Mean Difference)	0.20	% vol diff.

RATA Type: Flow, (DSCFM)*, High Load
Regulation: 40CFR60
RM Used: 2

Customer:	Primary Energy - Cokenergy Facility	Project #:	305091
Unit ID:	HRCC	CEM Model:	--
Location:	Stack 201	CEM Serial #:	031518-000-1118-UMCR

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM Volumetric Flow (DSCFM)*	CEM Volumetric Flow (DSCFM)*	(RM-CEM) Difference (di)
1	1	9/12/2018	07:15	07:25	643,000	598,000	45,000
0	2	9/12/2018	08:00	08:08	652,000	597,000	55,000
1	3	9/12/2018	08:40	08:49	632,000	592,000	40,000
1	4	9/12/2018	09:20	09:28	623,000	580,000	43,000
1	5	9/12/2018	10:00	10:10	625,000	597,000	28,000
1	6	9/12/2018	10:45	10:54	634,000	598,000	36,000
1	7	9/12/2018	11:25	11:33	630,000	599,000	31,000
1	8	9/12/2018	12:05	12:13	636,000	599,000	37,000
1	9	9/12/2018	12:45	12:53	632,000	601,000	31,000
1	10	9/12/2018	13:25	13:33	619,000	590,000	29,000

n	9	
t(0.975)	2.306	
Mean RM Value	630,444.444	RM avg
Mean CEM Value	594,888.889	CEM avg
Mean Difference	35,555.556	d avg
Standard Deviation	6,207.075	sd
Confidence Coefficient	4,771.172	CC
Relative Accuracy	6.40	% RA

*Standard conditions of 29.92 in/Hg and 68º F

APPENDIX

AETB and QI Information Summary

Facility Name:	Primary Energy – Cokenergy Facility
Location:	HRCC Stack 201
Test Date:	September 12, 2018 (RATA)

Test Parameters:	1, 2, 3A, 4, 6C
QI Last Name:	Lewis
QI First Name:	Gavin
QI Middle Initial:	----
AETB Name:	TRC Environmental Corporation
AETB Phone No:	312-533-2025
AETB Email:	glewis@trcsolutions.com
Group 1 Exam Date:	11/07/2017
Provider Name:	Source Evaluation Society
Provider Email:	qstiprogram@gmail.com
Group 3 Exam Date:	01/05/2018
Provider Name:	Source Evaluation Society
Provider Email:	qstiprogram@gmail.com

This is to Certify that:

Gavin Lewis

Is a Qualified Individual as defined in Section 8.3 of ASTM D7036-04 for the following test methods:

EPA Methods 1, 1A, 2, 2A, 2C, 2D, 2F, 2G, 2H, 3, 3B, 4, 5, 5A, 5B, 5D, 5E, 5F, 5i, 17, 19, 201A, and 202.

The individual has met the minimum experience requirements defined in Section 8.3.4.2 of ASTM D7036-04 and has successfully passed a comprehensive examination for the test methods designated above.

This certification is effective until: 11/07/2022

Date of Issue: 01-08-2018

Certificate Number: 01249

Edward J MacKinnon
Air Measurements Practice Quality Manager

TRC

This certificate is the exclusive property of TRC and is non-transferable.

This is to Certify that:

Gavin Lewis

Is a Qualified Individual as defined in Section 8.3 of ASTM D7036-04 for the following test methods:

EPA Methods 3A, 6C, 7E, 10, 10B, 19, 20, 25A.

CEM Performance Specifications PS2, PS3, PS4, PS4A, PS5, PS6, PS7, PS8, and PS15

The individual has met the minimum experience requirements defined in Section 8.3.4.2 of ASTM D7036-04 and has successfully passed a comprehensive examination for the test methods designated above.

This certification is effective until: 01-05-2023

Date of Issue: 01-08-2018

Certificate Number: 01251

Edward J MacKinnon
Air Measurements Practice Quality Manager

TRC

This certificate is the exclusive property of TRC and is non-transferable.

Primary Energy Coke

East Chicago, IN

Calibration Report

09/08/2018 - 09/14/2018

Created on : Oct 02, 2018 08:07:44

STACK 201

Date	Timestamp	Parameter	Type	Measured	Expected	Error	Tolerance	Result
09/08/2018								
	05:33:10	VOL FLOW, KSCFM	Zero	3.0	0.0	0.3	3	Pass
	05:36:10	VOL FLOW, KSCFM	Span	749.5	750.0	0.1	3	Pass
09/09/2018								
	05:33:09	VOL FLOW, KSCFM	Zero	2.0	0.0	0.2	3	Pass
	05:36:08	VOL FLOW, KSCFM	Span	749.2	750.0	0.1	3	Pass
09/10/2018								
	05:33:14	VOL FLOW, KSCFM	Zero	3.9	0.0	0.4	3	Pass
	05:36:15	VOL FLOW, KSCFM	Span	750.3	750.0	0.0	3	Pass
09/11/2018								
	05:33:12	VOL FLOW, KSCFM	Zero	3.7	0.0	0.4	3	Pass
	05:36:14	VOL FLOW, KSCFM	Span	750.1	750.0	0.0	3	Pass
09/12/2018								
	05:33:13	VOL FLOW, KSCFM	Zero	3.9	0.0	0.4	3	Pass
	05:36:13	VOL FLOW, KSCFM	Span	750.1	750.0	0.0	3	Pass
09/13/2018								
	05:33:12	VOL FLOW, KSCFM	Zero	3.7	0.0	0.4	3	Pass
	05:36:12	VOL FLOW, KSCFM	Span	750.0	750.0	0.0	3	Pass
09/14/2018								
	05:33:11	VOL FLOW, KSCFM	Zero	3.6	0.0	0.4	3	Pass
	05:36:13	VOL FLOW, KSCFM	Span	750.0	750.0	0.0	3	Pass

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 07:45:19

East Chicago, IN

9/12/2018 7:15:00 AM - 9/12/2018 7:35:00 AM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
07:15:00	164.8	12.8	11.0	11.7	982.1
07:16:00	162.6	12.8	11.0	11.7	965.2
07:17:00	165.0	12.8	11.0	11.7	984.7
07:18:00	166.2	12.8	11.0	11.7	992.2
07:19:00	163.5	12.8	11.0	11.7	978.9
07:20:00	161.7	12.8	11.0	11.7	958.4
07:21:00	159.4	12.8	11.0	11.7	949.9
07:22:00	157.9	12.8	11.0	11.7	937.5
07:23:00	158.7	12.8	11.0	11.7	942.1
07:24:00	159.0	12.8	11.0	11.7	947.8
07:25:00	158.3	12.8	11.0	11.7	949.0
07:26:00	158.8	12.8	11.0	11.7	933.2
07:27:00	158.8	12.8	11.0	11.7	954.1
07:28:00	157.9	12.8	11.0	11.7	951.5
07:29:00	157.9	12.8	11.0	11.7	937.8
07:30:00	159.7	12.8	11.0	11.7	938.1
07:31:00	158.5	12.8	11.0	11.7	947.0
07:32:00	158.4	12.8	11.0	11.7	954.3
07:33:00	160.1	12.8	11.0	11.7	942.9
07:34:00	157.1	12.8	11.0	11.7	929.9
07:35:00	158.0	12.8	11.0	11.7	942.3
Average :	160.1	12.8	11.0	11.7	953.3

* Invalid Status

RATA Run # 1

Verified By: _____

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 08:23:16

East Chicago, IN

9/12/2018 8:00:00 AM - 9/12/2018 8:20:00 AM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
08:00:00	154.1	12.9	11.1	11.6	928.1
08:01:00	154.0	12.9	11.1	11.6	904.8
08:02:00	156.3	12.9	11.1	11.6	923.9
08:03:00	155.5	12.9	11.1	11.6	927.3
08:04:00	154.0	12.9	11.1	11.6	915.4
08:05:00	154.0	12.9	11.1	11.6	915.9
08:06:00	155.0	12.9	11.1	11.6	921.6
08:07:00	153.1	12.9	11.1	11.6	898.2
08:08:00	154.6	12.9	11.1	11.6	927.7
08:09:00	151.6	12.9	11.1	11.6	899.8
08:10:00	152.5	12.9	11.1	11.6	907.5
08:11:00	151.1	12.9	11.1	11.6	895.1
08:12:00	154.5	12.9	11.1	11.6	926.2
08:13:00	153.8	12.9	11.1	11.6	919.7
08:14:00	153.8	12.9	11.1	11.6	911.0
08:15:00	153.4	12.9	11.1	11.6	905.4
08:16:00	153.7	12.9	11.1	11.6	908.9
08:17:00	154.3	12.9	11.1	11.6	917.5
08:18:00	156.2	12.9	11.1	11.6	910.1
08:19:00	157.5	12.9	11.1	11.6	930.7
08:20:00	157.5	12.9	11.1	11.6	929.3
Average :	154.3	12.9	11.1	11.6	915.4

* Invalid Status

RATA Run # 2

Verified By: _____

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 09:01:23

East Chicago, IN

9/12/2018 8:40:00 AM - 9/12/2018 9:00:00 AM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
08:40:00	156.6	13.0	11.2	11.5	924.5
08:41:00	156.2	12.9	11.2	10.9	919.0
08:42:00	157.7	13.0	11.2	11.5	942.4
08:43:00	157.2	13.0	11.1	12.3	921.1
08:44:00	159.4	13.0	11.2	11.5	944.0
08:45:00	159.4	13.0	11.2	11.5	942.1
08:46:00	159.5	13.0	11.2	11.5	940.8
08:47:00	160.7	13.0	11.2	11.5	950.4
08:48:00	159.3	13.0	11.2	11.5	928.2
08:49:00	160.4	13.0	11.2	11.5	948.3
08:50:00	159.9	13.0	11.2	11.5	952.2
08:51:00	156.4	13.0	11.2	11.5	932.6
08:52:00	157.8	13.0	11.2	11.5	930.6
08:53:00	156.6	13.0	11.2	11.5	927.9
08:54:00	156.5	13.0	11.2	11.5	928.2
08:55:00	157.4	13.0	11.2	11.5	941.2
08:56:00	155.8	13.0	11.2	11.5	919.0
08:57:00	157.9	13.0	11.2	11.5	936.1
08:58:00	158.5	13.0	11.2	11.5	949.9
08:59:00	157.4	13.0	11.2	11.5	927.5
09:00:00	156.9	13.1	11.2	12.2	933.1
Average :	158.0	13.0	11.2	11.5	935.2

* Invalid Status

RATA Run # 3

Verified By: _____

TRC Report 305091

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Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 09:44:42

East Chicago, IN

9/12/2018 9:20:00 AM - 9/12/2018 9:40:00 AM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
09:20:00	139.3	13.3	11.5	11.3	795.1
09:21:00	142.0	13.3	11.5	11.3	791.3
09:22:00	142.5	13.3	11.5	11.3	795.8
09:23:00	142.2	13.3	11.5	11.3	839.4
09:24:00	143.6	13.3	11.5	11.3	834.1
09:25:00	145.8	13.2	11.4	11.4	847.8
09:26:00	148.3	13.2	11.4	11.4	878.4
09:27:00	149.9	13.2	11.4	11.4	876.8
09:28:00	151.9	13.2	11.4	11.4	891.1
09:29:00	151.7	13.1	11.4	10.7	900.5
09:30:00	152.4	13.2	11.4	11.4	895.6
09:31:00	153.4	13.2	11.4	11.4	907.6
09:32:00	151.2	13.2	11.4	11.4	894.5
09:33:00	153.0	13.2	11.4	11.4	909.5
09:34:00	153.1	13.1	11.4	10.7	918.1
09:35:00	150.3	13.2	11.4	11.4	893.0
09:36:00	150.3	13.1	11.3	11.5	876.6
09:37:00	150.2	13.2	11.4	11.4	897.4
09:38:00	150.1	13.1	11.4	10.7	908.7
09:39:00	151.1	13.2	11.4	11.4	897.7
09:40:00	149.3	13.1	11.3	11.5	898.9
Average :	148.6	13.2	11.4	11.3	873.7

* Invalid Status

RATA Run # 4

Verified By: _____

RATA Data Report

9/12/2018 10:00:00 AM - 9/12/2018 10:20:00 AM

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
10:00:00	145.5	13.2	11.4	11.4	863.4
10:01:00	143.8	13.1	11.4	10.7	854.6
10:02:00	143.1	13.2	11.4	11.4	857.2
10:03:00	143.1	13.2	11.4	11.4	860.7
10:04:00	145.4	13.2	11.4	11.4	865.1
10:05:00	144.9	13.2	11.4	11.4	860.7
10:06:00	144.5	13.2	11.4	11.4	852.7
10:07:00	146.2	13.2	11.4	11.4	877.9
10:08:00	145.4	13.2	11.4	11.4	854.3
10:09:00	147.1	13.2	11.4	11.4	878.6
10:10:00	146.1	13.2	11.4	11.4	855.2
10:11:00	148.1	13.2	11.4	11.4	875.8
10:12:00	143.9	13.2	11.4	11.4	859.9
10:13:00	142.1	13.2	11.4	11.4	853.2
10:14:00	143.2	13.2	11.4	11.4	849.6
10:15:00	141.4	13.2	11.4	11.4	832.5
10:16:00	142.9	13.2	11.4	11.4	855.7
10:17:00	141.8	13.2	11.4	11.4	830.3
10:18:00	142.9	13.2	11.4	11.4	849.1
10:19:00	141.7	13.2	11.4	11.4	847.2
10:20:00	139.2	13.2	11.4	11.4	818.3
Average :	143.9	13.2	11.4	11.4	854.9

* Invalid Status

RATA Run # 5

Verified By:

TRC Report 305091

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Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 11:07:18

East Chicago, IN

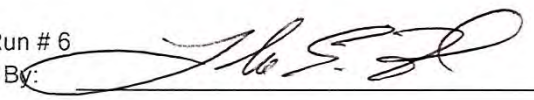
9/12/2018 10:45:00 AM - 9/12/2018 11:05:00 AM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
10:45:00	136.1	13.2	11.4	11.4	809.3
10:46:00	136.3	13.3	11.5	11.3	804.5
10:47:00	137.9	13.2	11.4	11.4	812.0
10:48:00	136.4	13.3	11.5	11.3	809.8
10:49:00	137.7	13.3	11.5	11.3	818.8
10:50:00	135.1	13.2	11.5	10.6	811.3
10:51:00	137.5	13.3	11.5	11.3	819.8
10:52:00	136.4	13.3	11.5	11.3	818.9
10:53:00	134.7	13.2	11.5	10.6	807.9
10:54:00	136.6	13.3	11.5	11.3	810.1
10:55:00	135.5	13.3	11.5	11.3	812.4
10:56:00	135.6	13.3	11.5	11.3	794.4
10:57:00	136.8	13.3	11.5	11.3	818.3
10:58:00	134.9	13.3	11.5	11.3	803.6
10:59:00	134.2	13.3	11.5	11.3	802.5
11:00:00	134.2	13.3	11.5	11.3	796.4
11:01:00	135.0	13.3	11.5	11.3	799.1
11:02:00	133.1	13.3	11.5	11.3	791.3
11:03:00	134.7	13.3	11.5	11.3	798.8
11:04:00	134.1	13.3	11.5	11.3	799.9
11:05:00	133.0	13.3	11.5	11.3	785.4
Average :	135.5	13.3	11.5	11.2	805.9

* Invalid Status

RATA Run # 6

Verified By: 

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 11:48:58

East Chicago, IN

9/12/2018 11:25:00 AM - 9/12/2018 11:45:00 AM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
11:25:00	135.8	13.3	11.6	10.5	819.9
11:26:00	135.6	13.4	11.6	11.2	804.7
11:27:00	137.4	13.4	11.6	11.2	816.4
11:28:00	136.4	13.4	11.6	11.2	816.5
11:29:00	138.4	13.4	11.6	11.2	820.0
11:30:00	137.6	13.4	11.6	11.2	816.5
11:31:00	137.8	13.4	11.6	11.2	829.7
11:32:00	137.8	13.4	11.6	11.2	813.5
11:33:00	138.0	13.4	11.6	11.2	825.5
11:34:00	136.5	13.4	11.6	11.2	811.9
11:35:00	138.3	13.4	11.6	11.2	813.9
11:36:00	138.1	13.4	11.6	11.2	818.3
11:37:00	139.4	13.4	11.6	11.2	832.8
11:38:00	139.7	13.4	11.6	11.2	829.1
11:39:00	139.6	13.4	11.6	11.2	822.6
11:40:00	140.9	13.4	11.6	11.2	843.1
11:41:00	139.4	13.4	11.6	11.2	826.3
11:42:00	140.7	13.4	11.7	10.4	834.5
11:43:00	140.5	13.4	11.7	10.4	835.3
11:44:00	141.2	13.4	11.7	10.4	844.8
11:45:00	143.0	13.5	11.7	11.1	853.1
Average :	138.7	13.4	11.6	11.0	825.2

* Invalid Status

RATA Run # 7

Verified By: _____

TRC Report 305091

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Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 12:32:29

East Chicago, IN

9/12/2018 12:05:00 PM - 9/12/2018 12:25:00 PM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
12:05:00	140.5	13.6	11.8	11.0	841.3
12:06:00	139.0	13.6	11.8	11.0	830.5
12:07:00	140.4	13.6	11.8	11.0	835.7
12:08:00	139.6	13.6	11.8	11.0	822.8
12:09:00	138.7	13.6	11.8	11.0	830.5
12:10:00	139.1	13.6	11.8	11.0	827.1
12:11:00	136.9	13.6	11.8	11.0	818.0
12:12:00	137.3	13.6	11.8	11.0	830.1
12:13:00	137.0	13.6	11.8	11.0	814.2
12:14:00	139.1	13.6	11.8	11.0	838.9
12:15:00	139.1	13.6	11.8	11.0	837.5
12:16:00	139.9	13.6	11.9	10.3	838.6
12:17:00	140.5	13.6	11.9	10.3	848.4
12:18:00	140.1	13.7	11.9	10.9	834.7
12:19:00	140.7	13.6	11.9	10.3	859.9
12:20:00	137.1	13.6	11.8	11.0	813.3
12:21:00	135.7	13.7	11.9	10.9	800.5
12:22:00	135.6	13.6	11.9	10.3	818.0
12:23:00	134.5	13.6	11.8	11.0	802.3
12:24:00	135.7	13.6	11.9	10.3	808.2
12:25:00	136.7	13.7	11.9	10.9	810.7
Average :	138.2	13.6	11.8	10.8	826.7

* Invalid Status

RATA Run # 8
Verified By: _____

TRC Report 305091

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Primary Energy Coke

East Chicago, IN

RATA Data Report

9/12/2018 12:45:00 PM - 9/12/2018 1:05:00 PM

Created on : Sep 12, 2018 13:06:53

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
12:45:00	133.8	13.7	11.9	10.9	799.3
12:46:00	135.2	13.7	11.9	10.9	810.2
12:47:00	133.4	13.7	11.9	10.9	792.7
12:48:00	131.5	13.7	11.9	10.9	782.4
12:49:00	129.4	13.7	11.9	10.9	776.5
12:50:00	130.2	13.7	11.9	10.9	779.0
12:51:00	130.6	13.7	12.0	10.2	780.9
12:52:00	130.7	13.7	12.0	10.2	781.6
12:53:00	130.1	13.7	12.0	10.2	785.4
12:54:00	129.5	13.7	12.0	10.2	776.1
12:55:00	130.5	13.7	12.0	10.2	781.3
12:56:00	128.6	13.7	11.9	10.9	771.7
12:57:00	130.1	13.7	12.0	10.2	779.3
12:58:00	130.4	13.7	12.0	10.2	781.2
12:59:00	129.6	13.7	12.0	10.2	788.2
13:00:00	129.0	13.7	11.9	10.9	765.9
13:01:00	131.1	13.7	12.0	10.2	786.6
13:02:00	129.4	13.7	12.0	10.2	776.6
13:03:00	128.4	13.7	12.0	10.2	777.0
13:04:00	129.3	13.7	12.0	10.2	772.7
13:05:00	127.9	13.7	12.0	10.2	775.5
Average :	130.4	13.7	12.0	10.5	781.9

* Invalid Status

RATA Run # 9

Verified By: _____

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 13:50:37

East Chicago, IN

9/12/2018 1:25:00 PM - 9/12/2018 1:45:00 PM

STACK 201

Time	SO2, PPM	O2 DRY, %	O2 WET, %	H2O, %	SO2, LB/HR
13:25:00	128.4	13.7	11.9	10.9	747.9
13:26:00	125.6	13.7	11.9	10.9	726.3
13:27:00	123.7	13.7	11.9	10.9	730.1
13:28:00	123.7	13.7	11.9	10.9	735.9
13:29:00	124.3	13.7	11.9	10.9	726.1
13:30:00	124.6	13.7	11.9	10.9	733.9
13:31:00	121.5	13.7	11.9	10.9	716.6
13:32:00	123.0	13.7	11.9	10.9	725.0
13:33:00	137.7	13.7	11.9	10.9	813.7
13:34:00	139.8	13.7	11.9	10.9	830.3
13:35:00	136.2	13.7	11.9	10.9	804.0
13:36:00	121.5	13.7	12.0	10.2	720.6
13:37:00	121.0	13.7	11.9	10.9	712.0
13:38:00	121.6	13.7	12.0	10.2	715.4
13:39:00	123.4	13.7	12.0	10.2	736.8
13:40:00	122.6	13.7	12.0	10.2	720.9
13:41:00	123.1	13.7	12.0	10.2	729.5
13:42:00	121.8	13.7	12.0	10.2	719.3
13:43:00	122.9	13.7	12.0	10.2	719.9
13:44:00	123.4	13.8	12.0	10.9	724.5
13:45:00	122.0	13.7	12.0	10.2	719.7
Average :	125.3	13.7	11.9	10.6	738.5

* Invalid Status

RATA Run # 10

Verified By:

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 08:14:55

East Chicago, IN

9/12/2018 7:15:00 AM - 9/12/2018 7:25:00 AM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
07:15:00	677.6	598.3
07:16:00	675.0	596.0
07:17:00	678.6	599.2
07:18:00	678.8	599.4
07:19:00	680.7	601.1
07:20:00	673.9	595.1
07:21:00	677.6	598.3
07:22:00	675.1	596.1
07:23:00	675.0	596.0
07:24:00	677.8	598.5
07:25:00	681.6	601.9
Average :	677.4	598.2

* Invalid Status

RATA Run # 1

Verified By: _____

TRC Report 305091

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RATA Data Report

9/12/2018 8:00:00 AM - 9/12/2018 8:08:00 AM

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
08:00:00	684.0	604.7
08:01:00	667.3	589.9
08:02:00	671.4	593.5
08:03:00	677.3	598.7
08:04:00	675.1	596.8
08:05:00	675.4	597.1
08:06:00	675.3	597.0
08:07:00	666.3	589.0
08:08:00	681.6	602.5
Average :	674.9	596.6

* Invalid Status

RATA Run # 2
Verified By:

TRC Report 305091

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Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 08:50:50

East Chicago, IN

9/12/2018 8:40:00 AM - 9/12/2018 8:49:00 AM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
08:40:00	669.7	592.7
08:41:00	663.0	590.7
08:42:00	678.0	600.0
08:43:00	670.8	588.3
08:44:00	671.9	594.6
08:45:00	670.5	593.4
08:46:00	669.1	592.2
08:47:00	671.0	593.8
08:48:00	661.0	585.0
08:49:00	670.7	593.6
Average :	669.6	592.4

* Invalid Status

RATA Run # 3

Verified By:

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 09:45:11

East Chicago, IN

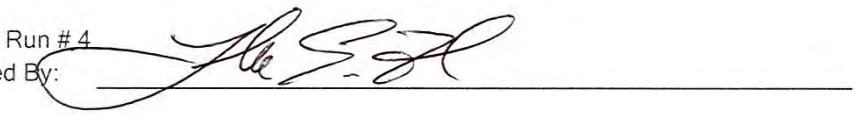
9/12/2018 9:20:00 AM - 9/12/2018 9:28:00 AM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
09:20:00	646.1	573.1
09:21:00	630.8	559.5
09:22:00	632.1	560.7
09:23:00	668.2	592.7
09:24:00	657.5	583.2
09:25:00	658.9	583.8
09:26:00	671.2	594.7
09:27:00	662.9	587.3
09:28:00	664.8	589.0
Average :	654.7	580.4

* Invalid Status

RATA Run # 4

Verified By: 

Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 10:28:56

East Chicago, IN

9/12/2018 10:00:00 AM - 9/12/2018 10:10:00 AM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
10:00:00	672.5	595.8
10:01:00	668.2	596.7
10:02:00	678.8	601.4
10:03:00	681.6	603.9
10:04:00	674.3	597.4
10:05:00	673.1	596.4
10:06:00	668.7	592.5
10:07:00	680.5	602.9
10:08:00	665.8	589.9
10:09:00	676.9	599.7
10:10:00	663.3	587.7
Average :	673.1	596.8

* Invalid Status

RATA Run # 5

Verified By: _____

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Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 11:07:53

East Chicago, IN

9/12/2018 10:45:00 AM - 9/12/2018 10:54:00 AM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
10:45:00	673.8	597.0
10:46:00	668.1	592.6
10:47:00	667.3	591.2
10:48:00	672.0	596.1
10:49:00	673.1	597.0
10:50:00	674.4	602.9
10:51:00	674.9	598.6
10:52:00	679.6	602.8
10:53:00	673.6	602.2
10:54:00	671.2	595.4
Average :	672.8	597.6

* Invalid Status

RATA Run # 6
Verified By:

TRC Report 305091

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Primary Energy Coke

RATA Data Report

Created on : Sep 12, 2018 11:48:32

East Chicago, IN

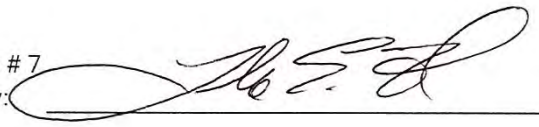
9/12/2018 11:25:00 AM - 9/12/2018 11:33:00 AM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
11:25:00	677.3	606.2
11:26:00	670.9	595.8
11:27:00	671.8	596.6
11:28:00	676.8	601.0
11:29:00	669.9	594.9
11:30:00	670.9	595.8
11:31:00	680.7	604.5
11:32:00	667.5	592.7
11:33:00	676.4	600.6
Average :	673.6	598.7

* Invalid Status

RATA Run # 7

Verified By: 

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RATA Data Report

9/12/2018 12:05:00 PM - 9/12/2018 12:13:00 PM

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
12:05:00	675.5	601.2
12:06:00	674.0	599.9
12:07:00	671.5	597.6
12:08:00	664.9	591.8
12:09:00	675.5	601.2
12:10:00	670.8	597.0
12:11:00	674.1	599.9
12:12:00	682.0	607.0
12:13:00	670.4	596.7
Average :	673.2	599.1

* Invalid Status

RATA Run # 8
Verified By: _____

TRC Report 305091

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RATA Data Report

9/12/2018 12:45:00 PM - 9/12/2018 12:53:00 PM

STACK 201

Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
12:45:00	673.2	599.8
12:46:00	675.3	601.7
12:47:00	669.6	596.6
12:48:00	670.5	597.4
12:49:00	676.2	602.5
12:50:00	674.2	600.7
12:51:00	668.5	600.3
12:52:00	668.6	600.4
12:53:00	674.9	606.1
Average :	672.3	600.6

* Invalid Status

RATA Run # 9

Verified By: _____

TRC Report 305091

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Time	VOL FLOW, KSCFM	VOL FLOW DRY, KSCFM
13:25:00	656.3	584.8
13:26:00	651.6	580.6
13:27:00	665.1	592.6
13:28:00	670.4	597.3
13:29:00	658.3	586.5
13:30:00	663.7	591.4
13:31:00	664.6	592.2
13:32:00	664.2	591.8
13:33:00	665.9	593.3
Average :	662.2	590.1

* Invalid Status

RATA Run # 10

Verified By:

TRC Report 305091

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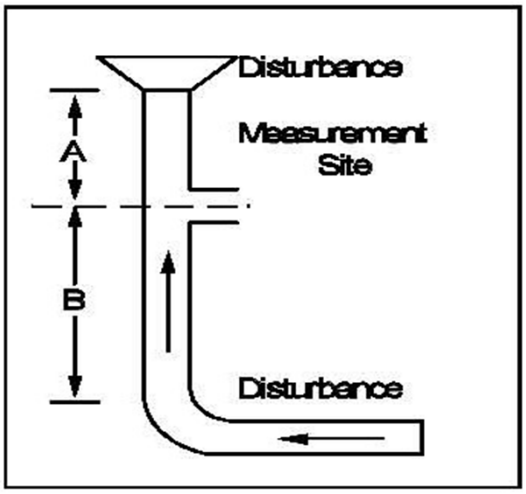
Sample Location Information for Volumetric Flow Determination - Round Ducts

Project #:	305091	Duct Diameter:	18.00 feet
Company:	Primary Energy	# of Ports Used:	4
Plant:	Cokenergy Facility	# of Points/Diameter:	8
Unit ID:	HRCC	Total # of points	16
Sample Location:	Stack 201	Sample Plane:	Horizontal
		Port Type:	Nipple
Distance A:	73.80 Feet, 4.10 Duct diameters	Port Length:	7.0 inches
Distance B:	201.00 Feet, 11.17 Duct diameters	Port Inside Diameter:	6.0 inches

Meets Method 1 criteria



Traverse Point Locations

Point	% of diameter	Inches from wall	Inches from port edge
1	3.2	6.9	13.9
2	10.5	22.7	29.7
3	19.4	41.9	48.9
4	32.3	69.8	76.8

Pre-cyclonic flow check conducted? No Reason: Conducted Previously

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Part 60 RATA
Initial Stratification Check and Test Point Selection

Project Number:	305091	Test Date:	9/12/2018	
Customer:	Primary Energy	Duct Shape:	Round	
Unit Identification:	HRCC	Diameter:	18	feet
Sample Location:	Stack 201			
		Port Length:	6.75	inches

Is the sample location downstream of a wet scrubber, or downstream of a point where two ducts converge? N

Sampling line/strategy selected: Short Line (0.4, 1.2, 2.0 meters)

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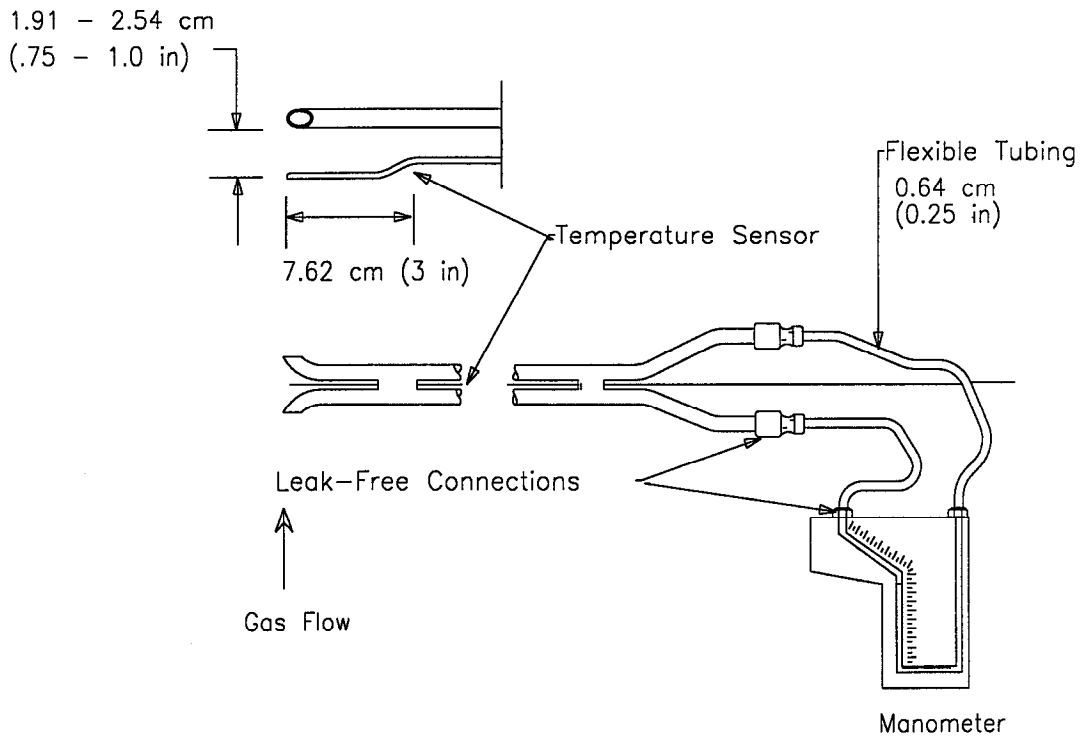
Determination of Stack Gas Velocity and Volumetric Flow Rate

USEPA Promulgated Test Method 2



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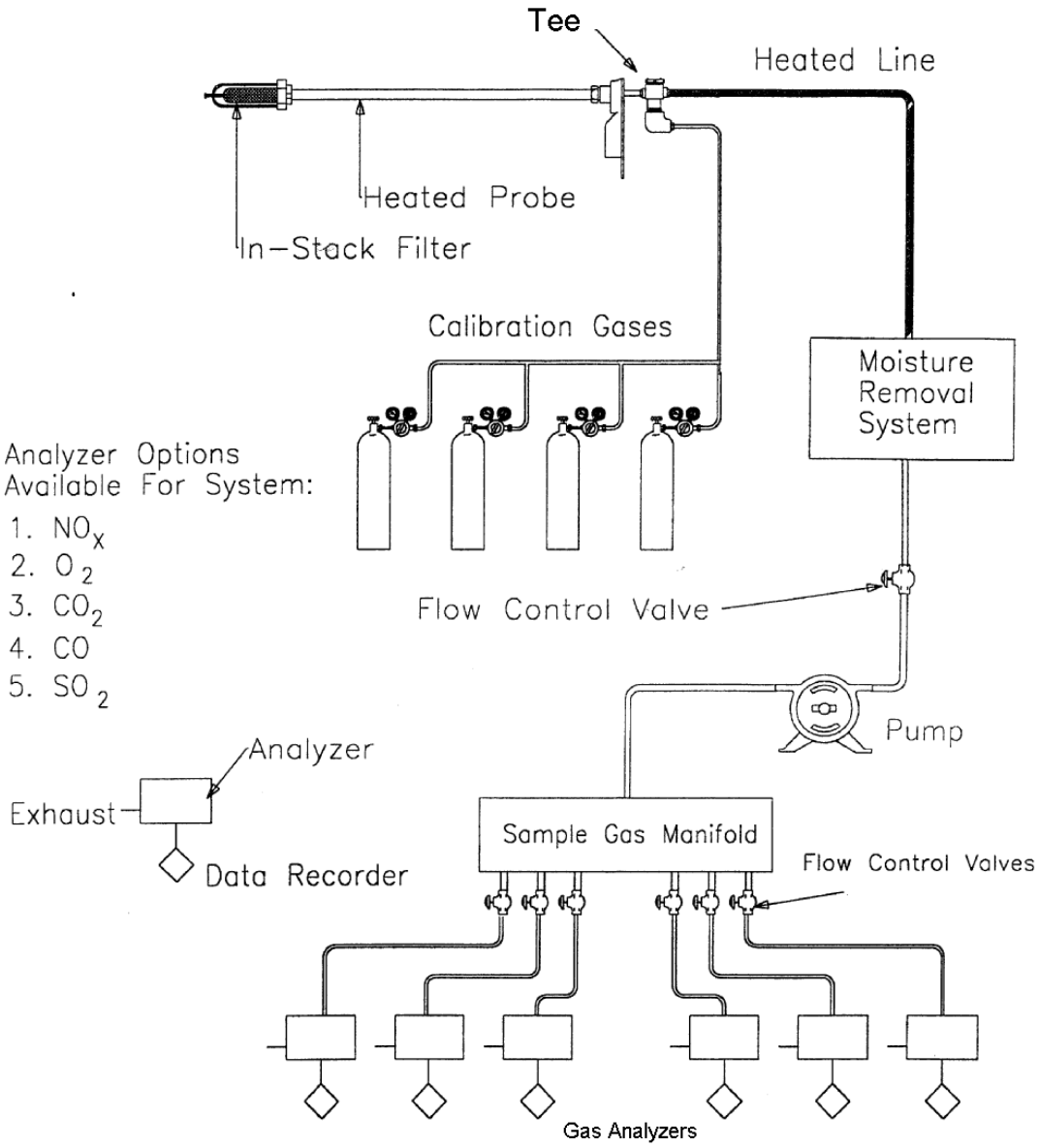
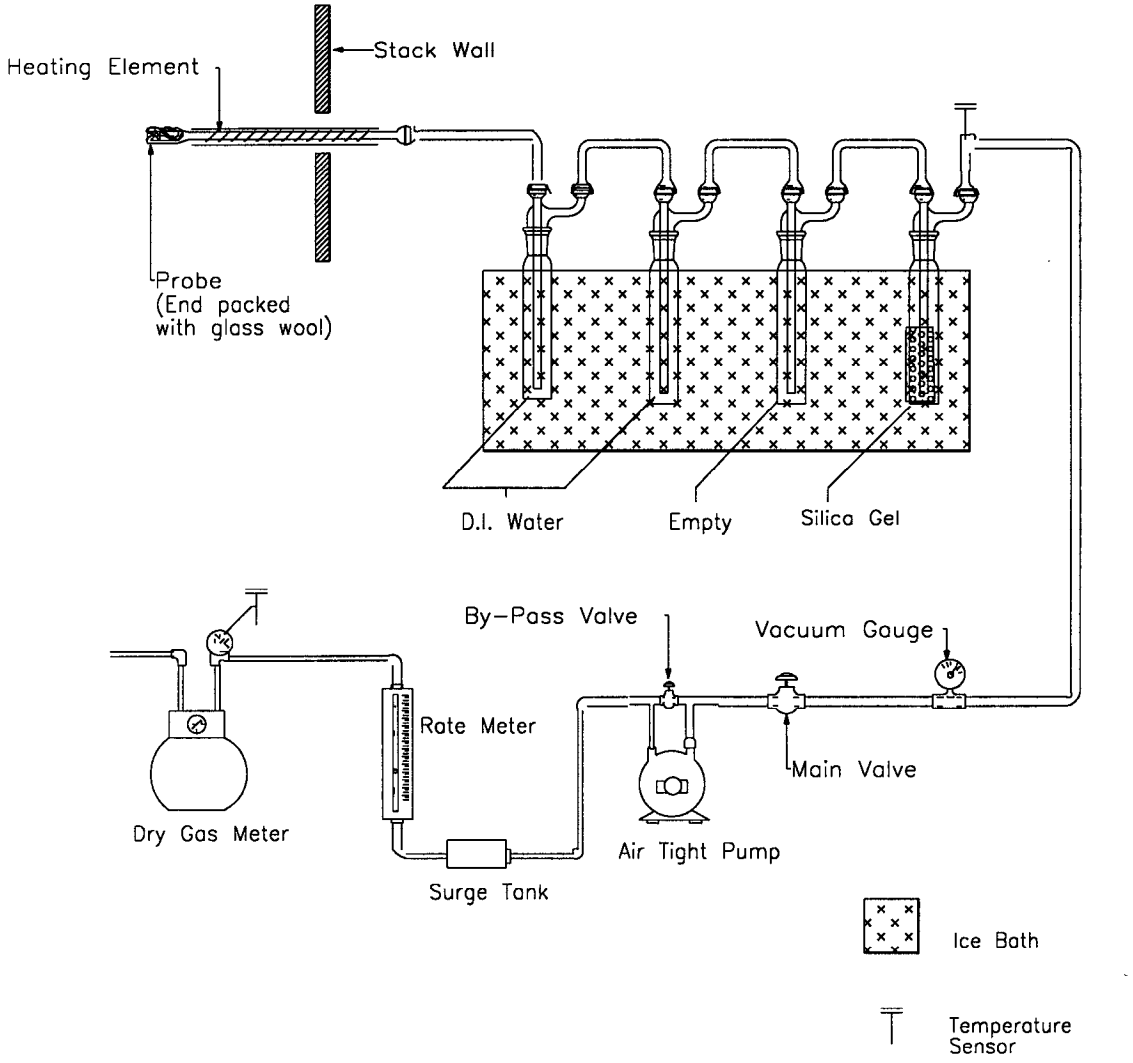
Determination of Multiple Gaseous Pollutants Using an Extractive Sampling Train

USEPA Promulgated Methods 3A, 6C and 10



Determination of Moisture Content in Stack Gases

USEPA Promulgated Method 4



Example Calculations - Method 2 Volumetric Flow

Company:	Primary Energy	Project Number:	305091
Unit ID:	HRCC	Test Date:	September 12, 2018
Plant:	Cokenergy Facility	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Note: In order to duplicate these examples, results must not be rounded.

Effluent Gas Pressure

$$P_s = P_{bar} + (P_g/13.6)$$

Where:

P_s = Flue gas pressure ("Hg)
P_{bar} = Ambient barometric pressure at sample elevation ("Hg)
P_g = Flue gas gauge pressure ("H_2O)

P_{bar} = 29.26 "Hg P_g = -1 "H_2O

P_s = 29.19 "Hg

Average Stack Temperature

$$T_s = \frac{\sum_{i=1}^{n} T_{si}}{n}$$

Where:

T_s = Average effluent gas temperature (^oF)
T_{si} = Effluent gas temperature at point i (^oF)
n = Total number of traverse points

T_s = 287 °F

Actual Meter Volume

$$V_m = Vf - Vi$$

Where:

V_i = Initial meter sample volume (cubic feet)
V_f = Final meter sample volume (cubic feet)
V_m = Sample volume collected at actual conditions (ft^3, dry basis)

Vf = 301.456 cf Vi = 279.000 cf

V_m = 22.456 cubic feet

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Example Calculations - Method 2 Volumetric Flow

Company:	Primary Energy	Project Number:	305091
Unit ID:	HRCC	Test Date:	September 12, 2018
Plant:	Cokenergy Facility	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Note: In order to duplicate these examples, results must not be rounded.

Standard Meter Volume

$$V_{m(std)} = T_{std}/29.92 \times Y \times V_m \times (P_{bar} + \Delta H /13.6)/(T_m + 460)$$

Where:

$V_{m(std)}$ = Sample volume collected corrected to 29.92"Hg and T_{std} (scf, dry basis)
Y = Dry test meter calibration coefficient (dimensionless)
V_m = Sample volume collected at actual conditions (ft^3, dry basis)
T_m = Average dry test meter temperature (°F)
ΔH = Pressure drop across calibrated orifice ("H2O)
T_{std} = Standard Temperature (°R)

V_m = 22.456 cf P_{bar} = 29.26 "Hg

ΔH = 2.00 "H_2O T_m = 70.9 °F

Y = 0.997 dimensionless T_{std} = 528 °R

$V_{m(std)}$ = 21.885 dscf

Volume of Water Vapor Condensed

$$V_{w(std)} = [(0.04707 \times \text{net ml } H_2O) + (0.04715 \times \text{net grams } H_2O)] \times (T_{std} / 528)$$

Where:

$V_{w(std)}$ = Sample volume collected corrected to 29.92 in. Hg and 528(°R) (ft^3, dry basis)

net grams H_2O = Final moisture weight - initial moisture weight

net grams H_2O = **3182.6** - **3108.3**

$V_{w(std)}$ = 3.503 cf

Moisture Content From Method 4 or Alt-008

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)} =}$$

Where:

B_{ws} = Fractional moisture content (dimensionless)

$V_{w(std)}$ = 3.503 cf $V_{m(std)}$ = 21.885 dscf

B_{ws} = 0.138

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Example Calculations - Method 2 Volumetric Flow

Company:	Primary Energy	Project Number:	305091
Unit ID:	HRCC	Test Date:	September 12, 2018
Plant:	Cokenergy Facility	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Note: In order to duplicate these examples, results must not be rounded.

Dry Molecular Weight

$$M_d = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times (\%N_2)$$

Where:

M_d = Effluent gas molecular weight (lb/lb-mole, dry basis)
$\%CO_2$ = Effluent gas Carbon Dioxide Content (% volume, dry basis)
$\%O_2$ = Effluent gas Oxygen Content (% volume, dry basis)
$\%N_2$ = Effluent Balance Gas Content (% volume, dry basis)
0.32 = Molecular weight of O2 divided by 100
0.44 = Molecular weight of CO2 divided by 100
0.28 = Molecular weight of Nitrogen divided by 100

$\%CO_2$ = 5.2 $\%O_2$ = 12.6 $\%N_2$ = 82.2

M_d = 29.34 lb/lb-mole From Method 3A, Instrumental

Wet Molecular Weight

$$M_s = Md \times (1-Bws) + (18.0 \times Bws)$$

Where:

M_s = Effluent gas molecular weight (lb/lb-mole, wet basis)
B_{ws} = Effluent gas fractional moisture content (dimensionless)

M_d = 29.34 lb/lb-mole B_{ws} = 0.138 From Method 4

M_s = 27.77 lb/lb-mole

Average Square Root of Velocity Head - applicable to Method 2 only

$$\text{avg}\sqrt{\Delta P} = \frac{\sum_{i=1}^{n} \sqrt{\Delta Pi}}{n}$$

Where:

$\sqrt{\Delta Pi}$ = square root of ΔP at traverse point i
$\text{avg}\sqrt{\Delta P}$ = Average of the square roots of ΔP's at all traverse points

$\text{avg}\sqrt{\Delta P}$ = 1.0275

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Example Calculations - Method 2 Volumetric Flow

Company:	Primary Energy	Project Number:	305091
Unit ID:	HRCC	Test Date:	September 12, 2018
Plant:	Cokenergy Facility	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Note: In order to duplicate these examples, results must not be rounded.

Average Duct Velocity - applicable to Method 2 only

$$V_s = 85.49 \times Cp \times avg\sqrt{\Delta P} \times ((Ts + 460)/ (Ps \times Ms))^{1/2}$$

Where:

V_s = Average velocity of effluent gas (ft/sec)
C_p = Pitot calibration coefficient (dimensionless)
$avg\sqrt{\Delta P}$ = Average of the square roots of ΔP's at all traverse points
T_s = Average effluent gas temperature (^oF)

C_p =	0.840		T_s =	287	°F
P_s =	29.19	"Hg	M_s =	27.77	lb/lb-mole
$avg\sqrt{\Delta P}$ =	1.0275				

V_s = 70.81 ft/sec

Volumetric Flow Rate (Actual Basis)

Applicable when Method 2 is used alone:

$$Qacfm = V_s \times A \times 60 \text{ sec/min}$$

Where:

' Q = Effluent gas volumetric flow rate at actual conditions (acfm)
A = Cross-sectional area of the stack/duct at the test location (ft^2)

V_s =	70.81	ft/sec	A =	254.469	ft^2

Q = 1,081,203 acfm

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Example Calculations - Method 2 Volumetric Flow

Company:	Primary Energy	Project Number:	305091
Unit ID:	HRCC	Test Date:	September 12, 2018
Plant:	Cokenergy Facility	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Note: In order to duplicate these examples, results must not be rounded.

Volumetric Flow Rate (Standard Wet Basis)

Standard cubic feet per minute (Wet):

$$Q_{std} = Q \times (T_{std}/29.92) \times (P_s/(T_s + 460))$$

Where:

Q_{std} = Effluent gas volumetric flow rate corrected to 29.92"Hg and 528°R (scfm)

Q = 1,081,203 scfm P_s = 29.19 "Hg

Ts (avg) = 287 °F T_{std} = 528 °R

Q_{std} = 745,862 scfm

Standard cubic feet per hour (Wet):

$$Q_{sw} = Q_{std} \times 60 \text{ min/hr}$$

Q_{sw} = 44,751,720 scfh

Volumetric Flow Rate (Standard Dry Basis)

Standard cubic feet per minute (Dry):

$$Q_{dscfm} = Q_{std} \times (1-B_{ws})$$

B_{ws} = 0.138 dimensionless

Q_{dscfm} = 642,941 dscfm

Standard cubic feet per hour (Dry):

$$Q_{sd} = Q_{dscfm} \times 60 \text{ min/hr}$$

Q_{sd} = 38,576,474 dscfh

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Example Calculations - Effluent Gas Concentration Determination

Project Number:	305091	Test Date:	September 12, 2018
Customer:	Primary Energy	Facility:	Cokenergy Facility
Unit Identification:	HRCC	Run #:	1
Sample Location:	Stack 201		

$$C_{gas} = (C - C_0) \times \frac{C_{ma}}{C_m - C_0}$$

Where:

C_{gas} = Effluent gas concentration (ppm or %vol)

C = Average gas concentration indicated by analyzer (ppm or %vol)

C_0 = Average of pre- and post-test system bias checks using low range gas (ppm or % vol)

C_m = Average of pre- and post-test system bias checks using upscale gas (ppm or % vol)

C_{ma} = Actual concentration of upscale gas (ppm or % vol)

SO_2	C =	152.39 ppm	C_0 =	2.90 ppm	
	C_m =	196.95 ppm	C_{ma} =	201.8 ppm	
	C_{SO2} =	**155.5 ppm**			
CO_2	C =	5.16 %vol	C_0 =	0.05 %vol	
	C_m =	8.77 %vol	C_{ma} =	8.798 %vol	
	C_{CO2} =	**5.2 %vol**			
O_2	C =	12.58 %vol	C_0 =	0.05 %vol	
	C_m =	9.98 %vol	C_{ma} =	9.976 %vol	
	C_{O2} =	**12.6 %vol**			

Note: Interim results are not rounded.

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Example Calculations - Pollutant Emission Rate, Volumetric Flow Rate-Based

Project Number:	305091	Test Date:	September 12, 2018
Customer:	Primary Energy	Facility:	Cokenergy Facility
Unit Identification:	HRCC	Run #:	1

$$ER = Cgas \times C_f \times Flow \times 60$$

Where:

ER = Pollutant emission rate (lb/hr)

C_{gas} = Pollutant concentration (ppm, wet or dry basis, but the same as flow)

MW = Pollutant molecular weight (gr/gr-mole)

Flow = Volumetric flow rate (cubic feet per minute wet or dry, but the same as C_{gas})

C_f = Conversion factor (ppm to lb/scf)

1.660E-07 = Conversion constant for SO2. From Table 19-1 of Method 19, 40CFR, Appendix A

For SO2 $ER = C_{gas} \times 1.660E\text{-}07 \times Flow \times 60$

C_{gas} = 155.5 ppmvd

Flow = 642,941 DSCFM

ER_{SO2} = 995.53 lb/hr

Note: Interim results are not rounded.

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Example Calculations - Relative Accuracy (RA) and Bias

Project Number:	305091	Test Date:	September 12, 2018
Customer:	Primary Energy	Facility:	Cokenergy Facility
Unit Identification:	HRCC		

Mean Difference:

$$\overline{d} = \frac{1}{n}\sum_{i=1}^{n} di$$

Where:

di = Difference between RM and CEMS values for run "i"

n = Number of runs used to calculate RA

Standard Deviation:

$$Sd = \left[\frac{\sum_{i=1}^{n} d_i^2 - \frac{\left[\sum_{i=1}^{n} d_i\right]^2}{n}}{n-1} \right]^{1/2}$$

Confidence Coefficient:

$$CC = t_{0.025} \frac{Sd}{\sqrt{n}}$$

Where:

$t_{0.025}$ = T values as presented in 40CFR60 or 40CFR75. For 40CFR60, use $t_{0.975,}$ which are the same T values.

Relative Accuracy based on RM:

$$RA = \frac{\left|\overline{d}\right| + \left|CC\right|}{RM\,avg} \times 100$$

Where:

RM avg = Average RM value for runs used to calculate RA

Relative Accuracy based on Applicable Standard - for Part 60 Applications Only:

$$RA = \frac{\left|\overline{d}\right| + \left|CC\right|}{App\ \ Std} \times 100$$

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Example Calculations - Moisture (Method 4)

Company:	Primary Energy	Project Number:	305091
Plant:	Cokenergy Facility	Test Date:	September 12, 2018
Unit ID:	HRCC	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Effluent Gas Pressure

$$P_s = P_{bar} + (P_g / 13.6)$$

Where:

P_s = Flue gas pressure ("Hg)
P_{bar} = Ambient barometric pressure at sample elevation ("Hg)
P_g = Flue gas gauge pressure ("H_2O)

P_{bar} = 29.26 "Hg P_g = -1.00 "H_2O

P_s = 29.19 "Hg

Actual Meter Volume

$$V_m = Vf - Vi$$

Where:

V_i = Initial meter sample volume (Cubic Feet or Liters)
V_f = Final meter sample volume (Cubic Feet or Liters)
V_m = Sample volume collected at actual conditions (dcf)

V_f = 301.456 cf V_i = 279.000 cf

V_m = 22.456 dcf

Sample Volume at Standard Conditions

$$V_{m(std)} = (T_{std} / 29.92) \times Y \times V_m \times (P_{bar} + P_m / 13.6)/(T_m + 460)$$

Where:

$V_{m(std)}$ = Sample volume collected corrected to 29.92 "Hg and 528 °R (dscf)
Y = Dry test meter calibration coefficient (dimensionless)
T_m = Average dry test meter temperature (^oF)
P_m = Average dry test meter pressure ("H_2O)
T_{std} = Standard temperature 528 °R

V_m = 22.456 dcf P_{bar} = 29.26 "Hg

P_m = 2.00 "H_2O T_m = 70.9 °F

Y = 0.997 T_{std} = 528.0 °R

$V_{m(std)}$ = 21.884 dscf

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Example Calculations - Moisture (Method 4)

Company:	Primary Energy	Project Number:	305091
Plant:	Cokenergy Facility	Test Date:	September 12, 2018
Unit ID:	HRCC	Run #:	1
Sample Location:	Stack 201	Operating Level:	High

Volume of Water Vapor Condensed at Standard Conditions

$$V_{wc(std)} = 0.04715 \times (T_{std} / 528) \times M_{H2O}$$

Where:

$V_{wc(std)}$ = Volume of water vapor collected corrected to 29.92 "Hg and 528 °R (scf)

M_{H2O} = Net weight gain of impingers (grams)

M_{H2O} = **74.3** grams

$V_{wc(std)}$ = 3.503 scf

Moisture Content

$$B_{ws} = \frac{V_{wc(std)}}{V_{wc(std)} + V_{m(std)}}$$

Where:

B_{ws} = Fractional moisture content (dimensionless)

$V_{wc(std)}$ = 3.503 scf $V_{m(std)}$ = 21.884 dscf

B_{ws} = 0.138

Dry Molecular Weight

$$M_d = 0.44 \times (\%CO_2) + 0.32 \times (\%O_2) + 0.28 \times (\%N_2)$$

Where:

M_d = Effluent gas molecular weight (lb/lb-mole, dry basis)

$\%CO_2$ = Effluent gas Carbon Dioxide Content (% volume, dry basis)

$\%O_2$ = Effluent gas Oxygen Content (% volume, dry basis)

$\%N_2$ = Effluent gas Nitrogen Content (% volume, dry basis)

0.32 = Molecular weight of O_2, divided by 100

0.44 = Molecular weight of CO_2, divided by 100

0.28 = Molecular weight of N_2, divided by 100

$\%CO_2$ = 5.2 $\%O_2$ = 12.6 $\%N_2$ = 82.2

M_d = 29.34 lb/lb-mole

Wet Molecular Weight

$$M_s = M_d \times (1 - B_{ws}) + (18.0 \times B_{ws})$$

Where:

M_s = Effluent gas molecular weight (lb/lb-mole, wet basis)

M_d = 29.34 lb/lb-mole B_{ws} = 0.138

M_s = 27.77 lb/lb-mole

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Instrumental Reference Method Field Data

Project Number:	305091	Start Date:	9/12/2018
Customer:	Primary Energy	End Date:	9/12/2018
Unit Identification:	HRCC	Facility:	Cokenergy Facility
Sample Location:	Stack 201	Recorded by:	Gavin Lewis
Load Level/Condition:	> 50% load	Fc Factor:	-
		Fd Factor:	-

Test Parameter				NO_X	SO_2	CO	CO_2	O_2	Volumetric Flow Rate	Moisture Fraction
Calibration Span, CS (Day 1)				-	452.6	-	17.86	22.01		
Calibration Span, CS (Day 2)				-	-	-	-	-		
Run No.	Start Date	First Minute	Last Minute	Run Average Raw Analyzer Responses					DSCFM	Bws
1	9/12/18	7:15	7:35	-	152.39	-	5.16	12.58	642941	-
2	9/12/18	8:00	8:20	-	148.93	-	5.11	12.70	652324	-
3	9/12/18	8:40	9:00	-	152.98	-	5.06	12.80	631745	-
4	9/12/18	9:20	9:40	-	143.08	-	4.96	12.99	623188	-
5	9/12/18	10:00	10:20	-	137.82	-	4.98	12.98	625367	-
6	9/12/18	10:45	11:05	-	130.89	-	4.94	13.06	633954	-
7	9/12/18	11:25	11:45	-	132.54	-	4.87	13.19	629515	-
8	9/12/18	12:05	12:25	-	133.23	-	4.76	13.38	636072	-
9	9/12/18	12:45	13:05	-	126.67	-	4.70	13.48	632043	-
10	9/12/18	13:25	13:45	-	121.24	-	4.73	13.47	619433	-

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Primary Energy
Cokenergy Facility
HRCC Stack 201

Run 1

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 7:15	153.39	5.19	12.55
9/12/2018 7:16	153.63	5.16	12.59
9/12/2018 7:17	154.13	5.18	12.56
9/12/2018 7:18	153.79	5.18	12.56
9/12/2018 7:19	155.88	5.15	12.60
9/12/2018 7:20	155.38	5.17	12.57
9/12/2018 7:21	149.20	5.17	12.56
9/12/2018 7:22	150.62	5.15	12.60
9/12/2018 7:23	151.50	5.18	12.56
9/12/2018 7:24	150.63	5.16	12.58
9/12/2018 7:25	153.38	5.15	12.60
9/12/2018 7:26	151.51	5.16	12.58
9/12/2018 7:27	151.44	5.18	12.56
9/12/2018 7:28	151.78	5.15	12.60
9/12/2018 7:29	152.94	5.16	12.58
9/12/2018 7:30	151.12	5.18	12.56
9/12/2018 7:31	152.55	5.15	12.59
9/12/2018 7:32	152.24	5.16	12.60
9/12/2018 7:33	152.97	5.16	12.58
9/12/2018 7:34	151.03	5.16	12.59
9/12/2018 7:35	151.00	5.15	12.59
Average	**152.39**	**5.16**	**12.58**

Run 2

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 8:00	146.48	5.11	12.71
9/12/2018 8:01	148.38	5.13	12.68
9/12/2018 8:02	147.88	5.13	12.67
9/12/2018 8:03	149.52	5.10	12.70
9/12/2018 8:04	148.57	5.12	12.68
9/12/2018 8:05	148.60	5.10	12.70
9/12/2018 8:06	147.16	5.12	12.67
9/12/2018 8:07	149.76	5.10	12.70
9/12/2018 8:08	148.26	5.12	12.67
9/12/2018 8:09	148.04	5.09	12.72
9/12/2018 8:10	147.37	5.12	12.67
9/12/2018 8:11	147.99	5.08	12.72
9/12/2018 8:12	148.38	5.13	12.65
9/12/2018 8:13	149.53	5.09	12.71
9/12/2018 8:14	150.11	5.10	12.69
9/12/2018 8:15	148.65	5.10	12.71
9/12/2018 8:16	149.03	5.09	12.72
9/12/2018 8:17	150.20	5.10	12.71
9/12/2018 8:18	149.89	5.11	12.70
9/12/2018 8:19	150.94	5.10	12.71
9/12/2018 8:20	152.77	5.09	12.72
Average	**148.93**	**5.11**	**12.70**

Run 3

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 8:40	149.49	5.08	12.75
9/12/2018 8:41	151.45	5.06	12.79
9/12/2018 8:42	149.95	5.08	12.75
9/12/2018 8:43	151.99	5.05	12.79
9/12/2018 8:44	151.41	5.09	12.75
9/12/2018 8:45	152.70	5.06	12.79
9/12/2018 8:46	154.51	5.06	12.79
9/12/2018 8:47	153.76	5.08	12.77
9/12/2018 8:48	153.97	5.07	12.79
9/12/2018 8:49	156.88	5.06	12.80
9/12/2018 8:50	154.38	5.08	12.78
9/12/2018 8:51	153.46	5.04	12.83
9/12/2018 8:52	152.20	5.07	12.79
9/12/2018 8:53	151.19	5.06	12.81
9/12/2018 8:54	153.90	5.05	12.81
9/12/2018 8:55	152.99	5.06	12.79
9/12/2018 8:56	155.48	5.04	12.83
9/12/2018 8:57	153.33	5.06	12.79
9/12/2018 8:58	153.66	5.04	12.87
9/12/2018 8:59	153.58	5.03	12.87
9/12/2018 9:00	152.39	5.04	12.83
Average	**152.98**	**5.06**	**12.80**

Run 4

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 9:20	136.04	4.90	13.09
9/12/2018 9:21	135.92	4.91	13.08
9/12/2018 9:22	134.26	4.91	13.08
9/12/2018 9:23	137.31	4.91	13.09
9/12/2018 9:24	137.41	4.91	13.09
9/12/2018 9:25	138.78	4.94	13.03
9/12/2018 9:26	142.21	4.96	12.99
9/12/2018 9:27	144.28	4.98	12.98
9/12/2018 9:28	145.34	4.99	12.94
9/12/2018 9:29	146.28	4.97	12.97
9/12/2018 9:30	148.57	4.97	12.95
9/12/2018 9:31	146.49	4.97	12.96
9/12/2018 9:32	146.75	4.97	12.97
9/12/2018 9:33	146.00	4.98	12.95
9/12/2018 9:34	146.86	4.98	12.96
9/12/2018 9:35	146.71	4.99	12.94
9/12/2018 9:36	144.99	4.98	12.96
9/12/2018 9:37	145.17	5.00	12.93
9/12/2018 9:38	143.97	4.98	12.96
9/12/2018 9:39	146.38	4.98	12.95
9/12/2018 9:40	144.94	4.99	12.94
Average	**143.08**	**4.96**	**12.99**

Primary Energy
Cokenergy Facility
HRCC Stack 201

Run 5

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 10:00	136.10	5.00	12.94
9/12/2018 10:01	136.51	5.00	12.95
9/12/2018 10:02	137.08	4.99	12.96
9/12/2018 10:03	137.12	4.98	12.97
9/12/2018 10:04	136.65	5.00	12.95
9/12/2018 10:05	137.52	4.98	12.98
9/12/2018 10:06	139.17	4.98	12.97
9/12/2018 10:07	138.78	4.98	12.97
9/12/2018 10:08	139.75	4.98	12.98
9/12/2018 10:09	139.79	4.99	12.96
9/12/2018 10:10	139.86	4.97	12.99
9/12/2018 10:11	141.38	4.98	12.98
9/12/2018 10:12	140.09	4.98	12.99
9/12/2018 10:13	137.45	4.95	13.02
9/12/2018 10:14	136.04	4.98	12.99
9/12/2018 10:15	137.38	4.96	12.99
9/12/2018 10:16	136.46	4.96	13.00
9/12/2018 10:17	137.79	4.97	13.00
9/12/2018 10:18	138.05	4.97	12.98
9/12/2018 10:19	135.44	4.96	13.00
9/12/2018 10:20	135.88	4.95	13.02
Average	**137.82**	**4.98**	**12.98**

Run 6

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 10:45	130.06	4.94	13.06
9/12/2018 10:46	132.01	4.96	13.03
9/12/2018 10:47	129.32	4.96	13.03
9/12/2018 10:48	132.09	4.94	13.06
9/12/2018 10:49	129.68	4.95	13.04
9/12/2018 10:50	131.17	4.93	13.06
9/12/2018 10:51	131.86	4.94	13.05
9/12/2018 10:52	131.84	4.94	13.06
9/12/2018 10:54	131.26	4.95	13.03
9/12/2018 10:55	131.13	4.93	13.06
9/12/2018 10:56	132.26	4.94	13.06
9/12/2018 10:57	131.19	4.94	13.05
9/12/2018 10:58	131.11	4.92	13.07
9/12/2018 10:59	131.57	4.93	13.06
9/12/2018 11:00	130.95	4.94	13.06
9/12/2018 11:01	129.33	4.94	13.05
9/12/2018 11:02	130.34	4.93	13.07
9/12/2018 11:03	129.51	4.94	13.05
9/12/2018 11:04	131.29	4.92	13.09
9/12/2018 11:05	130.60	4.93	13.06
9/12/2018 11:06	130.07	4.93	13.08
Average	**130.89**	**4.94**	**13.06**

Run 7

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 11:25	127.25	4.89	13.14
9/12/2018 11:26	129.47	4.88	13.15
9/12/2018 11:27	129.91	4.89	13.14
9/12/2018 11:28	129.33	4.86	13.18
9/12/2018 11:29	132.13	4.88	13.16
9/12/2018 11:30	130.09	4.87	13.17
9/12/2018 11:31	130.45	4.86	13.20
9/12/2018 11:32	132.17	4.87	13.18
9/12/2018 11:33	131.10	4.87	13.18
9/12/2018 11:34	132.28	4.85	13.21
9/12/2018 11:35	132.25	4.88	13.17
9/12/2018 11:36	132.43	4.89	13.16
9/12/2018 11:37	133.48	4.86	13.20
9/12/2018 11:38	135.23	4.87	13.19
9/12/2018 11:39	133.28	4.86	13.20
9/12/2018 11:40	133.55	4.86	13.20
9/12/2018 11:41	134.86	4.84	13.23
9/12/2018 11:42	134.68	4.86	13.20
9/12/2018 11:43	133.68	4.85	13.20
9/12/2018 11:44	136.92	4.84	13.23
9/12/2018 11:45	138.75	4.83	13.24
Average	**132.54**	**4.87**	**13.19**

Run 8

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 12:05	133.54	4.78	13.35
9/12/2018 12:06	133.80	4.76	13.38
9/12/2018 12:07	133.48	4.78	13.35
9/12/2018 12:08	133.82	4.77	13.36
9/12/2018 12:09	134.38	4.76	13.37
9/12/2018 12:10	135.71	4.76	13.38
9/12/2018 12:11	133.09	4.78	13.35
9/12/2018 12:12	132.55	4.77	13.38
9/12/2018 12:13	133.04	4.76	13.38
9/12/2018 12:14	132.43	4.75	13.38
9/12/2018 12:15	133.76	4.74	13.40
9/12/2018 12:16	134.82	4.76	13.38
9/12/2018 12:17	134.59	4.76	13.39
9/12/2018 12:18	135.98	4.74	13.41
9/12/2018 12:19	133.50	4.75	13.39
9/12/2018 12:20	133.75	4.75	13.40
9/12/2018 12:21	131.78	4.75	13.40
9/12/2018 12:22	130.84	4.75	13.41
9/12/2018 12:23	130.18	4.74	13.42
9/12/2018 12:24	131.22	4.75	13.40
9/12/2018 12:25	131.63	4.75	13.40
Average	**133.23**	**4.76**	**13.38**

Primary Energy
Cokenergy Facility
HRCC Stack 201

Run 9

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 12:45	129.66	4.72	13.45
9/12/2018 12:46	129.84	4.72	13.44
9/12/2018 12:47	129.59	4.71	13.47
9/12/2018 12:48	128.25	4.72	13.46
9/12/2018 12:49	126.63	4.71	13.46
9/12/2018 12:50	128.26	4.70	13.48
9/12/2018 12:51	127.51	4.71	13.47
9/12/2018 12:52	125.83	4.71	13.47
9/12/2018 12:53	127.05	4.69	13.49
9/12/2018 12:54	126.97	4.70	13.48
9/12/2018 12:55	125.73	4.71	13.47
9/12/2018 12:56	126.08	4.70	13.49
9/12/2018 12:57	126.19	4.70	13.47
9/12/2018 12:58	126.13	4.70	13.48
9/12/2018 12:59	126.93	4.69	13.50
9/12/2018 13:00	126.00	4.69	13.50
9/12/2018 13:01	125.54	4.72	13.46
9/12/2018 13:02	125.58	4.69	13.50
9/12/2018 13:03	124.92	4.71	13.50
9/12/2018 13:04	123.62	4.71	13.48
9/12/2018 13:05	123.69	4.69	13.50
Average	**126.67**	**4.70**	**13.48**

Run 10

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 13:25	123.62	4.75	13.44
9/12/2018 13:26	119.69	4.74	13.44
9/12/2018 13:27	119.95	4.73	13.46
9/12/2018 13:28	119.46	4.75	13.44
9/12/2018 13:29	119.57	4.74	13.44
9/12/2018 13:30	119.65	4.74	13.46
9/12/2018 13:31	118.82	4.71	13.48
9/12/2018 13:32	118.84	4.74	13.45
9/12/2018 13:33	119.74	4.74	13.45
9/12/2018 13:34	146.79	4.72	13.47
9/12/2018 13:35	131.59	4.74	13.46
9/12/2018 13:36	121.58	4.72	13.48
9/12/2018 13:37	116.57	4.73	13.48
9/12/2018 13:38	119.07	4.72	13.48
9/12/2018 13:39	118.30	4.73	13.47
9/12/2018 13:40	119.07	4.71	13.50
9/12/2018 13:41	118.24	4.73	13.47
9/12/2018 13:42	119.04	4.71	13.49
9/12/2018 13:43	120.24	4.71	13.49
9/12/2018 13:44	118.65	4.71	13.50
9/12/2018 13:45	117.49	4.69	13.52
Average	**121.24**	**4.73**	**13.47**

Volumetric Flow Test Run Data Summary

Primary Energy
Cokenergy Facility
HRCC Stack 201

Operating Level:	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	
Run No.:	1	2	3	4	5	6	7	8	9	10	**Average**
Start Date:	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	
End Date:	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	
Start Time:	7:15	8:00	8:40	9:20	10:00	10:45	11:25	12:05	12:45	13:25	
End Time:	7:25	8:08	8:49	9:28	10:10	10:54	11:33	12:13	12:53	13:33	
Test Parameters											
P_{bar} - Barometric pressure, inches Hg	29.26	29.28	29.28	29.28	29.28	29.31	29.28	29.28	29.26	29.26	29.28
P_g - Stack Pressure, inches of H2O	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
P_s - Absolute stack pressure, inches Hg	29.19	29.21	29.21	29.21	29.21	29.24	29.21	29.21	29.19	29.19	29.20
T_s - Average stack temperature, °F	287	284	285	285	286	286	287	286	286	287	285.66
% CO_2:	5.2	5.1	5.1	5.0	5.0	4.9	4.9	4.8	4.7	4.7	4.94
% O_2:	12.6	12.7	12.8	13.0	13.0	13.1	13.2	13.4	13.5	13.5	13.08
% Nitrogen:	82.2	82.2	82.1	82.0	82.0	82.0	81.9	81.8	81.8	81.8	81.98
M_d - dry basis lb/lb mole	29.336	29.324	29.328	29.320	29.320	29.308	29.312	29.304	29.292	29.292	29.31
Stack Diameter, Feet	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	
A - Cross Sectional Area of Stack, Ft^2	254.47	254.47	254.47	254.47	254.47	254.47	254.47	254.47	254.47	254.47	
Method 2 Results											
Average ΔP	1.058	1.099	1.022	0.988	1.001	1.018	1.016	1.021	1.016	0.987	1.02
Average Sqrt ΔP	1.027	1.047	1.010	0.993	1.000	1.008	1.007	1.010	1.007	0.992	1.01
Bws - Moisture content fraction	0.138	0.145	0.140	0.137	0.140	0.135	0.140	0.132	0.136	0.141	0.14
Ms - wet basis lb/lb mole	27.772	27.679	27.738	27.771	27.736	27.779	27.734	27.807	27.755	27.699	27.75
Average Velocity (ft/sec)	70.81	72.15	69.54	68.31	68.89	69.39	69.41	69.50	69.39	68.51	69.59
Actual cubic feet per minute (ACFM)	1,081,203	1,101,540	1,061,759	1,043,032	1,051,895	1,059,431	1,059,765	1,061,131	1,059,436	1,045,987	1,062,518
Standard cubic feet per minute (SCFM)	745,862	763,159	734,858	721,957	727,115	733,077	731,574	733,131	731,643	721,206	734,358
Standard cubic feet per hour (SCFH)	44,751,720	45,789,551	44,091,452	43,317,420	43,626,914	43,984,601	43,894,446	43,987,867	43,898,567	43,272,390	44,061,493
Dry Standard cubic feet per minute (DSCFM)	642,941	652,324	631,745	623,188	625,367	633,954	629,515	636,072	632,043	619,433	632,658
Dry Standard cubic feet per hour (DSCFH)	38,576,474	39,139,427	37,904,696	37,391,290	37,522,033	38,037,244	37,770,914	38,164,345	37,922,596	37,165,989	37,959,501

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	1
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	07:15
Pitot ID:	888A	**End Time:**	07:25
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.26
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.19
T_s - Average stack temperature, ^oF		287
Gas Molecular Weight Method:	% CO_2:	5.2
Method 3A, Instrumental	% O_2:	12.6
	% Nitrogen:	82.2
M_d - dry basis lb/lb mole		29.34
M_s - wet basis lb/lb mole		27.77
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.138

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	279.000
Final Meter Volume (cf)	301.456
Meter Temperature, deg F:	70.9
Meter Volume Vm(std) (cf):	21.885
Meter Volume Vw(std) (cf):	3.503
Delta H:	2.00
Train Initial Weight, g:	3108.3
Train Final Weight, g:	3182.6
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)	Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	01	1.10	1.0488	286	72.25	C	01	1.10	1.0488	287	72.30
A	02	1.10	1.0488	287	72.30	C	02	0.97	0.9849	286	67.85
A	03	1.10	1.0488	287	72.30	C	03	0.97	0.9849	286	67.85
A	04	1.00	1.0000	286	68.89	C	04	0.95	0.9747	286	67.15
B	01	1.00	1.0000	287	68.94	D	01	1.20	1.0954	287	75.52
B	02	0.98	0.9899	287	68.25	D	02	1.20	1.0954	287	75.52
B	03	1.00	1.0000	287	68.94	D	03	1.20	1.0954	287	75.52
B	04	0.95	0.9747	286	67.15	D	04	1.10	1.0488	287	72.30

Method 2 Results	
Average ΔP	1.0575
Average Sqrt ΔP	1.0275
Average Velocity (ft/sec)	70.81
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,081,203
Standard cubic feet per minute (SCFM)	745,862
Standard cubic feet per hour (SCFH)	44,751,720
Dry Standard cubic feet per minute (DSCFM)	642,941
Dry Standard cubic feet per hour (DSCFH)	38,576,474

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 12.0 in. Hg

Post-Test: 0.000 CFM @ 12.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	2
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	08:00
Pitot ID:	888A	**End Time:**	08:08
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.28
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.21
T_s - Average stack temperature, ^oF		284
Gas Molecular Weight Method:	% CO_2:	5.1
Method 3A, Instrumental	% O_2:	12.7
	% Nitrogen:	82.2
M_d - dry basis lb/lb mole		29.32
M_s - wet basis lb/lb mole		27.68
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.145

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	301.800
Final Meter Volume (cf)	324.310
Meter Temperature, deg F:	75.0
Meter Volume Vm(std):	21.784
Meter Volume Vw(std):	3.701
Delta H:	2.00
Train Initial Weight, g:	3336.7
Train Final Weight, g:	3415.2
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)	Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.20	1.0954	284	75.47	**C**	**01**	1.00	1.0000	284	68.89
A	**02**	1.20	1.0954	284	75.47	**C**	**02**	1.20	1.0954	284	75.47
A	**03**	1.20	1.0954	284	75.47	**C**	**03**	1.00	1.0000	283	68.84
A	**04**	1.20	1.0954	283	75.42	**C**	**04**	0.84	0.9165	283	63.10
B	**01**	1.10	1.0488	285	72.30	**D**	**01**	1.20	1.0954	284	75.47
B	**02**	1.10	1.0488	285	72.30	**D**	**02**	1.10	1.0488	284	72.25
B	**03**	1.10	1.0488	284	72.25	**D**	**03**	1.10	1.0488	284	72.25
B	**04**	0.95	0.9747	284	67.15	**D**	**04**	1.10	1.0488	284	72.25

Method 2 Results	
Average ΔP	1.0994
Average Sqrt ΔP	1.0473
Average Velocity (ft/sec)	72.15
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,101,540
Standard cubic feet per minute (SCFM)	763,159
Standard cubic feet per hour (SCFH)	45,789,551
Dry Standard cubic feet per minute (DSCFM)	652,324
Dry Standard cubic feet per hour (DSCFH)	39,139,427

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 10.0 in. Hg

Post-Test: 0.000 CFM @ 10.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	3
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	08:40
Pitot ID:	888A	**End Time:**	08:49
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.28
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.21
T_s - Average stack temperature, ^oF		285
Gas Molecular Weight Method:	% CO_2:	5.1
Method 3A, Instrumental	% O_2:	12.8
	% Nitrogen:	82.1
M_d - dry basis lb/lb mole		29.33
M_s - wet basis lb/lb mole		27.74
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.140

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	324.500
Final Meter Volume (cf)	347.041
Meter Temperature, deg F:	80.1
Meter Volume Vm(std):	21.608
Meter Volume Vw(std):	3.527
Delta H:	2.00
Train Initial Weight, g:	3181.5
Train Final Weight, g:	3256.3
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)	Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.00	1.0000	285	68.86	**C**	**01**	1.10	1.0488	285	72.23
A	**02**	1.10	1.0488	285	72.23	**C**	**02**	1.00	1.0000	285	68.86
A	**03**	1.10	1.0488	285	72.23	**C**	**03**	1.00	1.0000	284	68.82
A	**04**	0.95	0.9747	285	67.12	**C**	**04**	0.88	0.9381	284	64.56
B	**01**	0.98	0.9899	285	68.17	**D**	**01**	1.10	1.0488	285	72.23
B	**02**	0.97	0.9849	285	67.82	**D**	**02**	1.10	1.0488	284	72.18
B	**03**	1.00	1.0000	285	68.86	**D**	**03**	1.20	1.0954	284	75.39
B	**04**	0.90	0.9487	285	65.33	**D**	**04**	0.97	0.9849	284	67.78

Method 2 Results	
Average ΔP	1.0219
Average Sqrt ΔP	1.0100
Average Velocity (ft/sec)	69.54
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,061,759
Standard cubic feet per minute (SCFM)	734,858
Standard cubic feet per hour (SCFH)	44,091,452
Dry Standard cubic feet per minute (DSCFM)	631,745
Dry Standard cubic feet per hour (DSCFH)	37,904,696

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 12.0 in. Hg

Post-Test: 0.000 CFM @ 12.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	4
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	09:20
Pitot ID:	888A	**End Time:**	09:28
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.28
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.21
T_s - Average stack temperature, ^oF		285
Gas Molecular Weight Method:	% CO_2:	5.0
Method 3A, Instrumental	% O_2:	13.0
	% Nitrogen:	82.0
M_d - dry basis lb/lb mole		29.32
M_s - wet basis lb/lb mole		27.77
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.137

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	347.300
Final Meter Volume (cf)	370.431
Meter Temperature, deg F:	81.8
Meter Volume Vm(std):	22.104
Meter Volume Vw(std):	3.503
Delta H:	2.00
Train Initial Weight, g:	3395.4
Train Final Weight, g:	3469.7
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)	Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.00	1.0000	285	68.82	**C**	**01**	1.00	1.0000	285	68.82
A	**02**	1.00	1.0000	284	68.78	**C**	**02**	0.98	0.9899	285	68.13
A	**03**	1.10	1.0488	284	72.13	**C**	**03**	0.93	0.9644	285	66.37
A	**04**	0.97	0.9849	284	67.74	**C**	**04**	0.84	0.9165	285	63.08
B	**01**	0.94	0.9695	285	66.73	**D**	**01**	1.10	1.0488	284	72.13
B	**02**	1.00	1.0000	285	68.82	**D**	**02**	1.10	1.0488	285	72.18
B	**03**	1.00	1.0000	284	68.78	**D**	**03**	1.10	1.0488	285	72.18
B	**04**	0.84	0.9165	284	63.04	**D**	**04**	0.90	0.9487	285	65.29

Method 2 Results	
Average ΔP	0.9875
Average Sqrt ΔP	0.9929
Average Velocity (ft/sec)	68.31
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,043,032
Standard cubic feet per minute (SCFM)	721,957
Standard cubic feet per hour (SCFH)	43,317,420
Dry Standard cubic feet per minute (DSCFM)	623,188
Dry Standard cubic feet per hour (DSCFH)	37,391,290

Leak Checks:

Pitot: Pre-Test: Pass
Post-Test: Pass

Moisture Train:
Pre-Test: 0.000 CFM @ 12.0 in. Hg
Post-Test: 0.000 CFM @ 12.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	5
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	10:00
Pitot ID:	888A	**End Time:**	10:10
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.28
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.21
T_s - Average stack temperature, ^oF		286
Gas Molecular Weight Method:	% CO_2:	5.0
Method 3A, Instrumental	% O_2:	13.0
	% Nitrogen:	82.0
M_d - dry basis lb/lb mole		29.32
M_s - wet basis lb/lb mole		27.74
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.140

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	370.700
Final Meter Volume (cf)	393.341
Meter Temperature, deg F:	81.5
Meter Volume Vm(std):	21.648
Meter Volume Vw(std):	3.522
Delta H:	2.00
Train Initial Weight, g:	3136.5
Train Final Weight, g:	3211.2
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.10	1.0488	286	72.28
A	**02**	1.10	1.0488	286	72.28
A	**03**	1.10	1.0488	286	72.28
A	**04**	0.95	0.9747	286	67.17
B	**01**	1.00	1.0000	286	68.91
B	**02**	1.00	1.0000	286	68.91
B	**03**	1.00	1.0000	285	68.87
B	**04**	0.85	0.9220	285	63.49
C	**01**	1.00	1.0000	285	68.87
C	**02**	1.00	1.0000	285	68.87
C	**03**	1.00	1.0000	285	68.87
C	**04**	0.90	0.9487	285	65.33
D	**01**	1.00	1.0000	286	68.91
D	**02**	1.10	1.0488	286	72.28
D	**03**	1.00	1.0000	286	68.91
D	**04**	0.92	0.9592	286	66.10

Method 2 Results	
Average ΔP	1.0013
Average Sqrt ΔP	1.0000
Average Velocity (ft/sec)	68.89
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,051,895
Standard cubic feet per minute (SCFM)	727,115
Standard cubic feet per hour (SCFH)	43,626,914
Dry Standard cubic feet per minute (DSCFM)	625,367
Dry Standard cubic feet per hour (DSCFH)	37,522,033

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 13.0 in. Hg

Post-Test: 0.000 CFM @ 13.0 in. Hg

Comments:

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	6
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	10:45
Pitot ID:	888A	**End Time:**	10:54
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.31
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.24
T_s - Average stack temperature, ^oF		286
Gas Molecular Weight Method:	% CO_2:	4.9
Method 3A, Instrumental	% O_2:	13.1
	% Nitrogen:	82.0
M_d - dry basis lb/lb mole		29.31
M_s - wet basis lb/lb mole		27.78
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.135

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	393.500
Final Meter Volume (cf)	416.705
Meter Temperature, deg F:	80.4
Meter Volume Vm(std):	22.255
Meter Volume Vw(std):	3.480
Delta H:	2.00
Train Initial Weight, g:	3384.5
Train Final Weight, g:	3458.3
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.00	1.0000	286	68.82
A	**02**	1.00	1.0000	286	68.82
A	**03**	1.10	1.0488	286	72.18
A	**04**	1.00	1.0000	286	68.82
B	**01**	0.95	0.9747	285	67.04
B	**02**	0.98	0.9899	285	68.09
B	**03**	1.10	1.0488	286	72.18
B	**04**	0.95	0.9747	286	67.08
C	**01**	0.95	0.9747	286	67.08
C	**02**	1.00	1.0000	286	68.82
C	**03**	1.10	1.0488	286	72.18
C	**04**	0.89	0.9434	286	64.93
D	**01**	1.10	1.0488	285	72.14
D	**02**	1.10	1.0488	285	72.14
D	**03**	1.10	1.0488	285	72.14
D	**04**	0.97	0.9849	285	67.74

Method 2 Results	
Average ΔP	1.0181
Average Sqrt ΔP	1.0084
Average Velocity (ft/sec)	69.39
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,059,431
Standard cubic feet per minute (SCFM)	733,077
Standard cubic feet per hour (SCFH)	43,984,601
Dry Standard cubic feet per minute (DSCFM)	633,954
Dry Standard cubic feet per hour (DSCFH)	38,037,244

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 10.0 in. Hg

Post-Test: 0.000 CFM @ 10.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	7
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	11:25
Pitot ID:	888A	**End Time:**	11:33
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.28
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.21
T_s - Average stack temperature, ^oF		287
Gas Molecular Weight Method:	% CO_2:	4.9
Method 3A, Instrumental	% O_2:	13.2
	% Nitrogen:	81.9
M_d - dry basis lb/lb mole		29.31
M_s - wet basis lb/lb mole		27.73
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.140

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	416.848
Final Meter Volume (cf)	439.741
Meter Temperature, deg F:	79.8
Meter Volume Vm(std):	21.958
Meter Volume Vw(std):	3.560
Delta H:	2.00
Train Initial Weight, g:	3080.8
Train Final Weight, g:	3156.3
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.00	1.0000	287	68.96
A	**02**	1.00	1.0000	287	68.96
A	**03**	1.10	1.0488	287	72.33
A	**04**	0.98	0.9899	287	68.27
B	**01**	1.00	1.0000	287	68.96
B	**02**	1.00	1.0000	287	68.96
B	**03**	1.00	1.0000	287	68.96
B	**04**	0.90	0.9487	287	65.42

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
C	**01**	1.00	1.0000	287	68.96
C	**02**	0.98	0.9899	287	68.27
C	**03**	0.98	0.9899	286	68.22
C	**04**	0.83	0.9110	286	62.79
D	**01**	1.10	1.0488	286	72.28
D	**02**	1.20	1.0954	286	75.49
D	**03**	1.20	1.0954	286	75.49
D	**04**	0.98	0.9899	286	68.22

Method 2 Results	
Average ΔP	1.0156
Average Sqrt ΔP	1.0068
Average Velocity (ft/sec)	69.41
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,059,765
Standard cubic feet per minute (SCFM)	731,574
Standard cubic feet per hour (SCFH)	43,894,446
Dry Standard cubic feet per minute (DSCFM)	629,515
Dry Standard cubic feet per hour (DSCFH)	37,770,914

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 10.0 in. Hg

Post-Test: 0.000 CFM @ 10.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	8
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	12:05
Pitot ID:	888A	**End Time:**	12:13
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.28
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.21
T_s - Average stack temperature, ^oF		286
Gas Molecular Weight Method:	% CO_2:	4.8
Method 3A, Instrumental	% O_2:	13.4
	% Nitrogen:	81.8
M_d - dry basis lb/lb mole		29.30
M_s - wet basis lb/lb mole		27.81
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.132

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	439.810
Final Meter Volume (cf)	462.450
Meter Temperature, deg F:	82.7
Meter Volume Vm(std):	21.599
Meter Volume Vw(std):	3.296
Delta H:	2.00
Train Initial Weight, g:	3377.2
Train Final Weight, g:	3447.1
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.10	1.0488	286	72.18
A	**02**	1.10	1.0488	286	72.18
A	**03**	1.10	1.0488	286	72.18
A	**04**	0.95	0.9747	286	67.08
B	**01**	0.97	0.9849	286	67.78
B	**02**	0.98	0.9899	286	68.13
B	**03**	0.97	0.9849	286	67.78
B	**04**	0.84	0.9165	286	63.08

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
C	**01**	1.10	1.0488	286	72.18
C	**02**	1.00	1.0000	286	68.82
C	**03**	1.00	1.0000	286	68.82
C	**04**	0.93	0.9644	286	66.37
D	**01**	1.10	1.0488	286	72.18
D	**02**	1.10	1.0488	286	72.18
D	**03**	1.10	1.0488	286	72.18
D	**04**	1.00	1.0000	286	68.82

Method 2 Results	
Average ΔP	1.0213
Average Sqrt ΔP	1.0098
Average Velocity (ft/sec)	69.50
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,061,131
Standard cubic feet per minute (SCFM)	733,131
Standard cubic feet per hour (SCFH)	43,987,867
Dry Standard cubic feet per minute (DSCFM)	636,072
Dry Standard cubic feet per hour (DSCFH)	38,164,345

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 10.0 in. Hg

Post-Test: 0.000 CFM @ 10.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	9
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	12:45
Pitot ID:	888A	**End Time:**	12:53
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.26
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.19
T_s - Average stack temperature, ^oF		286
Gas Molecular Weight Method:	% CO_2:	4.7
Method 3A, Instrumental	% O_2:	13.5
	% Nitrogen:	81.8
M_d - dry basis lb/lb mole		29.29
M_s - wet basis lb/lb mole		27.75
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.136

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	462.500
Final Meter Volume (cf)	485.268
Meter Temperature, deg F:	85.3
Meter Volume Vm(std):	21.603
Meter Volume Vw(std):	3.404
Delta H:	2.00
Train Initial Weight, g:	3156.3
Train Final Weight, g:	3228.5
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.10	1.0488	286	72.28
A	**02**	1.10	1.0488	286	72.28
A	**03**	1.10	1.0488	286	72.28
A	**04**	0.97	0.9849	285	67.83
B	**01**	1.00	1.0000	285	68.87
B	**02**	1.00	1.0000	285	68.87
B	**03**	0.97	0.9849	286	67.87
B	**04**	0.88	0.9381	286	64.65

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
C	**01**	0.97	0.9849	286	67.87
C	**02**	0.97	0.9849	286	67.87
C	**03**	1.00	1.0000	286	68.91
C	**04**	0.92	0.9592	286	66.10
D	**01**	1.00	1.0000	286	68.91
D	**02**	1.10	1.0488	286	72.28
D	**03**	1.20	1.0954	286	75.49
D	**04**	0.97	0.9849	286	67.87

Method 2 Results	
Average ΔP	1.0156
Average Sqrt ΔP	1.0070
Average Velocity (ft/sec)	69.39
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,059,436
Standard cubic feet per minute (SCFM)	731,643
Standard cubic feet per hour (SCFH)	43,898,567
Dry Standard cubic feet per minute (DSCFM)	632,043
Dry Standard cubic feet per hour (DSCFH)	37,922,596

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 12.0 in. Hg

Post-Test: 0.000 CFM @ 12.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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METHOD 2 VOLUMETRIC FLOW DATA

Project No:	305091	**Operating Level:**	High
Company:	Primary Energy	**Run No.:**	10
Plant:	Cokenergy Facility	**Start Date:**	9/12/2018
Unit ID:	HRCC	**End Date:**	9/12/2018
Sample Location:	Stack 201	**Start Time:**	13:25
Pitot ID:	888A	**End Time:**	13:33
Pitot Coefficient:	0.84	**RM Testers:**	RN

Test Parameters		
P_{bar} - Barometric pressure, inches Hg		29.26
P_g - Stack Pressure, inches of H_2O		-1.00
P_s - Absolute stack pressure, inches Hg		29.19
T_s - Average stack temperature, ^oF		287
Gas Molecular Weight Method:	% CO_2:	4.7
Method 3A, Instrumental	% O_2:	13.5
	% Nitrogen:	81.8
M_d - dry basis lb/lb mole		29.29
M_s - wet basis lb/lb mole		27.70
Stack Diameter, Feet		18.00
A - Cross Sectional Area of Stack, Ft^2		254.47
B_{ws} - Moisture content fraction		0.141

Moisture Determination	
Method Used:	4
Meter Calibration:	0.997
Initial Meter Volume (cf)	485.400
Final Meter Volume (cf)	507.710
Meter Temperature, deg F:	88.0
Meter Volume Vm(std):	21.064
Meter Volume Vw(std):	3.461
Delta H:	2.00
Train Initial Weight, g:	3447.1
Train Final Weight, g:	3520.5
Condensate Initial Vol, mL:	0.0
Condensate Final Vol, mL:	0.0

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
A	**01**	1.00	1.0000	287	69.03
A	**02**	1.00	1.0000	287	69.03
A	**03**	1.00	1.0000	287	69.03
A	**04**	0.95	0.9747	287	67.28
B	**01**	0.98	0.9899	287	68.34
B	**02**	0.94	0.9695	287	66.93
B	**03**	0.98	0.9899	287	68.34
B	**04**	0.85	0.9220	287	63.64

Port	Point	ΔP (in. H_2O)	√ΔP	Temp (°F)	Velocity (V_S)
C	**01**	0.95	0.9747	287	67.28
C	**02**	0.98	0.9899	287	68.34
C	**03**	0.98	0.9899	287	68.34
C	**04**	0.82	0.9055	287	62.51
D	**01**	1.10	1.0488	287	72.40
D	**02**	1.10	1.0488	287	72.40
D	**03**	1.20	1.0954	287	75.62
D	**04**	0.96	0.9798	287	67.63

Method 2 Results	
Average ΔP	0.9869
Average Sqrt ΔP	0.9924
Average Velocity (ft/sec)	68.51
No WAF Applied to this Test	
Actual cubic feet per minute (ACFM)	1,045,987
Standard cubic feet per minute (SCFM)	721,206
Standard cubic feet per hour (SCFH)	43,272,390
Dry Standard cubic feet per minute (DSCFM)	619,433
Dry Standard cubic feet per hour (DSCFH)	37,165,989

Leak Checks:

Pitot: Pre-Test: Pass

Post-Test: Pass

Moisture Train:

Pre-Test: 0.000 CFM @ 10.0 in. Hg

Post-Test: 0.000 CFM @ 10.0 in. Hg

Comments:

Standard conditions of 29.92 in/Hg and 68º F

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Method 4 Test Run Data Summary

Company: Primary Energy
Plant: Cokenergy Facility
Unit: HRCC
Location: Stack 201

Test Run Number	1	2	3	4	5	6	7	8	9	10	Average
Source Condition	High	High	High	High	High	High	High	High	High	High	
Date	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	9/12/18	
Start Time	7:15	8:00	8:40	9:20	10:00	10:45	11:25	12:05	12:45	13:25	
End Time	7:45	8:30	9:10	9:50	10:30	11:15	11:55	12:35	13:15	13:55	
Sample Duration (min):	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Average Stack Temp, T_s (^oF):	286.0	285.0	285.0	285.0	286.0	287.0	287.0	286.0	286.0	287.0	286.0
Gas CO_2 Content (%v/v dry):	5.2	5.1	5.1	5.0	5.0	4.9	4.9	4.8	4.7	4.7	4.9
Gas O_2 Content (%v/v dry):	12.6	12.7	12.8	13.0	13.0	13.1	13.2	13.4	13.5	13.5	13.1
Gas N_2 Content (%v/v dry):	82.2	82.2	82.1	82.0	82.0	82.0	81.9	81.8	81.8	81.8	82.0
Gas Dry MW, M_d (lb/lb-mole):	29.34	29.32	29.33	29.32	29.32	29.31	29.31	29.30	29.29	29.29	29.31
Gas Wet MW, M_s (lb/lb-mole):	27.77	27.68	27.74	27.77	27.74	27.78	27.73	27.81	27.75	27.70	27.75
Barometric Pressure, P_{bar} ("Hg)	29.26	29.28	29.28	29.28	29.28	29.31	29.28	29.28	29.26	29.26	29.28
Flue Pressure, P_s ("Hg)	29.19	29.21	29.21	29.21	29.21	29.24	29.21	29.21	29.19	29.19	29.20
Meter Y	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997
Meter Pressure, P_m ("H_2O):	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Meter Temperature, T_m (^oF):	70.9	75.0	80.1	81.8	81.5	80.4	79.8	82.7	85.3	88.0	80.5
Meter Volume, V_m (dcf):	22.456	22.510	22.541	23.131	22.641	23.205	22.893	22.640	22.768	22.310	22.710
Meter Volume, V_m (L):	635.883	637.412	638.290	654.997	641.122	657.092	648.258	641.093	644.718	631.749	643.061
Meter Volume, V_m (dcm):	0.636	0.637	0.638	0.655	0.641	0.657	0.648	0.641	0.645	0.632	0.643
Meter Volume, $V_{m(std)}$ (dscf):	21.884	21.784	21.609	22.106	21.648	22.254	21.960	21.600	21.601	21.064	21.751
Meter Volume, $V_{m(std)}$ (dscm):	0.620	0.617	0.612	0.626	0.613	0.630	0.622	0.612	0.612	0.596	0.616
Moisture Volume, $V_{wc(std)}$ (scf):	3.503	3.701	3.527	3.503	3.522	3.480	3.560	3.296	3.404	3.461	3.496
Fractional Moisture Content, B_{ws}:	0.138	0.145	0.140	0.137	0.140	0.135	0.139	0.132	0.136	0.141	0.138

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	1	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.26 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 12

Post Leak Check: 0.000 @ 12

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	7:15:00	279.000	2.0	70.0	70.0	1.0	59.0	286.0
	7:20:00	282.760	2.0	72.0	70.0	1.0	60.0	286.0
	7:25:00	286.560	2.0	72.0	70.0	1.0	60.0	286.0
	7:30:00	290.340	2.0	71.0	70.0	1.0	61.0	286.0
	7:35:00	294.070	2.0	72.0	71.0	1.0	61.0	286.0
	7:40:00	297.770	2.0	72.0	71.0	1.0	62.0	286.0
	7:45:00	301.456						
	Net Volume:	22.456						
		Average:	2.00	70.9			60.5	286.0

Moisture Data

Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3108.3	3182.6
	Net:	74.3

Gas Analysis (%v/v dry)

O_2	CO_2
12.6	5.2
Average: 12.6	5.2

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	2	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.28 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 10

Post Leak Check: 0.000 @ 10

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	8:00:00	301.800	2.0	72.0	72.0	2.0	58.0	285.0
	8:05:00	305.590	2.0	75.0	73.0	2.0	58.0	285.0
	8:10:00	309.400	2.0	76.0	74.0	2.0	59.0	285.0
	8:15:00	313.400	2.0	77.0	75.0	2.0	60.0	285.0
	8:20:00	316.880	2.0	77.0	75.0	2.0	60.0	285.0
	8:25:00	320.600	2.0	79.0	75.0	2.0	61.0	285.0
	8:30:00	324.310						
	Net Volume:	22.510						
		Average:	2.00	75.0			59.3	285.0

Moisture Data

Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3336.7	3415.2
	Net:	78.5

Gas Analysis (%v/v dry)

O_2	CO_2
12.7	5.1
Average: 12.7	5.1

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	3	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.28 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 12

Post Leak Check: 0.000 @ 12

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	8:40:00	324.500	2.0	80.0	78.0	1.0	60.0	285.0
	8:45:00	328.310	2.0	80.0	78.0	1.0	60.0	285.0
	8:50:00	332.080	2.0	81.0	78.0	1.0	62.0	285.0
	8:55:00	335.890	2.0	82.0	78.0	1.0	62.0	285.0
	9:00:00	339.600	2.0	84.0	79.0	1.0	63.0	285.0
	9:05:00	343.340	2.0	84.0	79.0	1.0	63.0	285.0
	9:10:00	347.041						
	Net Volume:	22.541						
		Average:	2.00	80.1			61.7	285.0

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3181.5	3256.3
	Net:	74.8

	Gas Analysis (%v/v dry)	
	O_2	CO_2
	12.8	5.1
Average:	12.8	5.1

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	4	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.28 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 12

Post Leak Check: 0.000 @ 12

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	9:20:00	347.300	2.0	81.0	80.0	2.0	61.0	285.0
	9:25:00	351.150	2.0	83.0	80.0	2.0	61.0	285.0
	9:30:00	355.030	2.0	83.0	80.0	2.0	62.0	285.0
	9:35:00	358.890	2.0	83.0	81.0	2.0	62.0	285.0
	9:40:00	362.760	2.0	84.0	81.0	2.0	63.0	285.0
	9:45:00	366.600	2.0	84.0	81.0	2.0	63.0	285.0
	9:50:00	370.431						
Net Volume:		23.131						
		Average:	2.00	81.8			62.0	285.0

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3395.4	3469.7
Net:		74.3

Gas Analysis (%v/v dry)		
	O_2	CO_2
	13.0	5.0
Average:	13.0	5.0

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	5	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.28 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 13

Post Leak Check: 0.000 @ 13

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	10:00:00	370.700	2.0	83.0	81.0	2.0	59.0	286.0
	10:05:00	374.500	2.0	83.0	81.0	2.0	60.0	286.0
	10:10:00	378.290	2.0	84.0	81.0	2.0	60.0	286.0
	10:15:00	382.060	2.0	82.0	80.0	2.0	61.0	286.0
	10:20:00	385.880	2.0	82.0	80.0	2.0	61.0	286.0
	10:25:00	389.600	2.0	81.0	80.0	2.0	62.0	286.0
	10:30:00	393.341						
	Net Volume:	22.641						
		Average:	2.00	81.5			60.5	286.0

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3136.5	3211.2
	Net:	74.7

	Gas Analysis (%v/v dry)	
	O_2	CO_2
	13.0	5.0
Average:	13.0	5.0

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	6	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.31 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 10

Post Leak Check: 0.000 @ 10

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	10:45:00	393.500	2.0	80.0	79.0	2.0	60.0	287.0
	10:50:00	397.390	2.0	81.0	80.0	2.0	60.0	287.0
	10:55:00	401.200	2.0	82.0	80.0	2.0	61.0	287.0
	11:00:00	405.090	2.0	82.0	79.0	2.0	62.0	287.0
	11:05:00	409.000	2.0	82.0	79.0	2.0	62.0	287.0
	11:10:00	412.900	2.0	82.0	79.0	2.0	63.0	287.0
	11:15:00	416.705						
	Net Volume:	23.205						
		Average:	2.00	80.4			61.3	287.0

Moisture Data

Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3384.5	3458.3
	Net:	73.8

Gas Analysis (%v/v dry)

O_2	CO_2
13.1	4.9
Average: 13.1	4.9

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	7	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.28 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 10

Post Leak Check: 0.000 @ 10

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	11:25:00	416.848	2.0	79.0	78.0	2.0	61.0	287.0
	11:30:00	420.650	2.0	80.0	78.0	2.0	61.0	287.0
	11:35:00	424.440	2.0	81.0	78.0	2.0	62.0	287.0
	11:40:00	428.320	2.0	82.0	79.0	2.0	62.0	287.0
	11:45:00	432.150	2.0	82.0	79.0	2.0	63.0	287.0
	11:50:00	435.930	2.0	82.0	79.0	2.0	63.0	287.0
	11:55:00	439.741						
	Net Volume:	22.893						
		Average:	2.00	79.8			62.0	287.0

Moisture Data

Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3080.8	3156.3
Net:		75.5

Gas Analysis (%v/v dry)

	O_2	CO_2
	13.2	4.9
Average:	13.2	4.9

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	8	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.28 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 10

Post Leak Check: 0.000 @ 10

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	12:05:00	439.810	2.0	81.0	81.0	2.0	58.0	286.0
	12:10:00	443.600	2.0	83.0	81.0	2.0	58.0	286.0
	12:15:00	447.370	2.0	83.0	81.0	2.0	59.0	286.0
	12:20:00	451.130	2.0	85.0	82.0	2.0	59.0	286.0
	12:25:00	454.900	2.0	85.0	82.0	2.0	60.0	286.0
	12:30:00	458.700	2.0	86.0	82.0	2.0	60.0	286.0
	12:35:00	462.450						
	Net Volume:	22.640						
		Average:	2.00	82.7			59.0	286.0

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3377.2	3447.1
	Net:	69.9

	Gas Analysis (%v/v dry)	
	O_2	CO_2
	13.4	4.8
Average:	13.4	4.8

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	9	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.26 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 12

Post Leak Check: 0.000 @ 12

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	12:45:00	462.500	2.0	85.0	83.0	2.0	61.0	286.0
	12:50:00	466.200	2.0	86.0	83.0	2.0	61.0	286.0
	12:55:00	469.800	2.0	86.0	84.0	2.0	62.0	286.0
	13:00:00	473.770	2.0	87.0	84.0	2.0	63.0	286.0
	13:05:00	477.600	2.0	88.0	85.0	2.0	63.0	286.0
	13:10:00	481.460	2.0	88.0	85.0	2.0	64.0	286.0
	13:15:00	485.268						
	Net Volume:	22.768						
		Average:	2.00	85.3			62.3	286.0

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3156.3	3228.5
	Net:	72.2

	Gas Analysis (%v/v dry)	
	O_2	CO_2
	13.5	4.7
Average:	13.5	4.7

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Moisture Test Run Data

Company:	Primary Energy	**Project #:**	305091	**Console Operator:**	Ryan Novosel
Plant:	Cokenergy Facility	**Test Method:**	4	**Console ID:**	E44
Unit ID:	HRCC	**Test Run #:**	10	**Meter Y :**	0.997
Location:	Stack 201	**Test Date(s):**	9/12/2018	**Orifice ΔH@i:**	1.676
				Probe Temp. °F	--

Unit Operating Mode: High **Barometric Pressure ("Hg):** 29.26 **Static Pressure ("H_2O):** -1.00

Pre Leak Check: 0.000 @ 10

Post Leak Check: 0.000 @ 10

		Dry Gas Meter						
Port & Point ID	Clock Time	Volume Cubic Feet	Pressure ("H_2O)	Inlet (^oF)	Outlet (^oF)	Vacuum ("Hg)	Impinger Outlet (^oF)	Stack (^oF)
1-1	13:25:00	485.400	2.0	87.0	85.0	2.0	60.0	287.0
	13:30:00	489.440	2.0	89.0	85.0	2.0	60.0	287.0
	13:35:00	492.250	2.0	89.0	86.0	2.0	61.0	287.0
	13:40:00	496.130	2.0	91.0	86.0	2.0	61.0	287.0
	13:45:00	500.000	2.0	92.0	87.0	2.0	62.0	287.0
	13:50:00	503.850	2.0	92.0	87.0	2.0	62.0	287.0
	13:55:00	507.710						
	Net Volume:	22.310						
		Average:	2.00	88.0			61.0	287.0

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3447.1	3520.5
	Net:	73.4

	Gas Analysis (%v/v dry)	
	O_2	CO_2
	13.5	4.7
Average:	13.5	4.7

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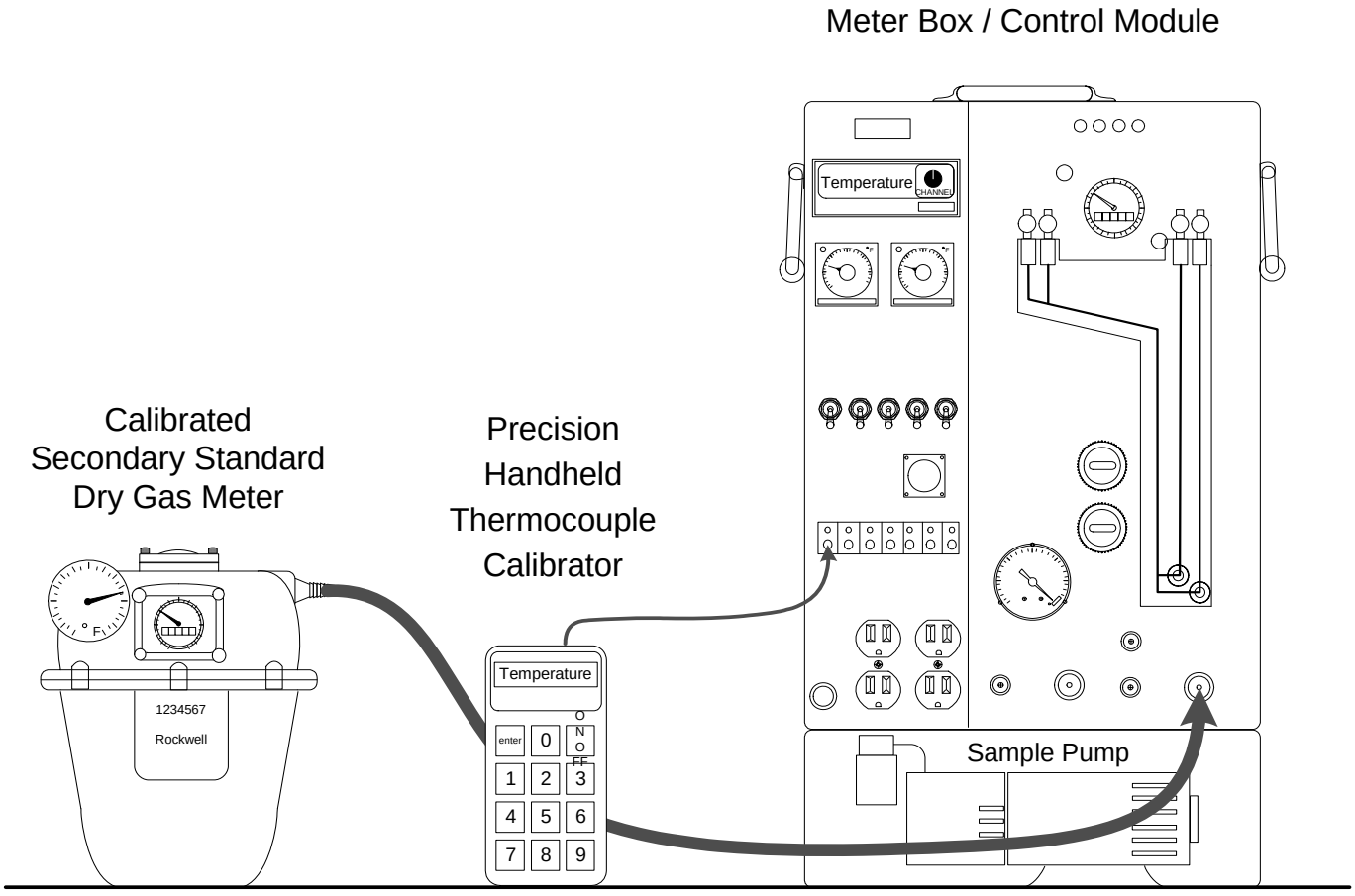
Equipment Configuration for Meter Box Calibration

USEPA Promulgated Method 5



Pre Test DGM Calibration

(before use, as left data)

Control Module I.D. No.	E44	System Leak Check:	Stable @ 8" w.c. @ > 5 min.	Date:	03-21-2018
Standard Meter I.D. No.:	3623853	Standard Meter Calibration Date:	08-04-2017	Calibrated By:	L. Campo
Standard Meter (Y_{ds}):	0.9941	Standard Meter Calibration Due Date:	08-04-2018	Barometric Pressure :	29.23

Run Number	Orifice Setting in.H_20	Meter Pressure in.H_20	Standard Meter Volume Vr	Control Module DGM Volume Vd	Standard Meter Temp. F Tr	Dry Gas Meter Inlet Temp. F Tdi	Dry Gas Meter Outlet Temp. F Tdo	Dry Gas Meter Avg. Temp. F Td	Time Min.	Time Sec.	Gamma Correction Coef. Y	Pressure equal to: 0.75 cfm @ STP (DH@)	Flow Rate (Q) scfm
Initial			988.248	933.385	74	75	75						
Final			995.554	940.698	74	76	76						
Difference 1	0.35	0.35	7.306	7.313	74	76	76	76	20	2	0.995	1.528	0.35
Initial			4.192	949.326	74	75	75						
Final			12.444	957.550	74	76	76						
Difference 2	0.85	0.85	8.252	8.224	74	76	76	76	15	5	0.998	1.649	0.53
Initial			13.068	958.171	74	76	76						
Final			21.254	966.327	74	76	76						
Difference 3	2.00	2.00	8.186	8.156	74	76	76	76	10	20	0.996	1.849	0.76
								Pre Test Calibration Factor (Y_{avg})			0.997	1.676	

Specifications: CFR 40, Part 60, Appendix A, Method 5, section 10.3.1. Calibration Before Use.

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Pre Test Temperature Indicator Calibration

(For K-Type Thermocouples)

Date: 03-21-2018

Name: L. Campo

Control Module Number: E44

Ambient Temperature: 74 ^{o}F

Reference std. thermocouple calibrator: Omega Engineering, Inc. Model No. CL23A *****
Reference std. thermocouple calibrator serial number: T-236796
Date of reference std. calibration verification: 6/1/2017
Due date of reference std. calibration verification: 6/1/2018

Reference Thermometer (^{o}F)	Thermometer Under Test (^{o}F)	Temperature Difference (%)
0	2	0.4
600	602	0.2
1200	1201	0.1

$$\text{Temperature Difference, \%} = \frac{\text{Ref. std. temp. } (^{o}F + 460) - \text{Therm. under test temp. } (^{o}F + 460)}{\text{Reference std temp. } (^{o}F + 460)} \times 100 \leq 1.5\ \%$$

** Reference std. is directly traceable to NIST (National Institute of Standards and Technology)*

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Post Test DGM Calibration

(after use, as found data)

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Control Module I.D. No.	E-44	System Leak Check:	Passed @ > 8" w.c. @ > 5 min	Date:	10-09-2018
Standard Meter I.D. No.:	3623853	Standard Meter Calibration Date:	8-22-2018	Calibrated By:	L. Campo
Standard Meter (Y_{ds}):	0.9972	Standard Meter Calibration Due Date:	8-22-2019	Barometric Pressure :	29.18

Run Number	Sample Train Vacuum (Hg") (avg test value)	Sample Train DH@$_{avg}$($H_2$0") (avg test value)	Standard Meter Gas Volume Vr	Control Module DGM Volume Vd	Standard Meter Temp. F Tr	Dry Gas Meter Inlet Temp. F Tdi	Dry Gas Meter Outlet Temp. F Tdo	Dry Gas Meter Avg. Temp. F Td	Time Min.	Time Sec.	Gamma Correction Coef Y	Pressure equal to: 0.75 cfm @ STP (DH@)	Flow Rate (Q) scfm
Initial			840.636	537.140	73	74	74						
Final			848.663	545.106	73	75	75						
Difference 1	0	0.85	8.027	7.966	73	75	75	75	15	16	1.006	1.785	0.50
Initial			848.663	545.106	73	75	75						
Final			856.667	553.042	73	76	76						
Difference 2	0	0.85	8.004	7.936	73	76	76	76	15	19	1.008	1.804	0.50
Initial			856.667	553.042	73	76	76						
Final			864.612	560.928	73	77	77						
Difference 3	0	0.85	7.945	7.886	73	77	77	77	15	15	1.009	1.812	0.50

Post Test Calibration Factor (Y_{avg}	1.008	1.800
Pre Test Calibration Factor (Y_{avg}):	0.997	
Pre Test Calibration (Date):	03-21-2018	
% diff. between Pre & Post (Y_{avg}):	1.1%	

Specifications: CFR 40, Part 60, Appendix A, Method 5, section 10.3.2. Calibration After Use.

If difference between Pre & Post is less than 5% use Pre Test (Y)

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Post Test Temperature Indicator Calibration

(For K-Type Thermocouples)

Date: 10-09-2018

Name: L. Campo

Control Module Number: E-44

Ambient Temperature: 73 ^{o}F

Reference std. thermocouple calibrator: Omega Engineering, Inc. Model No. CL23A *****
Reference std. thermocouple calibrator serial number: T-236796
Date of reference std. calibration verification: 5/31/2018
Due date of reference std. calibration verification: 5/31/2019

Reference Thermometer (^{o}F)	Thermometer Under Test (^{o}F)	Temperature Difference (%)
0	1	0.2
600	601	0.1
1200	1201	0.1

$$\text{Temperature Difference, \%} = \frac{\text{Ref. std. temp. } (^{o}\text{F} + 460) - \text{Therm. under test temp. } (^{o}\text{F} + 460)}{\text{Reference std temp. } (^{o}\text{F} + 460)} \times 100 \leq 1.5\ \%$$

** Reference std. is directly traceable to NIST (National Institute of Standards and Technology)*

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Field Calibration Tool Identification

Analyst:	Ryan Novosel
Date:	9/11/2018
Project Number:	305091
Client:	Primary Energy
Test Location:	Stack 201

Calibration Tools: Include all of the tools from the field calibration kit that you will be using on this project. (See SOP AM-CAL-025 for instructions on re-verification)

Item	ID#	S/N	Calibration Due Date
Digital Caliper	DC014	--	9/7/2019
Thermometer	TH014	122436576	9/7/2017
Barometer	BA014	160253744	3/8/2019
Calibration Weight	W100-014	2341	9/7/2019
Calibration Weight A	W500-014	4593	9/7/2019
Calibration Weight B	W500/2-014	5094	9/7/2019
Type A Angle Finder	AF014	--	9/7/2019
Plastic/Magnetic Torpedo Level	TL014	--	--

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Pre-Test Thermocouple Calibration Checks

Analyst:	Ryan Novosel
Date:	9/11/18
Project Number:	305091
Client:	Primary Energy
Test Location:	Stack 201

(See SOP AM-CAL-005 for instructions)

Console/Meter Box ID #	E44
Probe ID#	888
Test Location/Measurement Point Info:	Ground
NIST Thermometer ID #	TH014

Procedure 1: Calibrate thermocouple against a reference thermometer.

After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer.

Procedure 2: Check the response of the thermocouple to a change in temperature.

Check the "continuity" of the thermocouple by subjecting it to a change in temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections.

Measurement	T/C Temp, ^{o}F	NIST Thermometer Temp, ^{o}F	Difference, ^{o}F (± 2)	Continuity Check	Overall Status
Stack	80	80.5	0.5	Pass	Pass
Filter					
Impinger Exit	79	80	1.0	Pass	Pass
Meter in	80	80.2	0.2	Pass	Pass
Meter Out	80	80.3	0.3	Pass	Pass
Probe					
Other					
Other					

Notes:

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Post-Test Thermocouple Calibration Checks

Analyst:	Ryan Novosel
Date:	9/13/18
Project Number:	305091
Client:	Primary Energy
Test Location:	Stack 201

(See SOP AM-CAL-005 for instructions)

Console/Meter Box ID #	E44
Probe ID#	888
Test Location/Measurement Point Info:	Warehouse
NIST Thermometer ID #	TH014

Procedure 1: Calibrate thermocouple against a reference thermometer.

After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer.

Procedure 2: Check the response of the thermocouple to a change in temperature.

Check the "continuity" of the thermocouple by subjecting it to a change in temperature (e.g., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections.

Measurement	T/C Temp, ^{o}F	NIST Thermometer Temp, ^{o}F	Difference, ^{o}F (± 2)	Continuity Check	Overall Status
Stack	75	75.9	0.9	Pass	Pass
Filter					
Impinger Exit	76	76.4	0.4	Pass	Pass
Meter in	76	77	1.0	Pass	Pass
Meter Out	76	77	1.0	Pass	Pass
Probe					
Other					
Other					

Notes:

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PRE-TEST TYPE S PITOT TUBE INSPECTION

(See SOP AM-CAL-006 for Instructions)

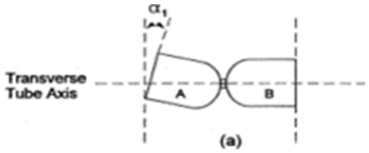
Pitot Tube No. : 888 Date: 9/11/2018 Analyst: Ryan Novosel

Project Number: 305091 Client: Primary Energy Test Location: Stack 201

Type S Pitot tube face openings meet alignment specifications illustrated in Figures 2-2 and 2-3 of Method 2?

x yes _____ no

Comments: _____



Limit:
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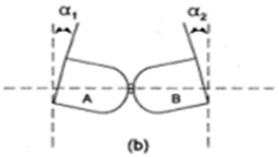

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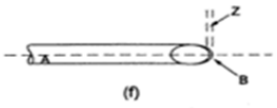

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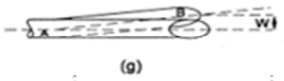

Limit:
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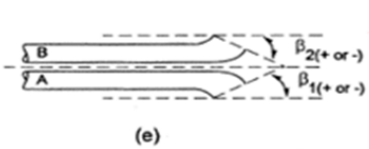

Limit:
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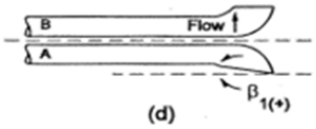
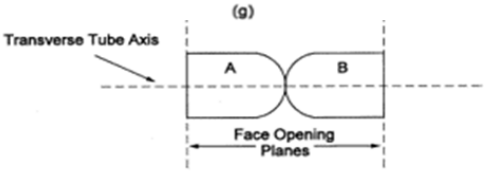
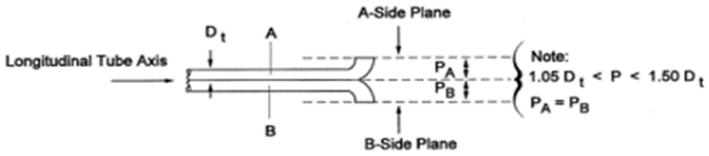
$\beta_2 < 5°$

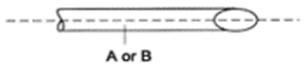




Requirement:
Face opening planes perpendicular to transverse axis



Requirement:
Face opening planes parallel to longitudinal axis



Requirement:
Both legs of equal length and centerlines coincident when viewed

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POST-TEST TYPE S PITOT TUBE INSPECTION

(See SOP AM-CAL-006 for Instructions)

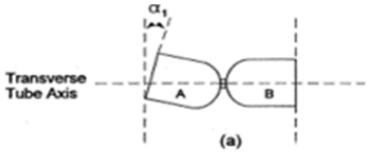
Pitot Tube No. : 888 Date: 9/13/2018 Analyst: Ryan Novosel

Project Number: 305091 Client: Primary Energy Test Location: Stack 201

Type S Pitot tube face openings meet alignment specifications illustrated in Figures 2-2 and 2-3 of Method 2?

_____ yes _____ no

Comments: _____



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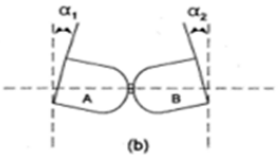

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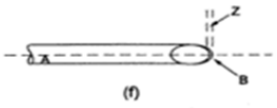

Limit:
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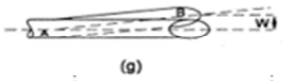

Limit:
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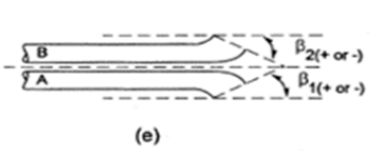
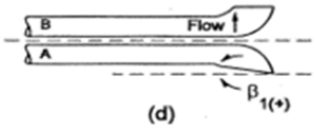
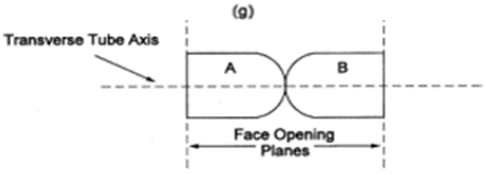
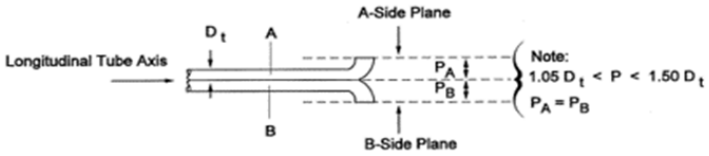


Limit:
$\beta_1 < 5°$
$\beta_2 < 5°$

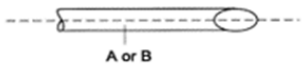




Requirement:
Face opening planes perpendicular to transverse axis



Requirement:
Face opening planes parallel to longitudinal axis



Requirement:
Both legs of equal length and centerlines coincident when viewed

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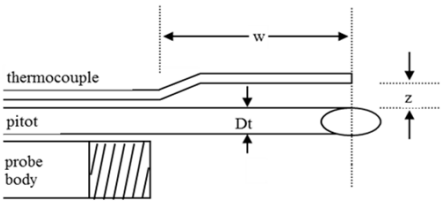
PRE-TEST PITOT TUBE ASSEMBLY INSPECTION

Analyst:	Ryan Novosel
Date:	9/11/18
Project Number:	305091
Test Location:	Stack 201
EPA Probe Configuration:	Method 2

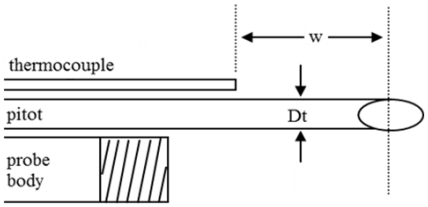
Pitot Assembly Intercomponent Spacings Meet Requirements x Yes ____ No
(See SOP AM-CAL-006 for Instructions)

Configuration A

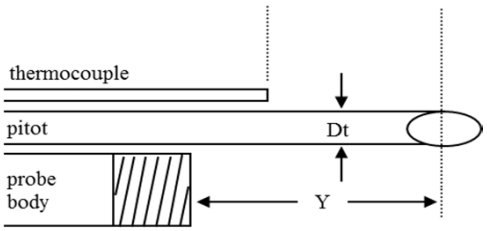


Requirements
D_t = ≥ 3/16" to ≤ 3/8"
W = ≥ 3 inches
Z = ≥ 0.75 inches

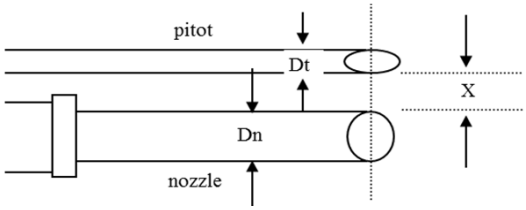
Configuration B



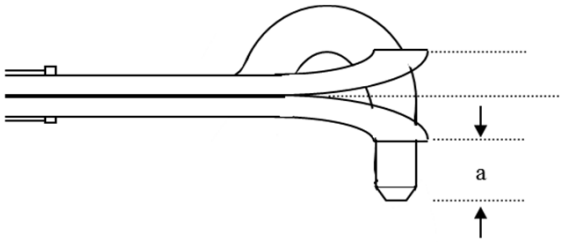
Requirements
D_t = ≥ 3/16" to ≤ 3/8"
W = ≥ 2 inches



Requirements
D_t = ≥ 3/16" to ≤ 3/8"



Requirements
D_t = ≥ 3/16" to ≤ 3/8"
X = ≥ 0.75 inches



Requirements

a = ≥ 0 inches

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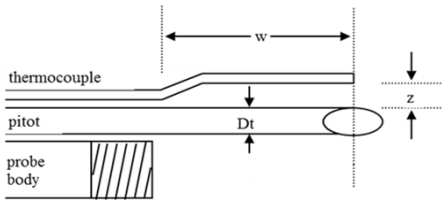
POST-TEST PITOT TUBE ASSEMBLY INSPECTION

Analyst:	Ryan Novosel
Date:	9/13/18
Project Number:	305091
Test Location:	Stack 201
EPA Probe Configuration:	Method 2

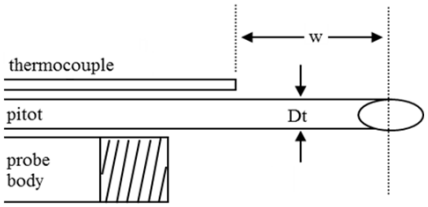
Pitot Assembly Intercomponent Spacings Meet Requirements x Yes _____ No
(See SOP AM-CAL-006 for Instructions)

Configuration A

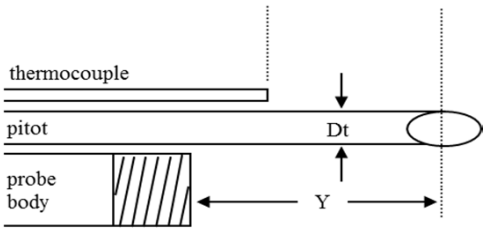


Requirements
D_t = ≥ 3/16" to ≤ 3/8"
W = ≥ 3 inches
Z = ≥ 0.75 inches

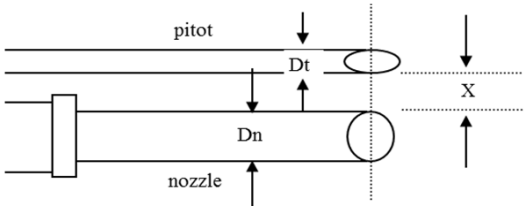
Configuration B



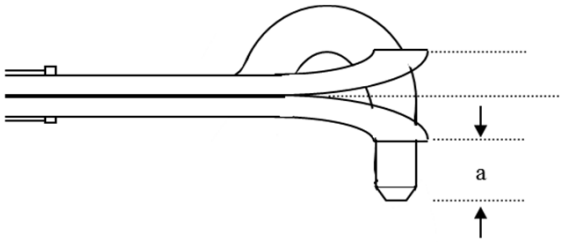
Requirements
D_t = ≥ 3/16" to ≤ 3/8"
W = ≥ 2 inches



Requirements
D_t = ≥ 3/16" to ≤ 3/8"



Requirements
D_t = ≥ 3/16" to ≤ 3/8"
X = ≥ 0.75 inches



Requirements

a = ≥ 0 inches

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Instrumental Reference Method Field Data

Project Number:	305091	Date:	9/12/2018
Customer:	Primary Energy	Facility:	Cokenergy Facility
Unit Identification:	HRCC	Recorded by:	Gavin Lewis
Sample Location:	Stack 201	Fc Factor:	-
Load Level/Condition:	> 50% load	Fd Factor:	-

RM Analyzer Information			
Reference Method Probe Type (Moisture Basis):			Extractive (Dry)
Pollutant	Manufacturer	Model #	Serial Number
NO_X	-	-	-
SO_2	Thermo	43C	509110869
CO	-	-	-
CO_2	Servomex	1440	01420c/1485
O_2	Servomex	1440	01415c/1492

Reference Method Initial Calibration Error Test								
Pollutant	Cal Gas Level	Cal Gas Cylinder Information			Analyzer Response	Absolute Difference	% Cal Error	Error Status
		Concentration	Exp Date	ID #				
NO_X	Low	-	-	-	-	-	-	-
	Mid	-	-	-	-	-	-	-
	High	-	-	-	-	-	-	-
SO_2	Low	0	01/24/26	EB0041701	0.50	0.50	0.11	Pass
	Mid	201.8	06/13/25	SG9135799BAL	202.31	0.51	0.11	Pass
	High	452.6	01/03/26	SG9151303 BAL	456.51	3.91	0.86	Pass
CO	Low	-	-	-	-	-	-	-
	Mid	-	-	-	-	-	-	-
	High	-	-	-	-	-	-	-
CO_2	Low	0	01/24/26	EB0041701	0.03	0.03	0.17	Pass
	Mid	8.798	05/17/26	CC473136	8.83	0.03	0.18	Pass
	High	17.86	05/15/23	CC19838	17.86	0.00	0.00	Pass
O_2	Low	0	01/24/26	EB0041701	0.03	0.03	0.14	Pass
	Mid	9.976	05/17/26	CC473136	10.08	0.10	0.47	Pass
	High	22.01	05/15/23	CC19838	22.07	0.06	0.27	Pass

CEM System Information			
CEM System Probe Type (Moisture Basis):			Extractive (Dry)
Pollutant	Manufacturer/Model	Serial Number	
		Primary	Backup
NO_X	-	-	-
SO_2	Thermo Scientific 43i-HL	1152150034	-
CO	-	-	-
CO_2	-	-	-
O_2	Brand Gaus 4705	11401	-

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Instrumental Reference Method Field Data

Project Number:	305091	Start Date:	9/12/2018
Customer:	Primary Energy	End Date:	9/12/2018
Unit Identification:	HRCC	Facility:	Cokenergy Facility
Sample Location:	Stack 201	Recorded by:	Gavin Lewis
Load Level/Condition:	> 50% load	Fc Factor:	-
		Fd Factor:	-

Actual Concentration of the Upscale Calibration Gas, C_{MA}					
	NO_X	SO_2	CO	CO_2	O_2
C_{MA} (Day 1)	-	201.8	-	8.798	9.976
C_{MA} (Day 2)	-	-	-	-	-

System Responses to Zero Calibration Gas										
Run No.	NO_X		SO_2		CO		CO_2		O_2	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	-	-	2.29	3.50	-	-	0.05	0.05	0.05	0.05
2	-	-	3.50	4.74	-	-	0.05	0.05	0.05	0.05
3	-	-	4.74	3.50	-	-	0.05	0.05	0.05	0.05
4	-	-	3.50	3.42	-	-	0.05	0.05	0.05	0.05
5	-	-	3.42	4.42	-	-	0.05	0.05	0.05	0.05
6	-	-	4.42	2.69	-	-	0.05	0.05	0.05	0.05
7	-	-	2.69	3.42	-	-	0.05	0.05	0.05	0.05
8	-	-	3.42	3.33	-	-	0.05	0.05	0.05	0.05
9	-	-	3.33	3.21	-	-	0.05	0.05	0.05	0.05
10	-	-	3.21	2.25	-	-	0.05	0.05	0.05	0.05

System Responses to Upscale Calibration Gas										
Run No.	NO_X		SO_2		CO		CO_2		O_2	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	-	-	197.26	196.64	-	-	8.76	8.77	9.98	9.98
2	-	-	196.64	196.89	-	-	8.77	8.77	9.98	9.98
3	-	-	196.89	197.72	-	-	8.77	8.78	9.98	9.98
4	-	-	197.72	198.01	-	-	8.78	8.77	9.98	9.98
5	-	-	198.01	197.84	-	-	8.77	8.76	9.98	9.98
6	-	-	197.84	196.75	-	-	8.76	8.76	9.98	9.98
7	-	-	196.75	197.60	-	-	8.76	8.76	9.98	9.98
8	-	-	197.60	197.22	-	-	8.76	8.75	9.98	9.98
9	-	-	197.22	197.39	-	-	8.75	8.75	9.98	9.98
10	-	-	197.39	196.06	-	-	8.75	8.73	9.98	9.98

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Instrumental Reference Method Calibration Data

Project Number:	305091	Start Date:	9/12/2018
Customer:	Primary Energy	End Date:	9/12/2018
Unit Identification:	HRCC	Facility:	Cokenergy Facility
Sample Location:	Stack 201	Recorded by:	Gavin Lewis

SO_2 System Bias/Calibration Error and Drift Summary

Run #	Calibration Gas Level	Span	Cdir	Initial Values		Final Values		Drift
		Span Gas Concentration (ppm)	Direct Cal Response (ppm)	System Response (ppm)	System Bias (% of span)	System Response (ppm)	System Bias (% of span)	(% of span)
1	Low Level Gas	452.6	0.5	2.29	0.4	3.50	0.7	0.3
	Upscale Gas	452.6	202.31	197.26	-1.1	196.64	-1.3	0.1
2	Low Level Gas	452.6	0.5	3.50	0.7	4.74	0.9	0.3
	Upscale Gas	452.6	202.31	196.64	-1.3	196.89	-1.2	0.1
3	Low Level Gas	452.6	0.5	4.74	0.9	3.50	0.7	0.3
	Upscale Gas	452.6	202.31	196.89	-1.2	197.72	-1.0	0.2
4	Low Level Gas	452.6	0.5	3.50	0.7	3.42	0.6	0.0
	Upscale Gas	452.6	202.31	197.72	-1.0	198.01	-1.0	0.1
5	Low Level Gas	452.6	0.5	3.42	0.6	4.42	0.9	0.2
	Upscale Gas	452.6	202.31	198.01	-1.0	197.84	-1.0	0.0
6	Low Level Gas	452.6	0.5	4.42	0.9	2.69	0.5	0.4
	Upscale Gas	452.6	202.31	197.84	-1.0	196.75	-1.2	0.2
7	Low Level Gas	452.6	0.5	2.69	0.5	3.42	0.6	0.2
	Upscale Gas	452.6	202.31	196.75	-1.2	197.60	-1.0	0.2
8	Low Level Gas	452.6	0.5	3.42	0.6	3.33	0.6	0.0
	Upscale Gas	452.6	202.31	197.60	-1.0	197.22	-1.1	0.1
9	Low Level Gas	452.6	0.5	3.33	0.6	3.21	0.6	0.0
	Upscale Gas	452.6	202.31	197.22	-1.1	197.39	-1.1	0.0
10	Low Level Gas	452.6	0.5	3.21	0.6	2.25	0.4	0.2
	Upscale Gas	452.6	202.31	197.39	-1.1	196.06	-1.4	0.3

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Instrumental Reference Method Calibration Data

Project Number:	305091	Start Date:	9/12/2018
Customer:	Primary Energy	End Date:	9/12/2018
Unit Identification:	HRCC	Facility:	Cokenergy Facility
Sample Location:	Stack 201	Recorded by:	Gavin Lewis

CO_2 System Bias/Calibration Error and Drift Summary

Run #	Calibration Gas Level	Span	Cdir	Initial Values		Final Values		Drift
		Span Gas Concentration (%vol)	Direct Cal Response (%vol)	System Response (%vol)	System Bias (% of span)	System Response (%vol)	System Bias (% of span)	(% of span)
1	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.76	-0.4	8.77	-0.3	0.1
2	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.77	-0.3	8.77	-0.3	0.0
3	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.77	-0.3	8.78	-0.3	0.1
4	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.78	-0.3	8.77	-0.3	0.1
5	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.77	-0.3	8.76	-0.4	0.1
6	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.76	-0.4	8.76	-0.4	0.0
7	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.76	-0.4	8.76	-0.4	0.0
8	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.76	-0.4	8.75	-0.4	0.1
9	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.75	-0.4	8.75	-0.4	0.0
10	Low Level Gas	17.86	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	17.86	8.83	8.75	-0.4	8.73	-0.6	0.1

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Instrumental Reference Method Calibration Data

Project Number:	305091	Start Date:	9/12/2018
Customer:	Primary Energy	End Date:	9/12/2018
Unit Identification:	HRCC	Facility:	Cokenergy Facility
Sample Location:	Stack 201	Recorded by:	Gavin Lewis

O_2 System Bias/Calibration Error and Drift Summary

Run #	Calibration Gas Level	Span	Cdir	Initial Values		Final Values		Drift
		Span Gas Concentration (%vol)	Direct Cal Response (ppm)	System Response (%vol)	System Bias (% of span)	System Response (%vol)	System Bias (% of span)	(% of span)
1	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
2	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
3	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
4	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
5	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
6	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
7	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
8	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
9	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0
10	Low Level Gas	22.01	0.03	0.05	0.1	0.05	0.1	0.0
	Upscale Gas	22.01	10.08	9.98	-0.5	9.98	-0.5	0.0

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Instrumental Reference Method
Calibration Corrected Test Data

Project Number:	305091	Start Date:	9/12/18
Customer:	Primary Energy	End Date:	9/12/18
Unit Identification:	HRCC	Facility:	Cokenergy Facility
Sample Location:	Stack 201	Recorded by:	Gavin Lewis
RM Probe Type:	Extractive (Dry)	Fc Factor:	-
Load Level/Condition:	> 50% load	Fd Factor:	-

Reference Method Results, As Measured Moisture Basis

Run #	Date	Start Time	End Time	NOX ppmvd	SO2 ppmvd	CO ppmvd	CO2 % v/v dry	O2 % v/v dry
1	9/12/18	7:15	7:35	-	155.5	-	5.2	12.6
2	9/12/18	8:00	8:20	-	151.7	-	5.1	12.7
3	9/12/18	8:40	9:00	-	155.5	-	5.1	12.8
4	9/12/18	9:20	9:40	-	144.9	-	5.0	13.0
5	9/12/18	10:00	10:20	-	139.3	-	5.0	13.0
6	9/12/18	10:45	11:05	-	132.6	-	4.9	13.1
7	9/12/18	11:25	11:45	-	134.6	-	4.9	13.2
8	9/12/18	12:05	12:25	-	135.1	-	4.8	13.4
9	9/12/18	12:45	13:05	-	128.3	-	4.7	13.5
10	9/12/18	13:25	13:45	-	123.3	-	4.7	13.5

Emission Rate Calculation Summary

Run #	NOX lb/MMBtu	SO2 lb/MMBtu	CO lb/MMBtu	NOX lb/hr	SO2 lb/hr	CO lb/hr	Flow DSCFM
1	-	-	-	-	995.53	-	642,941
2	-	-	-	-	985.56	-	652,324
3	-	-	-	-	978.42	-	631,745
4	-	-	-	-	899.58	-	623,188
5	-	-	-	-	867.53	-	625,367
6	-	-	-	-	837.47	-	633,954
7	-	-	-	-	843.99	-	629,515
8	-	-	-	-	855.59	-	636,072
9	-	-	-	-	807.91	-	632,043
10	-	-	-	-	760.57	-	619,433

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Primary Energy
Cokenergy Facility
HRCC Stack 201

Initial Calibration / Response Time

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry	
9/12/2018 6:01	0.50	0.03	0.03	
9/12/2018 6:02	0.50	0.03	0.03	**Local Calibrations**
9/12/2018 6:03	0.50	0.03	0.03	
9/12/2018 6:04	0.50	0.29	0.06	
9/12/2018 6:05	64.21	7.24	0.07	
9/12/2018 6:06	376.27	9.11	0.03	
9/12/2018 6:07	433.13	9.12	0.03	
9/12/2018 6:08	442.89	9.13	0.03	
9/12/2018 6:09	445.74	9.14	0.03	
9/12/2018 6:10	446.93	9.15	0.03	
9/12/2018 6:11	447.85	9.15	0.03	
9/12/2018 6:12	453.35	9.15	0.03	
9/12/2018 6:13	455.97	9.15	0.03	
9/12/2018 6:14	456.51	9.15	0.03	
9/12/2018 6:15	456.77	9.14	0.03	
9/12/2018 6:16	291.79	8.95	0.07	
9/12/2018 6:17	202.31	9.13	0.03	
9/12/2018 6:18	203.24	9.13	0.02	
9/12/2018 6:19	202.99	9.13	0.02	
9/12/2018 6:20	141.18	13.53	12.09	
9/12/2018 6:21	1.58	18.00	22.05	
9/12/2018 6:22	1.00	17.86	22.07	
9/12/2018 6:23	1.00	17.85	22.08	
9/12/2018 6:24	0.63	12.58	15.46	
9/12/2018 6:25	0.50	8.83	10.08	
9/12/2018 6:26	0.50	8.84	10.08	
9/12/2018 6:27	0.50	8.85	10.08	
9/12/2018 6:28	1.00	4.18	15.80	
9/12/2018 6:29	62.05	4.24	14.08	
9/12/2018 6:30	145.55	5.06	12.73	
9/12/2018 6:31	146.74	5.06	12.72	
9/12/2018 6:32	143.71	5.06	12.72	
9/12/2018 6:33	139.46	5.08	12.69	
9/12/2018 6:34	140.75	5.05	12.74	
9/12/2018 6:35	141.90	5.08	12.70	
9/12/2018 6:36	141.67	5.07	12.71	
9/12/2018 6:37	143.86	5.05	12.73	
9/12/2018 6:38	142.88	5.08	12.68	
9/12/2018 6:39	142.63	5.05	12.73	
9/12/2018 6:40	143.71	5.07	12.70	
9/12/2018 6:41	131.04	3.32	8.19	
9/12/2018 6:42	22.97	0.07	0.08	**Remote Calibrations**
9/12/2018 6:43	6.83	0.05	0.05	
9/12/2018 6:44	3.96	0.05	0.05	
9/12/2018 6:45	2.96	0.05	0.05	
9/12/2018 6:46	2.29	0.05	0.05	

Primary Energy
Cokenergy Facility
HRCC Stack 201

Initial Calibration / Response Time

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry	
9/12/2018 6:47	9.73	3.32	0.04	**SO2 Upscale**
9/12/2018 6:48	168.58	8.88	0.03	
9/12/2018 6:49	191.29	8.90	0.03	
9/12/2018 6:50	195.01	8.92	0.03	
9/12/2018 6:51	197.26	8.93	0.03	
9/12/2018 6:52	185.51	6.16	0.03	**SO2 Downscale**
9/12/2018 6:53	36.10	0.10	0.05	
9/12/2018 6:54	8.76	0.07	0.05	
9/12/2018 6:55	5.19	0.05	0.05	
9/12/2018 6:56	3.58	0.05	0.05	
9/12/2018 6:57	2.75	0.05	0.05	
9/12/2018 6:58	2.19	2.95	3.38	**CO2 / O2 Upscale**
9/12/2018 6:59	1.69	8.72	9.96	
9/12/2018 7:00	1.50	8.75	9.98	
9/12/2018 7:01	1.50	8.76	9.99	
9/12/2018 7:02	1.50	5.90	6.78	**CO2 / O2 Downscale**
9/12/2018 7:03	1.58	0.09	0.07	
9/12/2018 7:04	1.42	0.07	0.05	
9/12/2018 7:05	1.08	0.05	0.05	

Primary Energy
Cokenergy Facility
HRCC Stack 201

Post Calibration Run 1

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 7:40	3.50	0.05	0.05
9/12/2018 7:41	58.54	6.76	0.03
9/12/2018 7:42	185.22	8.88	0.03
9/12/2018 7:43	194.56	8.90	0.03
9/12/2018 7:44	196.64	8.90	0.03
9/12/2018 7:45	124.74	8.78	7.15
9/12/2018 7:46	13.42	8.76	9.98
9/12/2018 7:47	5.92	8.77	9.99
9/12/2018 7:48	4.00	8.77	10.00

Post Calibration Run 2

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 8:24	4.74	0.05	0.05
9/12/2018 8:25	54.09	6.24	0.03
9/12/2018 8:26	185.65	8.87	0.03
9/12/2018 8:27	195.41	8.89	0.03
9/12/2018 8:28	196.89	8.90	0.03
9/12/2018 8:29	127.06	8.79	6.92
9/12/2018 8:30	13.54	8.77	9.98
9/12/2018 8:31	6.21	8.77	10.00

Post Calibration Run 3

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 9:05	3.50	0.05	0.05
9/12/2018 9:06	53.89	6.15	0.03
9/12/2018 9:07	183.74	8.88	0.03
9/12/2018 9:08	195.76	8.90	0.03
9/12/2018 9:09	197.72	8.91	0.03
9/12/2018 9:10	125.31	8.80	7.04
9/12/2018 9:11	13.00	8.78	9.98
9/12/2018 9:12	6.04	8.78	10.00

Post Calibration Run 4

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 9:45	3.42	0.05	0.05
9/12/2018 9:46	25.05	4.58	0.04
9/12/2018 9:47	173.09	8.86	0.03
9/12/2018 9:48	193.94	8.89	0.03
9/12/2018 9:49	196.33	8.90	0.03
9/12/2018 9:50	198.01	8.91	0.03
9/12/2018 9:51	123.73	8.78	7.42
9/12/2018 9:52	13.34	8.77	9.98

Primary Energy
Cokenergy Facility
HRCC Stack 201

Post Calibration Run 5

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 10:29	4.42	0.05	0.05
9/12/2018 10:30	14.51	3.43	0.04
9/12/2018 10:31	162.16	8.85	0.03
9/12/2018 10:32	194.14	8.89	0.03
9/12/2018 10:33	196.31	8.90	0.03
9/12/2018 10:34	197.84	8.90	0.03
9/12/2018 10:35	137.85	8.80	6.44
9/12/2018 10:36	15.59	8.76	9.98
9/12/2018 10:37	6.73	8.76	9.98

Post Calibration Run 6

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 11:12	2.69	0.05	0.05
9/12/2018 11:13	19.35	4.20	0.04
9/12/2018 11:14	167.86	8.85	0.03
9/12/2018 11:15	193.81	8.88	0.03
9/12/2018 11:16	196.75	8.89	0.03
9/12/2018 11:17	128.08	8.78	7.30
9/12/2018 11:18	14.42	8.75	9.98
9/12/2018 11:19	6.50	8.76	9.98

Post Calibration Run 7

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 11:50	3.42	0.05	0.05
9/12/2018 11:51	68.30	6.41	0.03
9/12/2018 11:52	188.05	8.88	0.03
9/12/2018 11:53	195.10	8.90	0.03
9/12/2018 11:54	197.60	8.90	0.03
9/12/2018 11:55	149.79	8.81	5.21
9/12/2018 11:56	15.29	8.76	9.97
9/12/2018 11:57	6.39	8.76	9.98

Post Calibration Run 8

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 12:30	3.33	0.05	0.05
9/12/2018 12:31	65.89	6.40	0.03
9/12/2018 12:32	187.64	8.85	0.03
9/12/2018 12:33	194.95	8.88	0.03
9/12/2018 12:34	197.22	8.88	0.03
9/12/2018 12:35	132.72	8.78	6.97
9/12/2018 12:36	15.93	8.75	9.96
9/12/2018 12:37	6.33	8.75	9.98

Primary Energy
Cokenergy Facility
HRCC Stack 201

Post Calibration Run 9

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 13:10	3.21	0.05	0.05
9/12/2018 13:11	60.85	6.39	0.03
9/12/2018 13:12	186.97	8.86	0.03
9/12/2018 13:13	195.52	8.88	0.03
9/12/2018 13:14	197.39	8.88	0.03
9/12/2018 13:15	125.13	8.78	7.06
9/12/2018 13:16	11.84	8.75	9.97
9/12/2018 13:17	5.23	8.75	9.98

Post Calibration Run 10

Date / Time	SO2 ppmvd	CO2 %dry	O2 %dry
9/12/2018 13:51	2.25	0.05	0.05
9/12/2018 13:52	45.49	5.20	0.03
9/12/2018 13:53	185.64	8.84	0.03
9/12/2018 13:54	194.45	8.87	0.03
9/12/2018 13:55	196.06	8.88	0.03
9/12/2018 13:56	119.00	8.75	7.48
9/12/2018 13:57	13.00	8.73	9.97
9/12/2018 13:58	5.17	8.73	9.98

Response Time Verification

Project Number:	305091	Test Date:	9/12/2018
Customer:	Primary Energy	Facility:	Cokenergy Facility
Unit Identification:	HRCC	Recorded By:	Gavin Lewis
Sample Location:	Stack 201		

Upscale Response Check							
Pollutant	Cal Gas Level	Cal Gas Conc.	Start Time	Stable Response	Upscale Target Response	Time at Target	Response Time
NO_X	-	-	-	-	-	-	-
SO_2	Mid	201.80	6:47:00	197.26	187.40	6:49:00	0:02:00
CO	-	-	-	-	-	-	-
CO_2	Mid	8.80	6:58:00	8.75	8.31	6:59:00	0:01:00
O_2	Mid	9.98	6:58:00	9.98	9.48	6:59:00	0:01:00

Target Response is 95% of the Pre 1 System Response from the Upscale Bias Test

Start time is the time at which gas is introduced upstream of the probe.

Time at target is the time at which the required target response is achieved.

Response time is the difference between the two.

Downscale Response Check						
Pollutant	Cal Gas Level	Cal Gas Conc.	Start Time	Downscale Target Response	Time at Target	Response Time
NO_X	-	-	-	-	-	-
SO_2	Mid	201.80	6:52:00	10.09	6:54:00	0:02:00
CO	-	-	-	-	-	-
CO_2	Mid	8.80	7:02:00	0.44	7:03:00	0:01:00
O_2	Mid	9.98	7:02:00	0.50	7:03:00	0:01:00

Target Response is 0.5 ppm or 5.0 percent of the upscale gas concentration (whichever is less restrictive)

System Response Times	
Pollutant	**Response Time**
NO_X	**0:00:00**
SO_2	**0:02:00**
CO	**0:00:00**
CO_2	**0:01:00**
O_2	**0:01:00**

System response is the longer of the responses to zero and upscale gas.

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ANALYZER INTERFERENCE RESPONSE TEST

USEPA Reference Method: _____6C_____ Analyzer Type: _____SO_2_____

Analyzer Manufacturer: _____TECO_____ Model Number: _____43C_____

Date of Test: _____2/23/2007_____

Test No.	Time	SO_2 ppm (wet)		Percent Difference
		Method 6C	Method 6	
1	1713-1743	92.73	92.02	0.77
2	1752-1822	214.16	209.55	2.20
3	1919-1949	734.74	735.69	-0.13
			Total Percent Difference	2.84

Total percent difference allowable is ≤ 7%.

Detailed interference response test data is maintained on file and is available upon request.

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ANALYZER INTERFERENCE RESPONSE TEST

USEPA Reference Method: _____3A_____ Analyzer Type: _____CO_2_____

Analyzer Manufacturer: ___Servomex____ Model Number: _____1440_____

Analyzer Span: _____0-20%_____

Test Performed by: ____D. Grabowski____ Date: _____1/23/1998_____

Interference Gas	Interference Gas Concentration	Affect of Interference Gas on Analyzer	
		Analyzer Response, ppm	Percent of Span
NO_x	498.0 ppm	-0.02	-0.10
SO_2	208.9 ppm	-0.02	-0.10
CO	450.7 ppm	-0.02	-0.10
CO_2	10.06%	--	--
O_2	22.5%	-0.02	-0.10
	Total Response (sum)	-0.04	-0.40

Total affect on analyzer reading must be < 2% of analyzer span.

Detailed interference response test data is maintained on file and is available upon request.

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ANALYZER INTERFERENCE RESPONSE TEST

USEPA Reference Method: _____3A_____ Analyzer Type: _____O_2_____

Analyzer Manufacturer: _____Servomex__ Model Number: _____1440_____

Analyzer Span: _____0-25%_____

Test Performed by: _____D. Grabowski____ Date: _____1/23/1998_____

Interference Gas	Interference Gas Concentration	Affect of Interference Gas on Analyzer	
		Analyzer Response, ppm	Percent of Span
NO_x	498.0 ppm	0.02	0.08
SO_2	208.9 ppm	0.02	0.08
CO	450.7 ppm	0.00	0.00
CO_2	10.06%	0.00	0.00
O_2	22.5%	--	--
	Total Response (sum)	0.04	0.16

Total affect on analyzer reading must be < 2% of analyzer span.

Detailed interference response test data is maintained on file and is available upon request.

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Airgas
an Air Liquide company

Airgas USA, LLC
1601 Nicholas Blvd
Elk Grove, IL 60007
Airgas.com

CERTIFICATE OF BATCH ANALYSIS

Grade of Product: CEM-CAL ZERO

Part Number:	NI CZ15A	Reference Number:	136-401112246-1
Cylinder Analyzed:	CC119441	Cylinder Volume:	142.0 CF
Laboratory:	192 - Elk Grove (SAP) - IL	Cylinder Pressure:	2000 PSIG
Analysis Date:	Jan 24, 2018	Valve Outlet:	580
Lot Number:	136-401112246-1		

Expiration Date: Jan 24, 2026

EB0041701

ANALYTICAL RESULTS

Component	Requested Purity		Certified Concentration
NITROGEN	99.9995 %		99.9995 %
CARBON DIOXIDE	< 1.0 PPM	<LDL	0.12 PPM
NOx	< 0.1 PPM	<	0.1 PPM
SO2	< 0.1 PPM	<	0.1 PPM
THC	< 0.1 PPM	<LDL	0.04 PPM
CARBON MONOXIDE	< 0.5 PPM	<LDL	0.12 PPM

Permanent Notes: Airgas certifies that the contents of this cylinder meet the requirements of 40 CFR 72.2

Cylinders in Batch:

CC119441, CC128062, CC14648, CC214337, CC222236, CC346464, CC401454, CC450417, CC462173, EB0033993, EB0034727, EB0039072, EB0039355, EB0039363, EB0039426, EB0039718, EB0040297, EB0040334, EB0041697, EB0041701

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

Approved for Release

Airgas
an Air Liquide company

Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E05NI90E15A8N35	Reference Number:	54-124622327-1
Cylinder Number:	SG9135799BAL	Cylinder Volume:	149.3 CF
Laboratory:	124 - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12017	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,SO2,BALN	Certification Date:	Jun 13, 2017

Expiration Date: Jun 13, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	200.0 PPM	197.7 PPM	G1	+/- 0.7% NIST Traceable	06/05/2017, 06/13/2017
CARBON MONOXIDE	200.0 PPM	193.9 PPM	G1	+/- 1.0% NIST Traceable	06/06/2017
NITRIC OXIDE	200.0 PPM	197.7 PPM	G1	+/- 0.7% NIST Traceable	06/05/2017, 06/13/2017
SULFUR DIOXIDE	200.0 PPM	201.8 PPM	G1	+/- 0.8% NIST Traceable	06/05/2017, 06/13/2017
CARBON DIOXIDE	9.000 %	8.946 %	G1	+/- 0.8% NIST Traceable	06/05/2017
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14060114	CC432959	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 18, 2019
PRM	12312	680179	10.01 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Oct 15, 2014
NTRM	15060334	CC448443	241 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Mar 30, 2021
NTRM	15060315	CC448252	241.0 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	Mar 30, 2021
GMIS	812201405	CC502159	4.861 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Aug 12, 2017
NTRM	15060618	CC450443	248.1 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.6%	Dec 17, 2020
NTRM	12061356	CC361031	11.002 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2018

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900100	FTIR	May 22, 2017
CO-1 HORIBA VIA-510 TKPPF7FG	NDIR	May 16, 2017
Nicolet 6700 AMP0900100	FTIR	May 22, 2017
Nicolet 6700 AMP0900100	FTIR	May 22, 2017
Nicolet 6700 AMP0900100	FTIR	May 22, 2017

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E05NI90E15A7762	Reference Number:	54-401083591-1
Cylinder Number:	SG9151303BAL	Cylinder Volume:	149.3 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12018	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,SO2,BALN	Certification Date:	Jan 03, 2018

Expiration Date: Jan 03, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	450.0 PPM	460.5 PPM	G1	+/- 0.7% NIST Traceable	12/22/2017, 01/03/2018
CARBON MONOXIDE	450.0 PPM	444.9 PPM	G1	+/- 0.9% NIST Traceable	12/27/2017
NITRIC OXIDE	450.0 PPM	460.5 PPM	G1	+/- 0.7% NIST Traceable	12/22/2017, 01/03/2018
SULFUR DIOXIDE	450.0 PPM	452.6 PPM	G1	+/- 1.0% NIST Traceable	12/22/2017, 01/03/2018
CARBON DIOXIDE	9.000 %	8.985 %	G1	+/- 1.0% NIST Traceable	12/22/2017
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14060114	CC432959	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 18, 2019
PRM	12367	APEX1099237	10.0 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
NTRM	15060416	CC449822	496.8 PPM NITRIC OXIDE/NITROGEN	+/- 0.5%	May 04, 2021
GMIS	1114201605	CC506716	4.995 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Nov 14, 2019
NTRM	16060130	CC437452	515.2 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 16, 2021
NTRM	13060614	CC413600	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 19, 2019

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900100	FTIR	Dec 21, 2017
CO-1 SIEMENS ULTRAMAT 6E N1J5700	NDIR	Dec 13, 2017
Nicolet 6700 AMP0900100	FTIR	Dec 21, 2017
Nicolet 6700 AMP0900100	FTIR	Dec 21, 2017
Nicolet 6700 AMP0900100	FTIR	Dec 21, 2017

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI81E15A37P2	Reference Number:	54-401204617-1
Cylinder Number:	CC473136	Cylinder Volume:	150.3 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	May 17, 2018

Expiration Date: May 17, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	9.000 %	8.798 %	G1	+/- 0.8% NIST Traceable	05/17/2018
OXYGEN	10.00 %	9.976 %	G1	+/- 1.0% NIST Traceable	05/17/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060613	CC413592	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 09, 2019
NTRM	09061430	CC282477	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Apr 24, 2018
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Apr 20, 2018

Triad Data Available Upon Request

Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI60E15A1069	Reference Number:	54-124493649-4
Cylinder Number:	CC19838	Cylinder Volume:	158.2 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12015	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	May 15, 2015

Expiration Date: May 15, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	18.00 %	17.86 %	G1	+/- 1.1% NIST Traceable	05/15/2015
OXYGEN	22.00 %	22.01 %	G1	+/- 1.0% NIST Traceable	05/15/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	06120402	CC184369	19.66 % CARBON DIOXIDE/NITROGEN	+/- 0.5%	May 01, 2016
NTRM	06120204	CC195893	20.90 % OXYGEN/NITROGEN	+/- 0.4%	Dec 01, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	May 13, 2015
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	May 11, 2015

Triad Data Available Upon Request

Signature on file

Approved for Release

Method 2 Velocity Traverse Data

Project No: 305091
Company: PRIMARY ENERGY
Plant: EAST CHICAGO
Unit ID: (RN) ~~BOILER~~ HRSG
Sample Location: STACK 201

Test Date(s): 9-12-18
Operating Level:
Recorded by: RN
Pitot ID: 888
Pitot Coefficient Cp: .840

Duct Dimensions:
Duct Area (ft^2): 254.469
% CO_2: (1) 5.2 (2) 5.1 (3) 5.1
% O_2: (1) 12.6 (2) 12.7 (3) 12.8

Run No: 1 Time: 715 - 725
P_{bar} ("H_g): 29.26 Static ("H_2O): -1

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.1	285	
2	1.1	287	
3	1.1	287	
4	1.0	286	
2-1	1.0	287	
2	.98	287	
3	1.0	287	
4	.95	286	
3-1	1.1	287	
2	.97	286	
3	.97	286	
4	.95	286	
4-1	1.2	287	
2	1.2	287	
3	1.2	287	
4	1.1	287	
Avg.			

Leak Check Pre: ✓ Post: ✓

Run No: 2 Time: 800 - 808
P_{bar} ("H_g): 29.28 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.3	284	
2	1.3	284	
3	1.2	284	
4	1.2	283	
2-1	1.1	285	
2	1.1	285	
3	1.1	284	
4	.95	284	
3-1	1.0	284	
2	1.2	284	
3	1.0	283	
4	.84	283	
4-1	1.2	284	
2	1.1	284	
3	1.1	284	
4	1.1	284	
Avg.			

Leak Check Pre: ✓ Post: ✓

Run No: 3 Time: 840 - 849
P_{bar} ("H_g): 29.28 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.0	285	
2	1.1	285	
3	1.1	285	
4	.95	285	
2-1	.98	285	
2	.97	285	
3	1.0	285	
4	.90	285	
3-1	1.1	285	
2	1.0	285	
3	1.0	284	
4	.88	284	
4-1	1.1	285	
2	1.1	284	
3	1.2	284	
4	.97	284	
Avg.			

Leak Check Pre: ✓ Post: ✓

Moisture Test Data

Time	Meter Vol (ft^3) *or* (L)	ΔH ("H_2O)	Meter Temp. (°F)		Vacuum ("Hg)	Outlet Temp (°F)
Net						
Avg.						

Meter ID: Y=
ΔH@I:

Train Weight

Initial		g
Final		g
Gain		g

Moisture Leak Check

Pre		@ "Hg
Post		@ "Hg

Field Balance ID:
Standard Weight ID:
(g)
Nominal:
Measured
Comments:

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Method 2 Velocity Traverse Data

Project No:	305091	Test Date(s):	9-12-18	Duct Dimensions:	
Company:	PRIMARY ENERGY	Operating Level:		Duct Area (ft^2):	254.469
Plant:	EAST CHICAGO	Recorded by:	RW	% CO_2:	(4) 5.0 (5) 5.0 (6) 4.9
Unit ID:	HRSG	Pitot ID:	588	% O_2:	(4) 13.0 (5) 13.0 (6) 13.1
Sample Location:	STACK 201	Pitot Coefficient Cp:	.840		

Run No: 4 Time: 920 - 928
P_{bar} ("Hg): 29.25 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.0	285	
2	1.0	284	
3	1.1	284	
4	.97	284	
2-1	.94	285	
2	1.0	285	
3	1.0	284	
4	.84	284	
3-1	1.0	285	
2	.98	285	
3	.93	285	
4	.84	285	
4-1	1.1	284	
2	1.1	285	
3	1.1	285	
4	.80	285	
Avg.			

Leak Check Pre: ✓ Post: ✓

Run No: 5 Time: 1000 - 1010
P_{bar} ("Hg): 29.28 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.1	286	
2	1.1	286	
3	1.1	286	
4	.95	286	
2-1	1.0	286	
2	1.0	286	
3	1.0	285	
4	.85	285	
3-1	1.0	285	
2	1.0	285	
3	1.0	285	
4	.90	285	
4-1	1.0	286	
2	1.1	286	
3	1.0	286	
4	.92	286	
Avg.			

Leak Check Pre: ✓ Post: ✓

Run No: 6 Time: 1045 - 1054
P_{bar} ("Hg): 29.31 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.0	286	
2	1.0	286	
3	1.1	286	
4	1.0	286	
2-1	.95	285	
2	.98	285	
3	1.1	286	
4	.95	286	
3-1	.95	286	
2	1.0	286	
3	1.1	286	
4	.89	286	
4-1	1.1	285	
2	1.1	285	
3	1.1	285	
4	.97	285	
Avg.			

Leak Check Pre: ✓ Post:

Moisture Test Data

Time	Meter Vol (ft^3) *or* (L)	ΔH ("H_2O)	Meter Temp. (°F)		Vacuum ("Hg)	Outlet Temp (°F)
Net						
Avg.						

Meter ID: Y=
ΔH@I:

Train Weight

Initial		g
Final		g
Gain		g

Moisture Leak Check

Pre		@ "Hg
Post		@ "Hg

Field Balance ID:
Standard Weight ID:
(g)
Nominal:
Measured
Comments:

Method 2 Velocity Traverse Data

Project No:	305091	Test Date(s):	9-12-18	Duct Dimensions:	
Company:	PRIMARY ENERGY	Operating Level:		Duct Area (ft^2):	254.468
Plant:	EAST CHICAGO	Recorded by:	RN	% CO_2:	(7) 4.9 (8) 4.8 (9) 4.7
Unit ID:	HRCC	Pitot ID:	888	% O_2:	(7) 13.2 (8) 13.4 (9) 13.5
Sample Location:	STACK 201	Pitot Coefficient Cp:	.840		

Run No: 7 Time: 1125 - 1133
P_{bar} ("H_g): 29.25 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.0	287	
2	1.0	287	
3	1.1	287	
4	.98	287	
2-1	1.0	287	
2	1.0	287	
3	1.0	287	
4	.90	287	
3-1	1.0	287	
2	.98	287	
3	.98	286	
4	.53	311	
4-1	1.1	286	
2	1.2	286	
3	1.2	286	
4	.88	286	
Avg.		✓	✓

Leak Check Pre: ✓ Post: ✓

Run No: 8 Time: 1205 - 1213
P_{bar} ("H_g): 29.28 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.1	286	
2	1.1	286	
3	1.1	286	
4	.95	286	
2-1	.97	286	
2	.98	286	
3	.97	286	
4	.84	286	
3-1	1.1	286	
2	1.0	286	
3	1.0	286	
4	.93	286	
4-1	1.1	286	
2	1.1	286	
3	1.1	286	
4	1.0	286	
Avg.		✓	✓

Leak Check Pre: ✓ Post: ✓

Run No: 9 Time: 1245 - 1253
P_{bar} ("H_g): 29.26 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.1	286	
2	1.1	286	
3	1.1	286	
4	.97	285	
2-1	1.0	285	
2	1.0	285	
3	.97	286	
4	.88	285	
3-1	.97	286	
2	.97	286	
3	1.0	285	
4	.92	285	
4-1	1.0	286	
2	1.1	286	
3	1.2	286	
4	.97	286	
Avg.		✓	

Leak Check Pre: ✓ Post: ✓

Moisture Test Data

Time	Meter Vol (ft^3) *or* (L)	ΔH ("H_2O)	Meter Temp. (°F)		Vacuum ("Hg)	Outlet Temp (°F)
Net						
Avg.						

Meter ID: Y=
ΔH@I:

Train Weight

Initial		g
Final		g
Gain		g

Moisture Leak Check

Pre		@ "Hg
Post		@ "Hg

Field Balance ID:
Standard Weight ID:
(g)
Nominal:
Measured
Comments:

TRC

Method 2 Velocity Traverse Data

Project No: 305091
Company: PRIMARY ENERGY
Plant: EAST CHICAGO
Unit ID: HRSG
Sample Location: STACK 201

Test Date(s): 9-12-17
Operating Level:
Recorded by: RN
Pitot ID: 888
Pitot Coefficient Cp: .840

Duct Dimensions:
Duct Area (ft^2): 254.469
% CO_2: 4.7
% O_2: 13.5

Run No: 10 Time: 1305 - 1333
P_{bar} ("H_g): 29.26 Static ("H_2O): -1.0

Port-Point	Δp "H_2O	T_s (°F)	a
1-1	1.0	287	
2	1.6	287	
3	1.0	287	
4	.95	287	
2-1	.98	287	
2	.94	287	
3	.98	287	
4	.85	287	
3-1	.95	287	
2	.98	287	
3	.98	287	
4	.82	287	
4-1	1.1	287	
2	1.1	287	
3	1.2	287	
4	.96	287	
Avg.	✓	✓	✓

Leak Check Pre: ✓ Post: ✓

Run No: _____ Time: _____ - _____
P_{bar} ("H_g): _____ Static ("H_2O): _____

Port-Point	Δp "H_2O	T_s (°F)	a
Avg.			

Leak Check Pre: _____ Post: _____

Run No: _____ Time: _____ - _____
P_{bar} ("H_g): _____ Static ("H_2O): _____

Port-Point	Δp "H_2O	T_s (°F)	a
Avg.			

Leak Check Pre: _____ Post: _____

Moisture Test Data

Time	Meter Vol (ft^3) *or* (L)	ΔH ("H_2O)	Meter Temp. (°F)		Vacuum ("Hg)	Outlet Temp (°F)
Net						
Avg.						

Meter ID: Y=
ΔH@I:

Train Weight

Initial		g
Final		g
Gain		g

Moisture Leak Check

Pre		@ "Hg
Post		@ "Hg

Field Balance ID:
Standard Weight ID:
(g)
Nominal:
Measured
Comments:

TRC

Moisture Test Run Data

Company: PRIMARY ENERGY Project #: 305091 Console Operator: RN

Plant: EAST CHICAGO Test Method: 4 Console ID: E44

Unit ID: (RN) ~~BUTLER~~ HR2C Test Run #: 1 Meter Y: .997

Location: STACK 201 Test Date(s): 9-12-18 Orifice ΔH@i: 1.676

Unit Operating Mode: — Barometric Pressure ("Hg): 29.26 Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 12

Post Leak Check: 0 @ 12

Port & Point ID	Clock Time	Dry Gas Meter Volume Liters / Cubic Feet	Dry Gas Meter Pressure ("H_2O)	Dry Gas Meter Inlet (°F)	Dry Gas Meter Outlet (°F)	Dry Gas Meter Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	715	279.0	2.0	70	70	1	59	286
	720	282.76	2.0	72	70	1	60	286
	725	286.56	2.0	78	70	1	60	286
	730	290.34	2.0	71	70	1	61	286
	735	294.07	2.0	72	71	1	61	286
	740	297.77	2.0	72	71	1	62	286
	745	301.456						

TRC

Moisture Test Run Data

Company: PRIMARY ENERGY
Plant: EAST CHICAGO
Unit ID: HRSG
Location: STACK 201

Project #: 305091
Test Method: 4
Test Run #: 2
Test Date(s): 9-12-18

Console Operator: RN
Console ID: E44
Meter Y: .997
Orifice ΔH@i: 1.676

Unit Operating Mode: —
Barometric Pressure ("Hg): 29.28
Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 10
Post Leak Check: 0 @ 10

Port & Point ID	Clock Time	Dry Gas Meter Volume Liters / Cubic Feet	Dry Gas Meter Pressure ("H_2O)	Dry Gas Meter Inlet (°F)	Dry Gas Meter Outlet (°F)	Dry Gas Meter Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	800	301.80	2.0	72	70	2	58	285
	805	305.59	2.0	75	73	2	59	285
	810	309.40	2.0	76	74	2	59	285
	815	313.14	2.0	77	75	2	60	285
	820	316.88	2.0	77	75	2	60	285
	825	320.60	2.0	78	75	2	61	285
	830	324.31						

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Moisture Test Run Data

Company: PRIMARY ENERGY | Project #: 305091 | Console Operator: RN

Plant: EAST CHICAGO | Test Method: 4 | Console ID: C44

Unit ID: HRCC | Test Run #: 3 | Meter Y: .997

Location: STACK 201 | Test Date(s): 9-12-18 | Orifice ΔH@i: 1.676

Unit Operating Mode: — | Barometric Pressure ("Hg): 29.28 | Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 12

Post Leak Check: 0 @ 12

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	540	304.50	2.0	80	78	1	60	285
	545	308.31	2.0	80	78	1	60	285
	550	312.08	2.0	81	78	1	62	285
	555	315.89	2.0	82	78	1	62	285
	600	319.60	2.0	84	79	1	63	285
	605	323.34	2.0	84	79	1	63	285
	610	327.041						
Net Volume:								
Average:								

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3181.5	3256.3
Net:		74.8

Pump/Orifice* Leak Check: (Pass) / Fail / N/A

Gas Analysis (%v/v dry)	
O_2	CO_2
Average:	

Comments:

*Required for ALT-009 Meter Calibration Checks

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Moisture Test Run Data

RN

Company: ~~305091~~ PRIMARY ENERGY

Plant: ~~PRIMARY ENERGY~~ COFFEYVILLE

Unit ID: GAS TURBINE

Location: STACK 201

Project #: 305091

Test Method: 4

Test Run #: 4

Test Date(s): 9-12-15

Unit Operating Mode: —

Barometric Pressure ("Hg): 29.28

Console Operator: RN

Console ID: E44

Meter Y : .997

Orifice ΔH@i: 1.676

Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 12

Post Leak Check: 0 @ 12

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	920	347.3	2.0	81	80	2	61	285
	925	351.15	2.0	83	80	2	61	↓
	930	355.03	2.0	83	80	2	62	
	935	358.89	2.0	83	81	2	62	
	940	360.76	2.0	84	81	2	63	
	945	366.60	2.0	84	81	2	63	
	950	370.431						
Net Volume:								
Average:								

Moisture Data

Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3395.4	3469.7
Net:		74.3

Pump/Orifice* Leak Check: (Pass) / Fail / N/A

Gas Analysis (%v/v dry)

	O_2	CO_2
Average:		

Comments:

*Required for ALT-009 Meter Calibration Checks

3136.5

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Moisture Test Run Data

Company: PRIMARY ENERGY | Project #: 305091 | Console Operator: RN

Plant: EAST CHICAGO | Test Method: 4 | Console ID: E44

Unit ID: HRCC | Test Run #: 5 | Meter Y: .997

Location: STACK 201 | Test Date(s): 9-12-18 | Orifice ΔH@i: 1.676

Unit Operating Mode: — | Barometric Pressure ("Hg): 29.28 | Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 13

Post Leak Check: 0 @ 13

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	1000	370.70	2.0	83	81	2	59	286
	1005	374.50	2.0	83	81	2	60	↓
	1010	378.29	2.0	84	81	2	60	
	1015	382.06	2.0	82	80	2	61	
	1020	385.88	2.0	82	80	2	61	
	1025	389.60	2.0	81	80	2	62	
	1030	393.341						

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Moisture Test Run Data

Company: PRIMARY ENERGY
Plant: EAST CHICAGO
Unit ID: HRCC
Location: STACK 201

Project #: 305091
Test Method: 4
Test Run #: 6
Test Date(s): 9-12-18

Console Operator: RN
Console ID: E44
Meter Y: .997
Orifice ΔH@i: 1.676

Unit Operating Mode: —
Barometric Pressure ("Hg): 29.37
Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 10
Post Leak Check: 0 @ 10

Port & Point ID	Clock Time	Dry Gas Meter Volume Liters / Cubic Feet	Dry Gas Meter Pressure ("H_2O)	Dry Gas Meter Inlet (°F)	Dry Gas Meter Outlet (°F)	Dry Gas Meter Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1 ~~1045~~	~~393.50~~	393.50	2.0	80	79	2	60	287
	1050	397.39	2.0	81	80	2	66	↓
	1055	401.20	2.0	82	80	2	61	
	1100	405.09	2.0	82	79	2	62	
	1105	409.00	2.0	82	79	2	62	
	1110	412.9	2.0	82	79	2	63	↓
	1115	416.705						

TRC

Moisture Test Run Data

Company: PRIMARY ENERGY Project #: 305091 Console Operator: RN

Plant: EAST CHICAGO Test Method: 4 Console ID: E44

Unit ID: NRCC Test Run #: 7 Meter Y: .997

Location: STACK 201 Test Date(s): 9-12-18 Orifice ΔH@i: 1.676

Unit Operating Mode: _____ Barometric Pressure ("Hg): 29.25 Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 10

Post Leak Check: 0 @ 10

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	1130	416.848	2	79	78	2	61	287
	1135	420.65	2	80	78	2	61	
	1140	424.44	2	81	79	2	62	
	1145	428.32	2	82	78	2	62	
	1150	432.18	2	82	79	3	63	
	1155	435.93	2	82	79	2	63	
	1200	439.741						

TRC

Moisture Test Run Data

Company: PRIMARY ENERGY
Plant: EAST CHICAGO
Unit ID: NRC
Location: STACK 201

Project #: 305091
Test Method: 4
Test Run #: 8
Test Date(s): 9-12-18

Console Operator: RN
Console ID: E44
Meter Y: .997
Orifice ΔH@i: 1.676

Unit Operating Mode:
Barometric Pressure ("Hg): 29.28
Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 10
Post Leak Check: 0 @ 10

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	1205	439.81	2.0	81	81	2	55	276
	1210	443.69	2.0	82	81	2	58	↓
	1215	447.37	2.0	83	81	2	59	
	1220	451.13	2.0	85	82	2	59	
	1225	454.90	2.0	85	82	2	60	
	1230	458.70	2.0	86	82	2	60	
	1235	462.450						

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Moisture Test Run Data

Company: PRIMARY ENERGY
Plant: EAST CHICAGO
Unit ID: HRSG
Location: STACK 201
Unit Operating Mode: —

Project #: 305091
Test Method: 4
Test Run #: 9
Test Date(s): 9-12-18
Barometric Pressure ("Hg): 29.26

Console Operator: RN
Console ID: E44
Meter Y: .997
Orifice ΔH@i: 1.676
Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 12
Post Leak Check: 0 @ 12

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	1245	462.50	2.0	85	83	2	61	286
	1250	466.20	2.0	86	83	2	61	↓
	1255	469.80	2.0	86	84	2	62	
	1300	473.77	2.0	87	84	2	63	
	1305	477.60	2.0	88	85	2	63	
	1310	481.46	2.0	88	85	2	64	
	1315	485.268						
Net Volume:								
Average:								

Moisture Data		
Impinger ID	Tare wt. (grams)	Final wt. (grams)
	3156.3	3228.5
Net:		72.2

Pump/Orifice* Leak Check: (Pass) / Fail / N/A

Gas Analysis (%v/v dry)	
O_2	CO_2
Average:	

Comments:

*Required for ALT-009 Meter Calibration Checks

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Moisture Test Run Data

Company: PRIMARY ENERGY | Project #: 305091 | Console Operator: RN

Plant: EAST CHICAGO | Test Method: 4 | Console ID: E44

Unit ID: HRSG | Test Run #: 10 | Meter Y: .997

Location: STACK 201 | Test Date(s): 9-12-18 | Orifice ΔH@i: 1.676

Unit Operating Mode: — | Barometric Pressure ("Hg): 29.26 | Static Pressure ("H_2O): -1.0

Pre Leak Check: 0 @ 10

Post Leak Check: 0 @ 10

Port & Point ID	Clock Time	Dry Gas Meter: Volume Liters / Cubic Feet	Dry Gas Meter: Pressure ("H_2O)	Dry Gas Meter: Inlet (°F)	Dry Gas Meter: Outlet (°F)	Dry Gas Meter: Vacuum ("Hg)	Impinger Outlet (°F)	Stack (°F)
1-1	1325	475.40	2.0	87	85	2	60	288
	1330	489.44	2.0	89	85	2	60	
	1335	502.23	2.0	89	86	2	61	
	1340	516.13	2.0	91	86	2	61	
	1345	530.0	2.0	92	87	2	62	
	1350	543.85	2.0	92	87	2	62	V
	1355	557.71						