Cokenergy, LLC
3210 Watling Street
Mail Code 2-991
East Chicago, Indiana 46312

April 27, 2021

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

Including an electronic copy to:
R5airenforcement@epa.gov

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

Including an electronic copy to:
tennenbaum.susan@epa.gov

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

Including an electronic copy to:
bzlatos@idem.in.gov

Subject: Consent Decree, United States, et al. v. Indiana Harbor Coke Company, et al.
Cokenergy, LLC (Part 70 Permit No. T089-41033-00383)
Semi-Annual Progress Report – October 1, 2020 through March 31, 2021

To Whom It May Concern:

In accordance with Section VIII (Reporting Requirements), Paragraph 51. of the consent decree (18-cv-35), Cokenergy, LLC has prepared a semi-annual progress report detailing activities from October 1, 2020 until March 31, 2021. This report provides an update on Cokenergy's activities during the reporting period. Indiana Harbor Coke Company (IHCC) activities will be provided under a separate cover prepared and submitted by IHCC.

Paragraph 51.a. requires details on work performed and progress made towards implementing the requirements of Section IV (Compliance Requirements), including completion of any milestones. The following paragraphs provide an update on our compliance requirements.

Bypass Venting

Paragraph 14.a – *Annual Bypass Venting Limit - From January 1, 2017, through December 31, 2019, a maximum of 12% of the Coke Oven waste gases leaving the common tunnel shall be allowed to be vented to the atmosphere through the Bypass Vent Stacks, as determined on an annual basis.*

- Bypass venting for the period of January 1, 2019 – December 31, 2019 was well within the venting limit of 12% at 5.26%. Venting for 2017 and 2018 was also well within the 12% venting limit at 7.72% and 6.00% respectively.

Paragraph 14.b – *Annual Bypass Venting Limit – Beginning January 1, 2020, a maximum of 13% of the Coke Oven waste gases leaving the common tunnel shall be allowed to be vented to the atmosphere through the Bypass Vent Stack, as determined on an annual basis.*

- Bypass venting for the period of January 1, 2020 – December 31, 2020 was 4.24%.
- Bypass venting from January 1, 2021 through March 31, 2021 was 1.42%

Paragraph 14.c – *Exception to Paragraph 14.b. – Beginning on January 1, 2020, if Cokenergy undertakes HRSG Retubing, then in that calendar year a maximum of 14% of the Coke Oven waste gases leaving the common tunnel shall be allowed to be vented to the atmosphere through the Bypass Vent Stack, as determined on an annual basis, provided HRSG Retubing accounts for at least 3.25% annual Bypass Venting.*

- Cokenergy completed a partial retube on HRSG D3 on September 19, 2020, however this has accounted for only 0.17% of the annual venting.

Paragraph 15. – *Daily Bypass Venting Limit – A Maximum of 19% of the Coke Oven waste gases leaving the common tunnel shall be allowed to be vented to the atmosphere through the Bypass Vent Stacks on a twenty-four (24) hour average.*

- During the reporting period of October 1, 2020 through March 31, 2021 there were no incidents of exceedance of the Daily Bypass Venting Limit.

Paragraph 16. – *SO2 Daily Limit – Defendants shall limit SO2 emissions from the Main Stack and Bypass Vent Stacks to 1,656 lbs/hr for a twenty-four (24) hour average.*

- During the reporting period of October 1, 2020 through March 31, 2021 there were no incidents of exceedance of the SO2 Daily Limit.

Paragraph 17. – *Emissions Minimization*

- During the reporting period of October 1, 2020 through March 31, 2021 there were no incidents of exceedance of the Daily Bypass Venting Limit, therefore it was not necessary to implement any Emissions Minimization efforts. (Paragraph 51.f.)

Paragraph 18. – *Bypass Venting Incident Root Cause Failure Analysis*

- During the reporting period of October 1, 2020 through March 31, 2021 there were no incidents of exceedance of the Daily Bypass Venting Limit, therefore there were no Bypass Venting Incident RCFA

completed. (Paragraph 51.g. and 51.h.)

Enhanced Monitoring

Paragraph 19. – *Permanent Flow Monitor*

- Milestone complete, see Cokenergy Semiannual report dated April 29, 2019 for details.

Paragraph 21. – *ETS Updates*

- Milestone complete, see Cokenergy Semiannual report dated April 29, 2019 for details.

Paragraph 22. – *Bypass Vent Stack and Main Stack Testing*

- See Cokenergy Semiannual Report Dated April 27, 2020 for details.

Paragraph 22a. – *Lead Testing*

- Cokenergy completed the first lead stack testing on December 5 and 6, 2019. See Cokenergy Semiannual Report Dated April 27, 2020 for details. (Paragraph 51.d.).

Paragraph 22b. – *VOC Testing*

- Milestone Complete, See Cokenergy Semiannual Report Dated April 27, 2020 for details. (Paragraph 51.d.).

Preventive Maintenance and Operation Plans

Paragraphs 23 and 23.b. –*Cokenergy PMO Plan for HRSGs and FGD*

- Milestone complete, see Cokenergy Semiannual report dated April 29, 2019 for details. There have been no revisions or modifications of the PMO plan during the current reporting period.

Paragraph 23.c. – *Compliance Assurance*

- The CAP is addressed in Section 9.0 of Cokenergy's PMO Plan. IHCC has not reported production levels in excess of rates included in 23. c. i. during the reporting period of October 1, 2020 – March 31, 2021. (Paragraph 51.j.).

Paragraph 23.d. – *Defendants shall comply with the PMO Plans at all times, including periods of startup, shutdown, and malfunction of the HRSG and FGD.*

- Cokenergy has fully implemented our PMO plan and is following the requirements of the PMO plan.

Mitigation Measures

Paragraph 24 – *Dual SDA Operation*

- The emissions of SO2 for 2020 are approximately 6,019 tons per year.
- The emissions of SO2 for the period of January 1, 2021 through March 31, 2021 are approximately 1,493 tons, which projects to be less than 6,165 tons.

Permits

Paragraph 26. - *Permits*

- Milestone complete, see Cokenergy Semiannual report dated October 29, 2019 for details. (Paragraph 51.k.).

Paragraph 27.a. - *Applications for Permits Incorporating the Requirements in Section IV*

- Milestone complete, see Cokenergy Semiannual report dated April 29, 2019 for details. (Paragraph 51.k.).

Paragraph 27.b. – *Application to seek a site-specific revision to the Indiana State Implementation Plan ("SIP") at 326 IAC 7-4.1-7 and 326 IAC 7-4.1-8.*

- Milestone complete- Cokenergy formally submitted our request to modify the SIP on December 18, 2018 within the ninety (90) day requirement specified in the CD. IDEM developed the draft rule LSA Document #19-388 which was posted on August 14, 2019 for public comment. The initial public hearing was held on November 13, 2019. There were no public comments during the comment period or initial public hearing. The final public hearing was completed on January 8, 2020. The rule was approved and published in the Indiana Register on April 25, 2020. (Paragraph 51.k.).

Paragraph 28. – *Permitting Authority Cooperation*

- Cokenergy has actively worked with IDEM throughout the permitting process.

Paragraph 29. – Submittal of Permit Applications to EPA

- Cokenergy has provided copies of our complete permit application to EPA on the dates specified above in accordance with the requirements specified in Section XV (Notices) of the CD.

Paragraph 51.b. requests details on any significant modifications to previously submitted design specifications of any pollution control system, or to monitoring equipment, required to comply with the Compliance Requirements. Cokenergy has no modifications to report. Dual SDA operation is our normal operating mode and the Permanent Flow Monitor has been fully integrated into our Continuous Emissions Monitoring System (CEMS) and the Emissions Tracking System (ETS).

Cokenergy did not encounter any problems or anticipate any problems in complying with the Compliance Requirements (Paragraph 51.c.).

Paragraph 51.d. requests a summary of the emissions monitoring and testing data collected to demonstrate

compliance with any requirement of this CD. No testing has been completed during the current reporting period.

Paragraph 51.i. requests any updated PMO Plan required by Paragraph 23. There have been no updates or revisions to the PMO plan during this reporting period.

There is no noncompliance with the Section VII SEP requirements to report per Paragraph 51.l. Cokenergy received a request for extension from our contractor Elevate Energy on July 15, 2020. On July 21, 2020 Cokenergy formally requested a six-month extension through April 30, 2021 in accordance with paragraph 42 of the consent decree. COVID-19 related stay at home orders impacted the scheduling of the final lead abatement projects that were planned for the spring and summer of 2020. Abatement work did restart in August 2020. DOJ filed a request to approve, among other things, this extension on October 13, 2020 as a modification to the CD. The SEP Project was successfully completed prior to the extended deadline of April 30, 2021. Cokenergy submitted the final report for the SEP on December 16, 2020. Cokenergy was notified by the government on January 21, 2021 that the Lead Hazard Reduction SEP project was satisfactorily performed. Milestone complete.

Per Paragraph 51.m. there have been no failures to comply with the reporting requirements in Paragraphs 51, through 55.

Per Paragraph 51.n. Cokenergy has provided copies of the following documents

- Quarterly Deviation and Compliance Monitoring Report for the 4th quarter of 2020
- Quarterly Deviation and Compliance Monitoring Report for the 1st quarter of 2021
- Annual Compliance Certification for 2020.

Pursuant to Paragraph 51.o. the following table is a summary of Lightning Stand-Downs during the October 1, 2020 through March 31, 2021 reporting period.

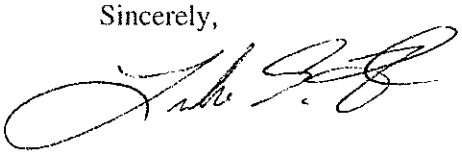
Start Date/Time	Lightning Warning Detail	End Date/Time	Duration	Compliance response impacted due to lightning stand down
10/12/2020 14:31	Alert: Ltg Warning (southeast 4.4)	10/12/2020 15:50	1:19:00	None
10/20/2020 18:41	Alert: Ltg Warning (west 7.4)	10/20/2020 19:35	0:54:00	None
10/20/2020 22:02	Alert: Ltg Warning (west 9.9)	10/20/2020 22:46	0:44:00	None
10/21/2020 22:28	Alert: Ltg Warning (west 7.6)	10/21/2020 22:58	0:30:00	None
10/22/2020 0:14	Alert: Ltg Warning (south 9.3)	10/22/2020 3:49	3:35:00	None
10/23/2020 5:26	Alert: Ltg Warning (southwest 7.1)	10/23/2020 5:56	0:30:00	None
10/23/2020 8:57	Alert: Ltg Warning (west 10.0)	10/23/2020 10:36	1:39:00	None
11/10/2020 18:12	Alert: Ltg Warning (northwest 8.7)	11/10/2020 19:46	1:34:00	None
11/14/2020 23:16	Alert: Ltg Warning (west 9.5)	11/15/2020 0:12	0:56:00	None

Per Paragraph 51.p. there were no power outages to report during the October 1, 2020 through March 31, 2021 reporting period.

If you have any questions regarding this semi-annual progress report, please contact me at (219) 397-4626 or email at lford@primaryenergy.com.

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 my 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.

Sincerely,



Luke E. Ford
Director EH&S
Primary Energy

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

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

File: X://675

ATTACHMENT 1

Fourth Quarter 2020 Deviation and Compliance Monitoring Report

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

January 22, 2021 Via UPS

Indiana Department of Environmental Management
Compliance and Enforcement Branch
Office of Air Quality
100 N. Senate Avenue
Mail Code 61-50, IGCN 1003
Indianapolis, IN 46204 - 2251

RE: Cokenergy, LLC Quarterly Report –Fourth Quarter 2020
Part 70 Permit No. T089-41033-00383

To Whom It May Concern:

In accordance with sections C.18 and D.1.14 of the subject permit, 326 IAC 3-5-5 and 326 IAC 3-5-7, we have enclosed the fourth quarter 2020 reports for the Cokenergy, LLC facility. This report includes:

- Part 70 Quarterly Report – Certification
- Part 70 Quarterly Deviation and Compliance Report
- CEMS Excess Emissions Report
- CEMS Downtime Report
- COMS Fourth Quarter 2020 Opacity Monitor Audit
- CEMS Fourth Quarter 2020 Cylinder Gas Audit

If you have any questions concerning this data, please call Luke Ford at (219) 397-4626.

Sincerely,

Seth Acheson

Seth Acheson
General Manager
Cokenergy LLC

Enclosure
cc: Luke Ford (scan via email)
Cliff Yukawa IDEM (scan via email)

File: X:\\ 615.4

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR MANAGEMENT
COMPLIANCE AND ENFORCEMENT SECTION
PART 70 OPERATING PERMIT
CERTIFICATION

Source Name: Cokenergy LLC

Source Address: 3210 Watling Street, MC 2-991, East Chicago, Indiana 46312-1610

Part 70 Permit No. : T089-41033-00383

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.

Please check what document is being certified:

☐ Annual Compliance Certification Letter

☒ Test Result (specify) 4th Quarter 2020 COMS Performance Opacity Audit and Cylinder Gas Audit

☒ Report (specify) 4th Quarter 2020 Deviation and Compliance Monitoring Report

☐ Notification (specify) _____

☐ Affidavit (specify) _____

☐ Other (specify) _____

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Signature: Seth Acheson

Printed Name: Seth Acheson

Title/Position: General Manager, Cokenergy, LLC

Phone: (219) 397-4521

Date: January 22, 2021

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
PART 70 OPERATING PERMIT
QUARTERLY DEVIATION AND COMPLIANCE MONITORING REPORT

Source Name: Cokenergy LLC
Source Address: 3210 Watling Street, MC 2-991, East Chicago, Indiana 46312-1610
Part 70 Permit No. T089-41033-00383

Months: October to December **Year:** 2020

This report shall be submitted quarterly based on a calendar year. Any deviation from the requirements, the date(s) of each deviation, the probable cause of the deviation, and the response steps taken must be reported. Deviations that are required to be reported by an applicable requirement shall be reported according to the schedule stated in the applicable requirement and do not need to be included in this report. Additional pages may be attached if necessary. If no deviations occurred, please specify in the box marked "No deviations occurred this reporting period".

☒ NO DEVIATIONS OCCURRED THIS REPORTING PERIOD

☐ THE FOLLOWING DEVIATIONS OCCURRED THIS REPORTING PERIOD

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Form Completed by: Seth Acheson

Title / Position: General Manager, Cokenergy, LLC

Date: January 22, 2021

Phone: (219) 397-4521

Excess Emissions and Downtime Report

COKENERGY, LLC, East Chicago, IN

Plant ID: 089-00383

Emissions Unit ID: Stack 201

Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

PLANT OPERATIONS DOWNTIME SUMMARY

Reporting Period: 4th Quarter of 2020

Commencement of Emission Unit Downtime	Completion of Emission Unit Downtime	Emission Unit Downtime Duration (hours)	Reasons for Emission Unit Downtime
NONE			
Total Emission Unit Downtime for the quarter =		0	hours

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

EXCESS EMISSIONS SUMMARY

Reporting Period: 4th Quarter of 2020

SO_2 Exceedances

Emission Standard: 1,656 lb/hr on a 24-hr average basis
(Note that this limit is for the combined emissions from Cokenergy Stack 201 and 16 IHCC Vent Stacks)

Date/Time of Commencement	Date/Time of Completion	Magnitude of Emissions (lb/hr)			Reasons for Excess Emissions	Corrective Actions Taken
		Main Stack Avg	Vent Stack Avg	Plant Avg		
None						

COKENERGY, LLC, East Chicago, IN

Plant ID: 089-00383

Emissions Unit ID: Stack 201

Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

EXCESS EMISSIONS SUMMARY

Reporting Period: 4th Quarter of 2020

Opacity Exceedances

Emission Standard: 20% opacity

Date/Time of Commencement	Date/Time of Completion	Magnitude of Emissions	Reasons for Excess Emissions	Corrective Actions Taken
None				
Total Duration	0 minutes			

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

CONTINUOUS MONITORING SYSTEM DOWNTIME SUMMARY

Reporting Period: 4th Quarter of 2020

Opacity Monitor Downtime

Date/Time of Commencement	Duration of Downtime (minutes)	Reasons for Instrument Downtime	System Repairs and Adjustments
10/7/20 8:00	120	Quarterly PMs and Opacity Performance Audit	Completed PMs and Audit
Total Downtime	120 minutes		

Note: Daily zero and span checks of the instrument have been excluded from the downtime summary per 326 IAC 3-5-7.

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

CONTINUOUS MONITORING SYSTEM DOWNTIME SUMMARY

Reporting Period: 4th Quarter of 2020

SO_2 CEMS Downtime

Date/Time of Commencement	Duration of Downtime (hours)	Reasons for Instrument Downtime	System Repairs and Adjustments
10/7/20 8:00	2	Quarterly PMs and Opacity Performance Audit	Completed PMs and Audit
10/18/20 6:00	31	SO2 pump failure	Pump replaced, calibrations completed
12/16/20 0:00	3	Solenoid failure	Replaced solenoid
Total Downtime	36 hours		

Note: Daily zero and span checks of the instrument have been excluded from the downtime summary per 326 IAC 3-5-7.

CYLINDER GAS AUDIT

FOR

Primary Energy

E. Chicago, IN

Unit: Stack 201

MONITORING SOLUTIONS, INC.
FULL EXTRACTIVE

Fourth (4th) Quarter Results
2020

CGA Completed On: 10/7/2020

PREPARED BY:

Monitoring | Solutions

Leaders in Environmental Monitoring Systems & Services

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I. Introduction

Monitoring Solutions, Inc. was contracted to conduct a Cylinder Gas Audit on a Continuous Emission Monitoring System (CEMS). This audit was performed:

Client: Primary Energy
City, State: E. Chicago, IN
Unit: Stack 201
Auditor: Dan Bowles
Audit Date: 10/7/2020

The audit of the Continuous Emission Monitoring System was conducted for the following gases:

Gas #1 : SO2
Gas #2 : O2 Dry & O2 Wet

Our assessment of this quarter's CGA results indicates that all of the analyzers evaluated during this test program meet the accuracy requirements as outlined in 40 CFR 60, Appendix F.
NOTE: Table 1-1 summarizes the results for the cylinder gas audit.

Reviewed by: _____

Date: 11/12/2020

Summary of Cylinder Gas Audit Results

Parameter	Low Gas Error	Mid Gas Error
SO2	3.27	1.67
O2 Dry	1.82	4.31
O2 Wet	3.15	4.31
	Pass	Pass

Table 1-1

40 CFR 60, Appendix F Performance Test requirements: <15%

II. CYLINDER GAS AUDIT PROCEDURES

Each Continuous Emission Monitor (CEM) must be audited three out of four calendar quarters of each year. As part of the Quality Control (QC) and Quality Assurance (QA) procedures, the quality of data produced is evaluated by response accuracy compared to known standards,

The Cylinder Gas Audit (CGA) for this quarter was conducted in accordance with the QA/QC procedure outlined in 40 CFR 60, Appendix F.

All applicable audit gases are connected to the sampling system. Each gas is introduced into the sampling and analysis system. The gases flow through as much of the sampling path as possible.

The gases are actuated on and off by utilizing a computer and/or PLC controlled solenoids at designated time intervals.

a) Challenge each monitor (both pollutant and diluent, if applicable) with cylinder gases of known concentrations at two measurement points listed in Table 1-2.

b) Use a separate cylinder gas for measurement points 1 and 2. Challenge the CEMS three times at each measurement point and record the responses.

c) Use cylinder gases that have been certified by comparison to National Institute of Standards and Technology (NIST) gaseous standard reference material (SRM) or NIST/EPA approved gas manufacturer's certified reference material (CRM) following ''Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors. (Protocol Number 1).''

NOTE: In rare cases, some operators may have pollutant cylinder gases that are not "Protocol 1". Pollutant cylinder gases in high concentrations may not be certifiable to the "Protocol 1 Standard" and are only available as a "Certified Standard" (e.g. Sulfur Dioxide [SO2] in a concentration of 3.0% - or - 30,000 ppm).

Gas	*Measurement point #1*	*Measurement point #2*
Pollutants -	20-30% of span value	50-60% of span value
Diluent - O2	4-6% by volume	8-12% by volume
Diluent - CO2	5-8% by volume	10-14% by volume

Table 1-2

NOTE: Some operators may have cylinder gas values that fall outside of these parameters. This may be a result of previous agreements with their state or local EPA authority.

d) Determine the Accuracy of each measurement point using the formula below. The "Accuracy" error must not exceed 15%.

$$A = \left(\frac{C_m - Ca}{C_a}\right) x\ 100 \qquad \leq 15 \text{ percent}$$

Where:

A = Accuracy of the CEMS, percent.

C_m = Average CEMS response during audit in units of applicable standard or appropriate concentration.

C_a = Average audit value (CGA certified value) in units of applicable standard or appropriate concentration.

III. Cylinder Gas Audit Data Sheets

CYLINDER GAS AUDIT (CGA) ERROR DETERMINATION

CLIENT: Primary Energy
PLANT / SITE: E. Chicago, IN
UNIT ID: Stack 201

CONDUCTED BY : Dan Bowles
ATTENDEE : N/A
AUDIT DATE: 10/7/2020

MONITOR TESTED: SO2
RANGE : 0 - 700 PPM

ANALYZER SERIAL NUMBER: 1152150034

	Run	Time	Reference value	Monitor value	Difference	Error %
Low-level	1	10:01	176.50	182.40	5.90	3.34 %
	2	10:19	176.50	182.30	5.80	3.29 %
	3	10:37	176.50	182.10	5.60	3.17 %
Mid-level	1	9:55	390.70	397.50	6.80	1.74 %
	2	10:13	390.70	397.30	6.60	1.69 %
	3	10:31	390.70	396.90	6.20	1.59 %

Low-level

Arithmetic Mean: 182.27

Tank S/N CC14789

Tank Expiration Date 7/25/2025

CGA Error: 3.27 %

Mid-Level

Arithmetic Mean: 397.23

Tank S/N XC024458B

Tank Expiration Date 3/24/2028

CGA Error: 1.67 %

CGA Report

Date	Parameter	Run#	Timestamp	Type	Expected	Measured	Low Diff	------	Mid Diff	------
10/07/2020										
	SO2, PPM	1	09:55:38	QTR_MID	390.7	397.5			6.8	
	SO2, PPM	1	10:01:38	QTR_LOW	176.5	182.4	5.9			
	SO2, PPM	2	10:13:37	QTR_MID	390.7	397.3			6.6	
	SO2, PPM	2	10:19:37	QTR_LOW	176.5	182.3	5.8			
	SO2, PPM	3	10:31:38	QTR_MID	390.7	396.9			6.2	
	SO2, PPM	3	10:37:38	QTR_LOW	176.5	182.1	5.6			

Arithmetic Mean of Quarterly Low : 182.3
Linearity Error of Quarterly Low : 3.3
Calibration Tolerance: 15.0

Arithmetic Mean of Quarterly Mid : 397.2
Linearity Error of Quarterly Mid : 1.7
Calibration Tolerance: 15.0

Calibration Result : Pass

CEMS Type : Full Extractive
Manufacturer: Thermo
Model Number : 43i-HL
Serial Number: 1152150034
Monitor Certification Date:

Tested By : _____

Date: _____

CYLINDER GAS AUDIT (CGA) ERROR DETERMINATION

CLIENT: Primary Energy
PLANT / SITE: E. Chicago, IN
UNIT ID: Stack 201

MONITOR TESTED: O2 Dry
RANGE : 0 - 25 %

CONDUCTED BY : Dan Bowles
ATTENDEE : N/A
AUDIT DATE: 10/7/2020

ANALYZER SERIAL NUMBER: 11400

	Run	Time	Reference value	Monitor value	Difference	Error %
Low-level	1	10:01	5.01	5.10	0.09	1.82 %
	2	10:19	5.01	5.10	0.09	1.82 %
	3	10:37	5.01	5.10	0.09	1.82 %
Mid-level	1	10:07	9.97	10.40	0.43	4.31 %
	2	10:25	9.97	10.40	0.43	4.31 %
	3	10:43	9.97	10.40	0.43	4.31 %

Low-level

Arithmetic Mean: 5.10

CGA Error: 1.82 %

Tank S/N CC14789
Tank Expiration Date 7/25/2025

Mid-Level

Arithmetic Mean: 10.40

CGA Error: 4.31 %

Tank S/N CC400438
Tank Expiration Date 8/16/2025

CGA Report

Date	Parameter	Run#	Timestamp	Type	Expected	Measured	Low Diff	------	Mid Diff	------
10/07/2020										
	O2 DRY, %	1	10:01:38	QTR_LOW	5.0	5.1	0.1			
	O2 DRY, %	1	10:07:37	QTR_MID	10.0	10.4			0.4	
	O2 DRY, %	2	10:19:37	QTR_LOW	5.0	5.1	0.1			
	O2 DRY, %	2	10:25:37	QTR_MID	10.0	10.4			0.4	
	O2 DRY, %	3	10:37:38	QTR_LOW	5.0	5.1	0.1			
	O2 DRY, %	3	10:43:38	QTR_MID	10.0	10.4			0.4	

Arithmetic Mean of Quarterly Low : 5.1
Linearity Error of Quarterly Low : 1.8
Calibration Tolerance: 15.0

Arithmetic Mean of Quarterly Mid : 10.4
Linearity Error of Quarterly Mid : 4.3
Calibration Tolerance: 15.0

Calibration Result : Pass

CEMS Type : Full Extractive
Manufacturer: Brand Gaus
Model Number : 4705
Serial Number: 11400
Monitor Certification Date:

Tested By : _____

Date: _____

CYLINDER GAS AUDIT (CGA) ERROR DETERMINATION

CLIENT: Primary Energy
PLANT / SITE: E. Chicago, IN
UNIT ID: Stack 201

CONDUCTED BY : Dan Bowles
ATTENDEE : N/A
AUDIT DATE: 10/7/2020

MONITOR TESTED: O2 Wet
RANGE : 0 - 25 %

ANALYZER SERIAL NUMBER: 11401

	Run	Time	Reference value	Monitor value	Difference	Error %
Low-level	1	10:01	5.01	5.10	0.09	1.82 %
	2	10:19	5.01	5.20	0.19	3.81 %
	3	10:37	5.01	5.20	0.19	3.81 %
Mid-level	1	10:07	9.97	10.40	0.43	4.31 %
	2	10:25	9.97	10.40	0.43	4.31 %
	3	10:43	9.97	10.40	0.43	4.31 %

Low-level

Arithmetic Mean: 5.17

Tank S/N CC14789

Tank Expiration Date 7/25/2025

CGA Error: 3.15 %

Mid-Level

Arithmetic Mean: 10.40

Tank S/N CC400438

Tank Expiration Date 8/16/2025

CGA Error: 4.31 %

CGA Report

Date	Parameter	Run#	Timestamp	Type	Expected	Measured	Low Diff	------	Mid Diff	-------
10/07/2020										
	O2 WET, %	1	10:01:38	QTR_LOW	5.0	5.1	0.1			
	O2 WET, %	1	10:07:37	QTR_MID	10.0	10.4			0.4	
	O2 WET, %	2	10:19:37	QTR_LOW	5.0	5.2	0.2			
	O2 WET, %	2	10:25:37	QTR_MID	10.0	10.4			0.4	
	O2 WET, %	3	10:37:38	QTR_LOW	5.0	5.2	0.2			
	O2 WET, %	3	10:43:38	QTR_MID	10.0	10.4			0.4	

Arithmetic Mean of Quarterly Low : 5.2
Linearity Error of Quarterly Low : 3.1
Calibration Tolerance: 15.0

Arithmetic Mean of Quarterly Mid : 10.4
Linearity Error of Quarterly Mid : 4.3
Calibration Tolerance: 15.0

Calibration Result : Pass

CEMS Type : Full Extractive
Manufacturer: Brand Gaus
Model Number : 4705
Serial Number: 11401
Monitor Certification Date:

Tested By : _____

Date: _____

IV. Cylinder Gas Certification Sheets

Airgas

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI84E15A0007	Reference Number:	54-124629354-1
Cylinder Number:	CC14789	Cylinder Volume:	150.4 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12017	Valve Outlet:	660
Gas Code:	CO2,O2,SO2,BALN	Certification Date:	Jul 25, 2017

Expiration Date: Jul 25, 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 mole/mole 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
SULFUR DIOXIDE	175.0 PPM	176.5 PPM	G1	+/- 1.0% NIST Traceable	07/17/2017, 07/25/2017
OXYGEN	5.000 %	5.009 %	G1	+/- 1.0% NIST Traceable	07/18/2017
CARBON DIOXIDE	10.00 %	10.00 %	G1	+/- 0.9% NIST Traceable	07/17/2017
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060140	CC437515	515.2 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 16, 2021
NTRM	11060719	CC338460	4.861 % OXYGEN/NITROGEN	+/- 0.4%	Dec 13, 2022
NTRM	13060635	CC413759	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 09, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801332	FTIR	Jun 21, 2017
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 17, 2017
Nicolet 6700 AHR0801332	FTIR	Jul 21, 2017

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI89E15A0052	Reference Number:	54-401756288-1
Cylinder Number:	XC024458B	Cylinder Volume:	149.9 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12020	Valve Outlet:	660
Gas Code:	CO2,SO2,BALN	Certification Date:	Mar 24, 2020

Expiration Date: Mar 24, 2028

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 mole/mole 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
SULFUR DIOXIDE	385.0 PPM	390.7 PPM	G1	+/- 1.1% NIST Traceable	03/16/2020, 03/24/2020
CARBON DIOXIDE	10.00 %	9.969 %	G1	+/- 1.0% NIST Traceable	03/16/2020
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	10010736	AAL072991	491.9 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Jul 06, 2022
NTRM	12061517	CC354769	19.87 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801332	FTIR	Mar 03, 2020
Nicolet 6700 AHR0801332	FTIR	Mar 03, 2020

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI90E15A0228	Reference Number:	54-400967311-1
Cylinder Number:	CC400438	Cylinder Volume:	145.2 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12017	Valve Outlet:	590
Gas Code:	O2,BALN	Certification Date:	Aug 16, 2017

Expiration Date: Aug 16, 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 mole/mole 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
OXYGEN	10.00 %	9.970 %	G1	+/- 1% NIST Traceable	08/16/2017
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	06120102	CC195613	9.898 % OXYGEN/NITROGEN	+/- 0.7%	Jul 26, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 17, 2017

Triad Data Available Upon Request

Signature on file

Approved for Release

OPACITY PERFORMANCE AUDIT

FOR

Primary Energy

E. Chicago, IN

Unit: Stack 201

MONITORING SOLUTIONS, INC.
MODEL: DURAG D-R 290 COMS

Fourth (4th) Quarter Results
2020

Audit Completed On: 10/7/2020

PREPARED BY:

Monitoring | Solutions

Leaders in Environmental Monitoring Systems & Services

TABLE OF CONTENTS

I. Introduction

Monitoring Solutions, Inc. was contracted to conduct an opacity performance audit on a Durag Model D-R 290 opacity system.

Client: Primary Energy
City, State: E. Chicago, IN
Auditor: Dan Bowles
Audit Date: 10/7/2020

The performance testing consists of:

1 Zero and Span Check
2 Zero Compensation Check
3 Optical Alignment Check
4 Calibration Error Check
5 Annual Zero Alignment (When required)

All raw data, calculated data and final summary are presented. The results indicate compliance for all specifications. Testing was performed as per 40CFR60 Appendix F and 40CFR60 Appendix B, PS1 (Where Applicable).

Annual "Zero Alignment" check performed this quarter:

YES: _____ NO: X ERROR: N/A

Summary of Calibration Error Check

Filter :	Low	Mid	High
Percent of Error:	0.11	0.10	0.33
	PASS	PASS	PASS

Reviewed by: _____

Date: 11/12/2020

Revision: March 2016

PERFORMANCE AUDIT PROCEDURES FOR THE MONITORING SOLUTIONS, INC. OPACITY MONITOR

II. Monitoring Solutions, Inc. Durag Model D-R 290

The instrument is manufactured by the Durag Corporation and distributed and serviced by Monitoring Solutions, Inc.

A. COMS Description

The Monitoring Solutions, Inc. D-R 290 opacity monitoring system consists of four major components: the Transmissometer, the terminal control box, the air-purging system and the remote control unit and data acquisition equipment. The Transmissometer component consists of an optical transmitter/receiver (transceiver) unit mounted on one side of a stack or duct and a retro reflector unit mounted on the opposite side. The transceiver unit contains the light source, the photodiode detector, and the associated electronics. The transceiver uses a single-lamp, single detector system to determine effluent opacity. A LED light source is modulated electronically at 2 KHz to eliminate any ambient light interference. The modulated beam is configured to alternately produce reference and measurement signals so that the effects of variations in the optical and electronic components of the COMS are minimized.

In a single display configuration, an AW unit is mounted in a blue housing next to the transceiver location. In a dual display configuration, an AZ unit is mounted in the blue housing next to the transceiver location and an AW is mounted in a remote location, typically, a control room. The AZ and the AW communicate via an RS 422 cable. The AZ unit provides an on stack readout and can be used as a diagnostic tool. In either configuration, only the AW provides the signals to the final recording device.

The air purging system serves a threefold purpose: 1) it provides an air window to keep exposed optical surfaces clean; 2) it protects the optical surfaces from condensation of stack gas moisture; and 3) it minimizes thermal conduction from the stack to the instrument. A standard installation has one air-purging system for each the transceiver and the retro reflector units.

The opacity monitor measures the amount of light transmitted through the effluent from the transceiver to the retro reflector and back again. The control unit uses the effluent transmittance to calculate the optical density of the effluent at the monitor location, or the "path" optical density. In order to provide stack exit opacity data, the path optical density must be corrected. The correction factor is expressed as the ratio of the stack exit inside diameter to the inside diameter of the stack at the Transmissometer location. This ratio is called the "stack correction factor" (SCF) by Monitoring Solutions, Inc. The following equations illustrate the relationship between this ratio, path optical density, and stack exit opacity.

Calculation of "Stack Correction Factor"

L_x / L_t = stack correction factor

where:

L_x = stack exit inside diameter (in)

L_t = the stack inside diameter (or the duct width) at the monitor location (in).

$OP_x = 1 - (1 - \frac{Opacity}{100})^{correction\ factor}$

OP_x = stack exit opacity (%)

B. Performance Audit Procedures

1. Preliminary Data

a. Obtain the stack exit inside diameter (in feet) and the stack inside diameter at the monitor location (in feet). Record these values in Blanks 1 and 2 of the Monitoring Solutions, Inc. D-R 290 Performance Audit Data Sheet.

Note: Effluent handling system dimensions may be acquired from the following sources listed in descending order of reliability: 1) physical measurements, 2) construction drawings, 3) opacity monitor installation/certification documents, and 4) source personnel recollections.

b. Calculate the stack correction factor (SCF) by dividing the value in Blank 1 by the value in Blank 2. Record the result in Blank 3.

c. Record the source-cited Stack Correction Factor (SCF) in Blank 4.

Note: The stack correction factor (SCF) is preset by the manufacturer using information supplied by the source. The value recorded in Blank 4 should be the value source personnel agree should be set inside the monitor.

d. Obtain the reference zero and span calibration values. Record these values in Blank 5 and Blank 6, respectively.

Note: The reference zero and span calibration values may not be the same as the values recorded during instrument installation and/or certification. The zero and span values recorded in Blank 5 and Blank 6 should be the reference values recorded during the most recent clear-path calibration of the CEMS.

2. Error Checks

The following steps describe the error codes for the Monitoring Solutions, Inc. D-R 290 remote control unit. The audit can continue with the error codes shown below being present, provided the source has been informed of the fault conditions. All other error codes must be corrected prior to audit.

Error code 100 = Transceiver blower fault
Error code 200 = Transceiver filter plugged
Error code 300 = Reflector blower fault
Error code 400 = Reflector filter plugged

Note: If a fault is active, an error code will be displayed on the stack mounted display and on the remote display. An explanation of the error codes can be found in the manual.

3. Instrument Range Check

a. Check the COMS measurement range by pressing the MOD button (the LED on the button will light up) and using the PLUS button to cycle through the displays.

b. Record the instrument range in Blank 11.

4. Reference Signal, Zero and Span Checks

a. Initiate the calibration cycle by pressing the arrow and plus buttons simultaneously and holding for approximately 5 seconds.

Note: The opacity monitor will automatically cycle through the internal zero (zero point check), external zero (window check), span and stack taper ratio modes. Approximately 6 minutes for a complete cycle.

b. Record the milliamp value shown for the internal zero (zero point check) displayed on the control panel display in Blank 12.

Note: The internal zero checks the instrument reference signal (Zero Point Check). Since the instrument provides a full scale output of 4 to 20 milliamps, a value of 4 milliamps displayed on the control unit display represents a zero condition. After 1 ½ minutes in the internal zero mode, the monitor will automatically switch to the external zero mode (Window Check).

c. Record the milliamp value shown for the external zero (window check) displayed on the control panel in Blank 13. Also record the external zero value (in percent opacity) displayed on the opacity data recorder in Blank 14.

(Continued on next page)

Note: During the zero calibration check, the zero mirror is moved into the path of the measurement beam by a servomotor. The zero mechanism is designed to present the transceiver with a simulated clear-path condition. The daily zero check does not test the actual clear-path zero, nor does it provide a check of cross-stack parameters such as the optical alignment of the Transmissometer or drift in the reflectance of the retro reflector. The actual clear-path zero can only be checked during clear-stack or off-stack calibration of the CEMS. In addition to simulating the instrument clear-path zero, the zero mechanism allows the amount of dust on the transceiver optics (primary lens and zero mirror) to be quantified. After 1 ½ minutes in the external zero mode, the CEMS will automatically enter the span mode.

d. Record in Blank 15 the span value (in milliamps) displayed on the control panel display. Also record the span value (in percent opacity) displayed on the data recorder in Blank 16. Go to the Transmissometer location.

Note: During the span calibration check, a servomotor moves an internal span filter into the path of the measurement beam while the zero mirror is in place. The span mechanism is designed to provide an indication of the upscale accuracy of the CEMS relative to the simulated clear-path zero. Note: The opacity monitor display will output its stack correction factor (SCF) for 1 ½ minutes when the span portion of the calibration cycle is completed. The CEMS automatically returns to the measurement mode when the SCF portion of the calibration cycle is complete.

5. Reflector Dust Accumulation Check.

a. Record the effluent opacity prior to cleaning the retroreflector optics in Blank 17.

b. Open the reflector housing, inspect and clean the retroreflector optics, and close the housing.

c. Record the post-cleaning effluent opacity in Blank 18. Go to the transceiver location.

6. Transceiver Dust Accumulation Check.

a. Record the pre-cleaning effluent opacity in Blank 19.

b. Open the transceiver, clean the optics (primary window and zero mirror) and close the transceiver.

c. Record the post-cleaning effluent opacity in Blank 20.

7. Alignment Check

a. Determine the monitor alignment by looking through the alignment port of the side of the transceiver.

b. Observe whether the image is centered in the cross hairs and record this information (YES or NO) in Blank 21.

8. Zero Compensation Check

The Durag 290 provides internal compensation for window contamination. This compensation value can be determined by performing the Window Check. This compensation cannot be disabled for testing. Remove internal compensation as follows: Clean the transceiver window and the zero mirror lens. Verify the window check value is at zero so no compensation is applied to the quarterly audit. Enter the Filter Audit Mode and verify the starting Durag opacity value is zero percent. **NOTE:** This process must be completed prior to the Calibration Error Check.

9. Zero Alignment Error Check

The Zero Alignment Error Check is performed one time each year. This check utilizes Durag's Clear Path Procedure. This procedure verifies the "measuring" zero point of the unit in a known clear path setup. The Transceiver and reflector are removed from their installation and set up on stands in a clean, dust free environment. The stands are set at the same distance as the installation location. Without performing any adjustments, the measuring zero is compared to the simulated zero - or - Window Check. The difference between the measuring zero and the simulated zero, must NOT exceed 2% opacity.

Verify the Zero Compensation Check has been performed. Since the zero compensation function cannot be disabled for the zero alignment check, the optics must be cleaned and a manual calibration performed. This will set the internal compensation value to 0.0%. This MUST be accomplished prior to the Zero Alignment Check.

Perform the following to document the "Zero Alignment Error":

a) Remove the Transceiver & Reflector from its current installation and setup on stands at the exact distance as their original location.

b) Perform the Zero Compensation Check and perform a manual calibration.

c) Record the Durag's response to the clear path zero in % opacity without any adjustment.

d) Activate the simulated zero (Window Check) and record the reading in % opacity without any adjustment.

(continued on next page)

e) The response difference between these two readings are recorded as the "zero alignment error". The maximum allowable zero alignment error is 2%.

f) Adjust the simulated zero (window check) to read the same value in % opacity as the clear path zero.

10. Calibration Error Check

The calibration error check is performed using three neutral density filters. Performing the calibration error check on-stack using the filters determines the linearity of the instrument response relative to the current clear-path zero setting. This calibration error check does not determine the accuracy of the actual instrument clear-path zero or the status of any cross-stack parameters. A true calibration check is performed by moving the on-stack components to a location with minimal ambient opacity, making sure that the proper path length and alignments are attained, and then placing the calibration filters in the measurement path.

a. Put the monitor in Filter Audit mode.

b. Wait approximately three minutes or until a clear "zero" value has been recorded and displayed on the data recorder.

c. Record the audit filter serial numbers and opacity values in Blanks 22, 23, and 24.

d. Remove the filters from their protective covers, inspect and if necessary, clean them.

e. Insert the low range neutral density filter into the filter audit slot located in front of the heated lens.

f. Wait approximately three minutes or until a clear value has been recorded and displayed on the data recorder.

Note: The audit data should be taken from a data recording/reporting device that presents instantaneous opacity (or opacity data with the shortest available integration period).

g. Record the COMS response to the low range neutral density filter.

h. Remove the low range filter and insert the mid range neutral density filter.

i. Wait approximately three minutes and record the COMS response to the mid range neutral density filter.

j. Remove the mid range filter and insert the high range filter.

k. Wait approximately three minutes and record the COMS response to the high range neutral density filter.

(continued on next page)

l. Remove the high range filter.

m. * If applicable, wait approximately three minutes, and record the zero value.

n. Repeat steps (e) through (m) until a minimum of three opacity readings are obtained for each neutral density filter.

o. If six-minute integrated opacity data is required, repeat steps (e) through (m) once more, changing the waiting periods to 13 minutes.

p. Record the six-minute integrated data.

Note: In order to acquire valid six-minute averaged opacity data, each filter must remain in for at least two consecutive six-minute periods; the first period will be invalid because it was in progress when the filter was inserted. A waiting period of 13 minutes is recommended. You should have a "starting zero" reading and an "ending zero" reading.

q. When the calibration error check is complete, return the monitor to measuring mode. Close the transceiver head and the weather cover, and return to the COMS control unit.

11. Test Conclusion

a. Obtain a copy of the audit data from the data recorder.

b. Transcribe the calibration error response from the data recorder to Blanks 25 through 50 of the audit form and complete the audit data calculations.

C. Interpretation of Audit Results

This section is designed to help the auditor interpret the D-R 290 performance audit results.

Error codes / fault analysis

Error codes are typically associated with parameters that the monitor manufacturer feels are critical to COMS function, and to the collection of valid opacity data. The parameters associated with each of the error codes are found in the manufacturer's manual. With the exception of alarms that warn of elevated opacity levels (alarm or warning lamps), the error codes indicate that the COMS is not functioning properly. An error or failure indication will be represented by a "YES" in Blanks 7 - 10.

(continued on next page)

Stack Exit Correlation Error Check

The path length correction error in Blank 51 should be within +2%. This error exponentially affects the opacity readings, resulting in over - or - underestimation of the stack exit opacity. The most common error in computing the optical path length correction factor is the use of the flange-to-flange distance in place of the stack/duct inside diameter at the monitor location. This error will result in underestimation of the stack exit opacity and can be identified by comparing the monitor optical path length to the flange-to-flange distance; the flange-to-flange distance should be greater by approximately two to four feet

Control Panel Meter Error (Optional)

The accuracy of the control panel meter (AW) is important at sources using the meter during monitor adjustment and calibration. The accuracy of the control panel meter (Blank 52 and Blank 54) is determined by comparing the zero and span reference values to the panel meter output recorded during the COMS calibration check.

Note: Some installations utilize a different "Instrument Range Setting" than the normal 100% range. The panel meter span error must be corrected for the different range in order to provide an accurate error result. Use the following equation to calculate the span error corrected for "Instrument Range" (Blank 11):

Panel Meter span error in % opacity =

$$(((\text{Blank } 15 - 4) \div 16) \times \text{Blank } 11) - \text{Blank } 6$$

Zero and Span Checks

The D-R 290 internal zero or "zero point check" (Blank 12 should be set to indicate 0% opacity (equivalent to 3.7 - 4.3 mA). An external zero error or "window check" (Blank 53) greater than 4% opacity is usually due to excessive dust accumulation on the optical surfaces, electronic drift or an electronic/mechanical offset of the data recorder. Excessive dust on the optical surfaces sufficient to cause a significant zero error would be indicated by the difference in the internal and external zero values and/or window alarm. Instrument span error (Blank 55) may be caused by the same problem(s) that cause zero errors and may be identified in a similar fashion.

If the zero and span errors are due to a data recorder offset, both errors will be in the same direction and will be of the same magnitude

(continued on next page)

The external zero displayed on the control unit panel meter (AW) also indicates the level of dust accumulation on the zero retroreflector and transceiver measurement window. The difference between the internal and external zero responses should equal the amount of dust found on the transceiver optics (Blank 57). To convert the zero responses to a value that represents lens dusting in percent opacity, use the following equation.

Meter response in % opacity = 6.25 [(Blank 13) - (Blank 12)]

Optical Alignment Check

When the transceiver and retroreflector are misaligned, a portion of the measurement beam that should be returned to the measurement detector is misdirected, resulting in a positive bias in the data reported by the COMS. One of the most common causes of misalignment is vibration which may cause the on-stack components to shift slightly on the instrument mounting flanges. Another common cause of misalignment is thermal expansion and contraction of the structure on which the transmissometer is mounted. If the COMS is being audited while the unit is off-line (cold stack), the results of the alignment analysis may not be representative of the alignment of the instrument when the stack or duct is at normal operating temperature. When checking the alignment, the reflected light beam should be centered.

Zero Compensation Check

The Zero Compensation Check should be performed and documented as such in (Blank 21a).

Annual Zero Alignment Error Check

The Zero Alignment Error Check is performed once each year. It verifies that the enegy output from the simulated zero device (Window Check) is within 2% of the Clear Path reading. The values required for this check are documented in (Blank 21b). If the difference between the Clear Path Value and the Simulated Zero (Window Check) value differ by more than 2%, then the COMS unit is considered Out Of Control. If the difference is 2% or less, then the Window Check Value is adjusted to match the Clear Path value.

Optical Surface Dust Accumulation Check

The results of the dust accumulation check (Blank 58) should not exceed 4%. A dust accumulation value of more than 4% opacity indicates that the air flow of the purge system and/or the cleaning frequency of the optical surfaces are inadequate. When determining the optical surface dust accumulation, the auditor should note whether the effluent opacity is relatively stable (within +2% opacity) before and after cleaning the optical surfaces. If the effluent opacity is fluctuating by more that +2%, the dust accumulation analysis should be omitted.

(continued on next page)

Calibration Error

Calibration error results (Blanks 68, 69 and 70) in excess of +3% are indicative of a non-linear or miss calibrated instrument. However, the absolute calibration accuracy of the monitor can be determined only when the instrument clear-path zero value is known. If the zero and span data are out-of-specification, the calibration error data will often be biased in the direction of the zero and span errors. Even if the zero and span data indicate that the COMS is calibrated properly, the monitor may still be inaccurate due to error in the clear-path zero adjustment. The optimum calibration procedure involves using neutral density filters during clear-stack or off-stack COMS calibration. This procedure would establish both the absolute calibration accuracy and linearity of the COMS. If this procedure is impractical, and it is reasonable to assume that the clear-path zero is set correctly, the monitor's calibration can be set using either the neutral density filters or the internal zero and span values.

Appendix A
COMS Audit Data Forms for the Durag Model D-R 290

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Company: Primary Energy
Unit ID: Stack 201
Auditor: Dan Bowles
Attendees: N/A
Transceiver serial number: 1248342
Reflector serial number: 1248145
Remote serial number 1248283
Date: 10/7/2020

City, ST: E. Chicago, IN
Representing: Monitoring Solutions
Representing:

COMS Flange to Flange distance (Feet / Inches): 226.125"

Preliminary Data

1	Inside diameter at Stack Exit = Lx	216.000 inches
2	Inside diameter at the Transmissometer location = Lt	216.000 inches
3	Calculated Stack Correction Factor (SCF) = Lx/Lt	1.000
4	Source-cited Stack Correction Factor (SCF)	1.000
5	Source-cited zero automatic calibration value (% opacity)	0.00 %
6	Source-cited span automatic calibration value (% opacity)	40.00 %

[START AT CONTROL UNIT / DATA RECORDER LOCATION]

(If required) [INSPECT DATA RECORDING SYSTEM AND MARK WITH "OPACITY AUDIT," AUDITOR'S NAME, AFFILIATION, DATE, SOURCE, PROCESS UNIT/STACK IDENTIFICATION, AND THE TIME OF DAY.]

Error codes / faults	YES - or - NO
7 Blower [Loss of purge air from blower - Error 100, 300]	NO
8 Filter [Air filter restriction - Error 200, 400]	NO
9 Window [Excessive dirt on transceiver window - Error 001]	NO
10 Fault [Additional CEMS fault has occurred. Note fault code on Opacity display and consult the instrument manual.]	NO

Instrument Range Check

11	Instrument range setting	100 %

Zero Check

12	Opacity Display - Internal zero value in "milliamps" (Zero Point Check) [Wait for 1½ minutes for automatic change to external zero mode.]	4.00 mA
13	Opacity Display - Zero calibration value in "milliamps" (Window Check)	4.00 mA
14	Opacity data recorder zero calibration value in "% Op" (Window Check) [Wait 1½ minutes for automatic change to span mode.]	0.00 mA

Span Check

15	Opacity Display - Span calibration value in "milliamps" (Span Check)	10.40 mA
16	Opacity data recorder span calibration value in "% Op" (Span Check)	40.00 %

[Go to reflector location.]

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Reflector Dust Accumulation Check

17 Pre-cleaning effluent opacity (% Op) 3.6 %
[Inspect and clean optical surface.]
18 Post-cleaning effluent opacity (% Op) 3.5 %
[Go to transceiver location.]

Transceiver Dust Accumulation Check and Zero Compensation Check

19 Pre-cleaning effluent opacity (% Op) 3.5 %
[Inspect and clean optical window and zero mirror.]
20 Post-cleaning effluent opacity (% Op) 2.9 %

Optical Alignment Check

[LOOK THROUGH ALIGNMENT SIGHT AND DETERMINE IF BEAM IMAGE IS CENTERED.]
21 Is the image centered? YES - or - NO: YES

Zero Compensation Check

21a Did you comply with the Zero Compensation Check? YES - or - NO: YES

Annual Zero Alignment Error Check

21b Did you comply with the Annual Zero Alignment Error Check? YES - or - NO: NO

Zero Alignment Error Check results (if applicable):

Clear Path Value % = N/A Window Check Value % = N/A Zero Alignment Error % = N/A

[Record audit filter data.]

Filter	Serial NO.	% Opacity	SCF%
22 LOW	YC61	18.30	18.30 %
23 MID	YC62	27.30	27.30 %
24 HIGH	YC63	46.40	46.40 %

[Remove the audit filters from the protective covers, inspect, and clean each filter]

[Set the unit up to display the initial zero. Wait 3 minutes to allow opacity data recorder to record initial zero]

[Insert a filter, wait approximately 3 minutes, and record the opacity value reported by the opacity data recorder. Repeat the process 5 times for each filter.]

[Read and transcribe final calibration error data from the opacity data recorder on the next page]

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

25 ZERO 0.10

	LOW		MID		HIGH		(If Required) ZERO
26	18.40	27	27.40	28	46.10	29	N/A
30	18.30	31	27.40	32	46.10	33	N/A
34	18.30	35	27.40	36	46.20	37	N/A
38	18.30	39	27.40	40	46.10	41	N/A
42	18.40	43	27.40	44	46.20	45	0.00

[Six-minute average data, if applicable.]

	ZERO		LOW		MID		HIGH		(If Required) ZERO
46	0.00	47	18.60	48	27.70	49	46.40	50	0.10

Reserved Area

Calculation of Audit Results

Stack Correction Factor correlation error (%):

51 $\left[\frac{Blank\ 4 - Blank\ 3}{Blank\ 3}\right]$ x 100 = 0.00

(Blank 4: 1.000; Blank 3: 1.000)

Zero Error (% Op.):

52 Opacity Display: 6.25 * (Blank 13 - 4.0) - Blank 5 (4.00; 0.00) = 0.00 %

53 Opacity Data Recorder: Blank 14 - Blank 5 (0.00; 0.00) = 0.00

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Span Error (% Op.):

54	Opacity Display	10.40 (((Blank 15 - 4.0) ÷ 16) ×	100 Blank 11) -	40.00 Blank 6	=	0.00 %
55	Opacity Data Recorder	40 Blank 16	-	40 Blank 6	=	0.00

Optical Surface Dust Accumulation (% OP):

56	Retroreflector	3.6 Blank 17	-	3.5 Blank 18	=	0.10 %
57	Transceiver	3.5 Blank 19	-	2.9 Blank 20	=	0.60 %
58	Total	0.1 Blank 56	+	0.6 Blank 57	=	0.70 %

Optical Path Length Correction (SCF)
Audit Filters Corrected for Path Length:

59 LOW: 18.30 1.000

$$1 - (1 - (\frac{Blank\ 22}{100})^{Blank\ 4}) \times 100$$ = 18.30 %

60 MID: 27.30 1.000

$$1 - (1 - (\frac{Blank\ 23}{100})^{Blank\ 4}) \times 100$$ = 27.30 %

61 HIGH 46.40 1.000

$$1 - (1 - (\frac{Blank\ 24}{100})^{Blank\ 4}) \times 100$$ = 46.40 %

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Auditor: Dan Bowles Date: 10/07/20
Source: Primary Energy Unit: Stack 201

PARAMETER		Blank No.	Audit Results	Specifications
Error Codes/Faults				
Blower failure		7	NO	NO
Filter Blockage		8	NO	NO
Window		9	NO	NO
Fault		10	NO	NO
SCF Correlation Error		51	0.00	+/- 2% Op
Internal Zero Error	Display	52	0.00	+/- 4% Op
	Data	53	0.00	+/- 4% Op
Internal Span Error	Display	54	0.00	+/- 4% Op
	Data	55	0.00	+/- 4% Op
Optical Alignment Analysis		21	YES	YES = Centered
Zero Compensation Check		21a	YES	YES = Complied With
Zero Alignment Error		21b	N/A	≤ 2% Op
Optical Surface Dust Accumulation				
Retroreflector		56	0.10	≤ 2% Op
Transceiver		57	0.60	≤ 2% Op
Total		58	0.70	≤ 4% Op
Calibration Error Analysis				
Arithmetic Mean Difference				
	LOW	62	0.04	
		71a	0.30	
	MID	63	0.10	
		72a	0.40	
	HIGH	64	-0.26	
		73a	0.00	
Confidence Coeffecient				
		65	0.07	
		66	0.00	
		67	0.07	
Calibration Error				
		68	0.11	≤ 3% Op
		69	0.10	≤ 3% Op
		70	0.33	≤ 3% Op

Revision: March, 2016

OPACITY LOW FILTER AUDIT

Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 10/7/2020

LOW FILTER RUN	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Difference^2
		RM	(X_i)	X_i^2
1	18.40	18.30	0.10	0.0100
2	18.30	18.30	0.00	0.0000
3	18.30	18.30	0.00	0.0000
4	18.30	18.30	0.00	0.0000
5	18.40	18.30	0.10	0.0100

n = 5

t(0.975) = 2.776

Mean Ref. Method Value	**18.3000**	***RM***
Sum of Differences	**0.2000**	***Xi***
Arithmetic Mean Difference	**0.0400**	***Xi ave***
Sum of Differences Squared	**0.0200**	***Xi^2***
Standard Deviation	**0.0548**	***sd***
2.5% Error Conf.Coef	**0.0680**	***CC***
Calibration Error	**0.1080**	***percent***

OPACITY MID FILTER AUDIT

Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 10/7/2020

MID FILTER RUN	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Difference^2
		RM	(X_i)	X_i^2
1	27.40	27.30	0.10	0.0100
2	27.40	27.30	0.10	0.0100
3	27.40	27.30	0.10	0.0100
4	27.40	27.30	0.10	0.0100
5	27.40	27.30	0.10	0.0100

n = 5

t(0.975) = 2.776

Mean Ref. Method Value	**27.3000**	*RM*
Sum of Differences	**0.5000**	*Xi*
Arithmetic Mean Difference	**0.1000**	*Xi ave*
Sum of Differences Squared	**0.0500**	*Xi^2*
Standard Deviation	**0.0000**	*sd*
2.5% Error Conf.Coef	**0.0000**	*CC*
Calibration Error	**0.1000**	*percent*

OPACITY HIGH FILTER AUDIT

Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 10/7/2020

HIGH FILTER RUN	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Difference^2
		RM	(X_i)	X_i^2
1	46.10	46.40	-0.30	0.0900
2	46.10	46.40	-0.30	0.0900
3	46.20	46.40	-0.20	0.0400
4	46.10	46.40	-0.30	0.0900
5	46.20	46.40	-0.20	0.0400

n = 5

t(0.975) = 2.776

Mean Ref. Method Value	**46.4000**	***RM***
Sum of Differences	**-1.3000**	***Xi***
Arithmetic Mean Difference	**-0.2600**	***Xi ave***
Sum of Differences Squared	**0.3500**	***Xi^2***
Standard Deviation	**0.0548**	***sd***
2.5% Error Conf.Coef	**0.0680**	***CC***
Calibration Error	**0.3280**	***percent***

10/07/2020	OPACITY, %
07:55	
07:55:00	0.0 MOS
07:55:02	0.0 MOS
07:55:04	0.0 MOS
07:55:06	0.0 MOS
07:55:08	0.0 MOS
07:55:10	0.0 MOS
07:55:12	0.0 MOS
07:55:14	0.0 MOS
07:55:16	0.0 MOS
07:55:18	0.1 MOS
07:55:20	0.1 MOS
07:55:22	0.3 MOS
07:55:24	4.9 MOS
07:55:26	9.4 MOS
07:55:28	13.6 MOS
07:55:30	17.5 MOS
07:55:32	18.4 MOS
07:55:34	18.4 MOS
07:55:36	18.4 MOS
07:55:38	18.4 MOS
07:55:40	18.4 MOS
07:55:42	18.4 MOS
07:55:44	18.3 MOS
07:55:46	18.3 MOS
07:55:48	18.3 MOS
07:55:50	18.3 MOS
07:55:52	18.4 MOS
07:55:54	15.8 MOS
07:55:56	15.8 MOS
07:55:58	18.1 MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
07:56		
07:56:00	20.4	MOS
07:56:02	25.2	MOS
07:56:04	27.4	MOS
07:56:06	27.4	MOS
07:56:08	27.4	MOS
07:56:10	27.4	MOS
07:56:12	27.4	MOS
07:56:14	27.4	MOS
07:56:16	27.4	MOS
07:56:18	27.4	MOS
07:56:20	27.4	MOS
07:56:22	27.4	MOS
07:56:24	27.4	MOS
07:56:26	27.4	MOS
07:56:28	24.1	MOS
07:56:30	25.7	MOS
07:56:32	31.5	MOS
07:56:34	36.2	MOS
07:56:36	45.7	MOS
07:56:38	46.1	MOS
07:56:40	46.1	MOS
07:56:42	46.1	MOS
07:56:44	46.1	MOS
07:56:46	46.1	MOS
07:56:48	46.1	MOS
07:56:50	46.1	MOS
07:56:52	46.1	MOS
07:56:54	46.1	MOS
07:56:56	46.1	MOS
07:56:58	46.1	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
07:57		
07:57:00	43.5	MOS
07:57:02	33.0	MOS
07:57:04	26.1	MOS
07:57:06	19.1	MOS
07:57:08	14.8	MOS
07:57:10	18.3	MOS
07:57:12	18.3	MOS
07:57:14	18.3	MOS
07:57:16	18.3	MOS
07:57:18	18.3	MOS
07:57:20	18.3	MOS
07:57:22	18.3	MOS
07:57:24	18.3	MOS
07:57:26	18.3	MOS
07:57:28	18.3	MOS
07:57:30	18.3	MOS
07:57:32	18.3	MOS
07:57:34	18.3	MOS
07:57:36	18.3	MOS
07:57:39	14.4	MOS
07:57:41	13.2	MOS
07:57:43	16.0	MOS
07:57:45	18.8	MOS
07:57:47	24.1	MOS
07:57:49	27.4	MOS
07:57:51	27.4	MOS
07:57:53	27.4	MOS
07:57:55	27.4	MOS
07:57:57	27.4	MOS
07:57:59	27.4	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
07:58		
07:58:01	27.4	MOS
07:58:03	27.4	MOS
07:58:05	27.4	MOS
07:58:07	27.4	MOS
07:58:09	27.4	MOS
07:58:11	27.4	MOS
07:58:13	27.4	MOS
07:58:15	27.4	MOS
07:58:17	27.4	MOS
07:58:19	24.7	MOS
07:58:21	29.4	MOS
07:58:23	33.4	MOS
07:58:25	37.5	MOS
07:58:27	46.1	MOS
07:58:29	46.1	MOS
07:58:31	46.1	MOS
07:58:33	46.1	MOS
07:58:35	46.1	MOS
07:58:37	46.1	MOS
07:58:39	46.1	MOS
07:58:41	46.1	MOS
07:58:43	46.1	MOS
07:58:45	46.1	MOS
07:58:47	46.1	MOS
07:58:49	46.1	MOS
07:58:51	46.1	MOS
07:58:53	34.9	MOS
07:58:55	22.9	MOS
07:58:57	16.2	MOS
07:58:59	9.3	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %
07:59	
07:59:01	13.6 MOS
07:59:03	18.2 MOS
07:59:05	18.3 MOS
07:59:07	18.3 MOS
07:59:09	18.3 MOS
07:59:11	18.3 MOS
07:59:13	18.3 MOS
07:59:15	18.3 MOS
07:59:17	18.3 MOS
07:59:19	18.3 MOS
07:59:21	18.4 MOS
07:59:23	18.4 MOS
07:59:25	18.0 MOS
07:59:27	15.1 MOS
07:59:29	17.4 MOS
07:59:31	19.4 MOS
07:59:33	21.3 MOS
07:59:35	27.4 MOS
07:59:37	27.4 MOS
07:59:39	27.4 MOS
07:59:41	27.4 MOS
07:59:43	27.4 MOS
07:59:45	27.4 MOS
07:59:47	27.4 MOS
07:59:49	27.4 MOS
07:59:51	27.4 MOS
07:59:53	27.4 MOS
07:59:55	27.4 MOS
07:59:57	27.4 MOS
07:59:59	24.6 MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
08:00		
08:00:01	26.2	MOS
08:00:03	30.9	MOS
08:00:05	35.6	MOS
08:00:07	43.1	MOS
08:00:09	46.2	MOS
08:00:11	46.2	MOS
08:00:13	46.2	MOS
08:00:15	46.2	MOS
08:00:17	46.2	MOS
08:00:19	46.2	MOS
08:00:22	46.2	MOS
08:00:24	46.2	MOS
08:00:26	46.2	MOS
08:00:28	46.2	MOS
08:00:30	46.2	MOS
08:00:32	46.2	MOS
08:00:34	32.6	MOS
08:00:36	21.1	MOS
08:00:38	9.5	MOS
08:00:40	3.5	MOS
08:00:42	7.0	MOS
08:00:44	11.5	MOS
08:00:46	16.1	MOS
08:00:48	18.3	MOS
08:00:50	18.3	MOS
08:00:52	18.3	MOS
08:00:54	18.3	MOS
08:00:56	18.3	MOS
08:00:58	18.3	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %
08:01	
08:01:00	18.3 MOS
08:01:02	18.3 MOS
08:01:04	18.4 MOS
08:01:06	18.3 MOS
08:01:08	18.3 MOS
08:01:10	18.3 MOS
08:01:12	15.0 MOS
08:01:14	14.9 MOS
08:01:16	17.2 MOS
08:01:18	19.4 MOS
08:01:20	25.0 MOS
08:01:22	27.4 MOS
08:01:24	27.4 MOS
08:01:26	27.4 MOS
08:01:28	27.4 MOS
08:01:30	27.4 MOS
08:01:32	27.4 MOS
08:01:34	27.4 MOS
08:01:36	27.4 MOS
08:01:38	27.4 MOS
08:01:40	27.4 MOS
08:01:42	27.4 MOS
08:01:44	27.4 MOS
08:01:46	24.1 MOS
08:01:48	27.8 MOS
08:01:50	31.5 MOS
08:01:52	36.1 MOS
08:01:54	42.4 MOS
08:01:56	46.2 MOS
08:01:58	46.2 MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
08:02		
08:02:00	46.2	MOS
08:02:02	46.1	MOS
08:02:04	46.2	MOS
08:02:06	46.1	MOS
08:02:08	46.1	MOS
08:02:10	46.1	MOS
08:02:12	46.1	MOS
08:02:14	46.1	MOS
08:02:16	46.2	MOS
08:02:18	46.2	MOS
08:02:20	38.9	MOS
08:02:22	30.8	MOS
08:02:24	23.8	MOS
08:02:26	18.1	MOS
08:02:28	17.2	MOS
08:02:30	18.4	MOS
08:02:32	18.4	MOS
08:02:34	18.4	MOS
08:02:36	18.4	MOS
08:02:38	18.4	MOS
08:02:40	18.4	MOS
08:02:42	18.4	MOS
08:02:44	18.4	MOS
08:02:46	18.4	MOS
08:02:48	18.4	MOS
08:02:50	18.4	MOS
08:02:52	18.4	MOS
08:02:54	18.4	MOS
08:02:56	17.8	MOS
08:02:58	14.4	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
08:03		
08:03:00	16.6	MOS
08:03:03	18.9	MOS
08:03:05	21.1	MOS
08:03:07	27.4	MOS
08:03:09	27.5	MOS
08:03:11	27.4	MOS
08:03:13	27.4	MOS
08:03:15	27.4	MOS
08:03:17	27.4	MOS
08:03:19	27.5	MOS
08:03:21	27.5	MOS
08:03:23	27.5	MOS
08:03:25	27.5	MOS
08:03:27	27.5	MOS
08:03:29	27.5	MOS
08:03:31	27.4	MOS
08:03:33	27.4	MOS
08:03:35	23.3	MOS
08:03:37	22.1	MOS
08:03:39	26.7	MOS
08:03:41	32.6	MOS
08:03:43	42.2	MOS
08:03:45	46.2	MOS
08:03:47	46.2	MOS
08:03:49	46.2	MOS
08:03:51	46.2	MOS
08:03:53	46.2	MOS
08:03:55	46.2	MOS
08:03:57	46.1	MOS
08:03:59	46.1	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

10/07/2020	OPACITY, %	
08:04		
08:04:01	46.1	MOS
08:04:03	46.2	MOS
08:04:05	46.1	MOS
08:04:07	46.2	MOS
08:04:09	46.2	MOS
08:04:11	37.6	MOS
08:04:13	29.5	MOS
08:04:15	22.6	MOS
08:04:17	15.7	MOS
08:04:19	17.3	MOS
08:04:21	17.7	MOS
08:04:23	16.2	MOS
08:04:25	18.3	MOS
08:04:27	20.2	MOS
08:04:29	22.5	MOS
08:04:31	27.4	MOS
08:04:33	27.4	MOS
08:04:35	27.4	MOS
08:04:37	27.4	MOS
08:04:39	29.8	MOS
08:04:41	34.5	MOS
08:04:43	39.0	MOS
08:04:45	42.7	MOS
08:04:47	46.2	MOS
08:04:49	46.2	MOS
08:04:51	31.9	MOS
08:04:53	20.3	MOS
08:04:55	8.8	MOS
08:04:57	0.0	MOS
08:04:59	0.0	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

OPACITY FILTER AUDIT

*** 6-minute Averages ***

Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 10/7/2020

6 Minute Averages	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Opacity Error
		RM	(Xi)	
ZERO	0.00	0.00	0.00	**0.00**
LOW	18.60	18.30	0.30	**0.30**
MID	27.70	27.30	0.40	**0.40**
HIGH	46.40	46.40	0.00	**0.00**
ZERO	0.10	0.00	0.10	**0.10**

Primary Energy Coke

Opacity Report

Created on : Oct 07, 2020 10:15:14

East Chicago, IN

10/07/2020 - 10/07/2020

10/07/2020

STACK 201

Hour	Opac, % Minutes 0 - 5	Opac, % Minutes 6 - 11	Opac, % Minutes 12 - 17	Opac, % Minutes 18 - 23	Opac, % Minutes 24 - 29	Opac, % Minutes 30 - 35	Opac, % Minutes 36 - 41	Opac, % Minutes 42 - 47	Opac, % Minutes 48 - 53	Opac, % Minutes 54 - 59
0	2.1 SVC	2.2 SVC	2.1 SVC	2.1 SVC	2.2 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC
1	2.1 SVC	2.1 SVC	2.2 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.2 SVC	2.1 SVC
2	2.2 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.2 SVC	2.2 SVC	2.1 SVC	2.2 SVC	2.1 SVC
3	2.1 SVC	2.1 SVC	2.2 SVC	2.2 SVC	2.1 SVC	2.2 SVC	2.2 SVC	2.2 SVC	2.2 SVC	2.2 SVC
4	2.2 SVC	2.2 SVC	2.2 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 NSA	2.0 SVC	2.1 SVC	2.1 SVC
5	2.1 SVC	2.0 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.2 SVC	2.2 SVC
6	2.2 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.1 SVC	2.2 SVC	2.1 SVC
7	2.1 SVC	2.1 SVC	2.1 SVC	2.0 SVC	2.1 SVC	2.0 SVC	2.0 SVC	2.0 MOS	1.2 MOS	20.6 MOS
8	24.5 MOS	0.0 MOS	0.0 MOS	11.9 MOS	18.6 MOS	22.4 MOS	27.7 MOS	28.6 MOS	46.4 MOS	46.4 MOS
9	8.5 MOS	0.1 MOS	2.9 MOS	3.3 MOS	3.3 MOS	3.3 MOS	3.2 MOS	3.2 NSA	3.2 SVC	3.2 SVC
10	3.3 SVC	3.3 SVC								

Status Code Definitions

MOS = MONITOR OUT OF SERVICE NSA = NO SAMPLE AVAILABLE SVC = MONITOR IN SERVICE

The average opacity period average for the day was 2.2 % for 80 periods of valid data.

The Fan was in operation for 102 periods

The maximum opacity period average for the day was 3.3 %

There were 22 periods of invalid data

Monitoring Solutions
Leaders in Environmental Monitoring Systems & Services
4404 Guion Rd., Indianapolis, Indiana 46254 Tel: 317.856.9400

REPORT OF CERTIFICATION OF NEUTRAL DENSITY AUDIT FILTERS

Date of Filter Certification: **August 29, 2020**
Date of Filter Expiration: **February 28, 2021** **Filter Set - K**

Audit Device / Filter Slot Angle of Incidence **10** Degrees
Path-Length Correction **1.000** (Straight Stack)

Table 1: Individual Filter Certification Data

Serial Number	Opacity Value (%)	Transmittance (%)	Previous Opacity (%)	Change in Opacity (%)
YC60	8.4	91.6	8.5	0.1
YC61	18.3	81.7	18.2	0.1
YC62	27.3	72.7	27.3	0.0
YC63	46.4	53.6	46.3	0.1
YG00	57.9	42.1	57.8	0.1
YG02	86.6	13.4	86.4	0.2

Laboratory-Based Transmissometer
Operator

See second page for Instrument Information and Details of Certification

ATTACHMENT 2

First Quarter 2021 Deviation and Compliance Monitoring Report

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

April 23, 2021

Via UPS

Indiana Department of Environmental Management
Compliance and Enforcement Branch
Office of Air Quality
100 N. Senate Avenue
Mail Code 61-50, IGCN 1003
Indianapolis, IN 46204 - 2251

RE: Cokenergy, LLC Quarterly Report –First Quarter 2021
Part 70 Permit No. T089-41033-00383

To Whom It May Concern:

In accordance with sections C.18 and D.1.14 of the subject permit, 326 IAC 3-5-5 and 326 IAC 3-5-7, we have enclosed the first quarter 2021 reports for the Cokenergy, LLC facility. This report includes:

- Part 70 Quarterly Report – Certification
- Part 70 Quarterly Deviation and Compliance Report
- CEMS Excess Emissions Report
- CEMS Downtime Report
- COMS First Quarter 2021 Opacity Monitor Audit
- CEMS First Quarter 2021 Cylinder Gas Audit

If you have any questions concerning this data, please call Luke Ford at (219) 397-4626.

Sincerely,

Seth Acheson

Seth Acheson
General Manager
Cokenergy LLC

Enclosure
cc: Luke Ford (scan via email)
Cliff Yukawa IDEM (scan via email)

File: X:\\ 615.4

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR MANAGEMENT
COMPLIANCE AND ENFORCEMENT SECTION
PART 70 OPERATING PERMIT
CERTIFICATION

Source Name: Cokenergy LLC

Source Address: 3210 Watling Street, MC 2-991, East Chicago, Indiana 46312-1610

Part 70 Permit No. : T089-41033-00383

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.

Please check what document is being certified:

☐ Annual Compliance Certification Letter

☒ Test Result (specify) 1st Quarter 2021 COMS Performance Opacity Audit and Cylinder Gas Audit

☒ Report (specify) 1st Quarter 2021 Deviation and Compliance Monitoring Report

☐ Notification (specify) _____

☐ Affidavit (specify) _____

☐ Other (specify) _____

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Signature: Seth Acheson

Printed Name: Seth Acheson

Title/Position: General Manager, Cokenergy, LLC

Phone: (219) 397-4521

Date: April 23, 2021

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
PART 70 OPERATING PERMIT
QUARTERLY DEVIATION AND COMPLIANCE MONITORING REPORT

Source Name: Cokenergy LLC
Source Address: 3210 Watling Street, MC 2-991, East Chicago, Indiana 46312-1610
Part 70 Permit No. T089-41033-00383

Months: January to March **Year:** 2021

This report shall be submitted quarterly based on a calendar year. Any deviation from the requirements, the date(s) of each deviation, the probable cause of the deviation, and the response steps taken must be reported. Deviations that are required to be reported by an applicable requirement shall be reported according to the schedule stated in the applicable requirement and do not need to be included in this report. Additional pages may be attached if necessary. If no deviations occurred, please specify in the box marked "No deviations occurred this reporting period".

☒ NO DEVIATIONS OCCURRED THIS REPORTING PERIOD

☐ THE FOLLOWING DEVIATIONS OCCURRED THIS REPORTING PERIOD

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Permit Requirement: (specify permit condition #)	
Date of Deviation:	**Duration of Deviation:**
Number of Deviations:	
Probable Cause of Deviation:	
Response Steps Taken:	

Form Completed by: Seth Acheson

Title / Position: General Manager, Cokenergy, LLC

Date: April 23, 2021

Phone: (219) 397-4521

Excess Emissions and Downtime Report

COKENERGY, LLC, East Chicago, IN

Plant ID: 089-00383

Emissions Unit ID: Stack 201

Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

PLANT OPERATIONS DOWNTIME SUMMARY

Reporting Period: 1st Quarter of 2021

Commencement of Emission Unit Downtime	Completion of Emission Unit Downtime	Emission Unit Downtime Duration (hours)	Reasons for Emission Unit Downtime
NONE			
Total Emission Unit Downtime for the quarter =		0	hours

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

EXCESS EMISSIONS SUMMARY

Reporting Period: 1st Quarter of 2021

SO_2 Exceedances

Emission Standard: 1,656 lb/hr on a 24-hr average basis
(Note that this limit is for the combined emissions from Cokenergy Stack 201 and 16 IHCC Vent Stacks)

Date/Time of Commencement	Date/Time of Completion	Magnitude of Emissions (lb/hr)			Reasons for Excess Emissions	Corrective Actions Taken
		Main Stack Avg	Vent Stack Avg	Plant Avg		
None						

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

EXCESS EMISSIONS SUMMARY

Reporting Period: 1st Quarter of 2021

Opacity Exceedances

Emission Standard: 20% opacity

Date/Time of Commencement	Date/Time of Completion	Magnitude of Emissions	Reasons for Excess Emissions	Corrective Actions Taken
None				
Total Duration	0 minutes			

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

CONTINUOUS MONITORING SYSTEM DOWNTIME SUMMARY

Reporting Period: 1st Quarter of 2021

Opacity Monitor Downtime

Date/Time of Commencement	Duration of Downtime (minutes)	Reasons for Instrument Downtime	System Repairs and Adjustments
1/8/21 10:00	120	Quarterly PMs and Opacity Performance Audit	Completed PMs and Audit
Total Downtime	120 minutes		

Note: Daily zero and span checks of the instrument have been excluded from the downtime summary per 326 IAC 3-5-7.

COKENERGY, LLC, East Chicago, IN
Plant ID: 089-00383
Emissions Unit ID: Stack 201
Emissions Unit: Heat Recovery Coke Carbonization Waste Heat Stack

CONTINUOUS MONITORING SYSTEM DOWNTIME SUMMARY

Reporting Period: 1st Quarter of 2021

SO_2 CEMS Downtime

Date/Time of Commencement	Duration of Downtime (hours)	Reasons for Instrument Downtime	System Repairs and Adjustments
1/7/21 9:00	2	Quarterly PMs and Cylinder Gas Audit	Completed PMs and Audit
1/8/21 10:00	4	Quarterly PMs and Opacity Performance Audit	Completed PMs and Audit
1/14/21 8:00	3	SO2 monitor maintenance	SO2 monitor mirror assembly replaced and cleaned capillary
3/8/21 2:00	2	Sample chiller peristaltic pump failure	Replaced peristaltic pump
Total Downtime	11 hours		

Note: Daily zero and span checks of the instrument have been excluded from the downtime summary per 326 IAC 3-5-7.

CYLINDER GAS AUDIT

FOR

Primary Energy

E. Chicago, IN

Unit: Stack 201

MONITORING SOLUTIONS, INC.
FULL EXTRACTIVE

First (1st) Quarter Results
2021

CGA Completed On: 1/7/2021

PREPARED BY:

Monitoring | Solutions

Leaders in Environmental Monitoring Systems & Services

TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

I. Introduction

Monitoring Solutions, Inc. was contracted to conduct a Cylinder Gas Audit on a Continuous Emission Monitoring System (CEMS). This audit was performed:

Client: Primary Energy
City, State: E. Chicago, IN
Unit: Stack 201
Auditor: Dan Bowles
Audit Date: 1/7/2021

The audit of the Continuous Emission Monitoring System was conducted for the following gases:

Gas #1 : SO2
Gas #2 : O2 Dry & O2 Wet

Our assessment of this quarter's CGA results indicates that all of the analyzers evaluated during this test program meet the accuracy requirements as outlined in 40 CFR 60, Appendix F.
NOTE: Table 1-1 summarizes the results for the cylinder gas audit.

Reviewed by: Zachary Russell

Date: 1/21/2021

Summary of Cylinder Gas Audit Results

Parameter	Low Gas Error	Mid Gas Error
SO2	3.21	0.06
O2 Dry	5.81	6.32
O2 Wet	3.81	5.32
	Pass	Pass

Table 1-1

40 CFR 60, Appendix F Performance Test requirements: <15%

II. CYLINDER GAS AUDIT PROCEDURES

Each Continuous Emission Monitor (CEM) must be audited three out of four calendar quarters of each year. As part of the Quality Control (QC) and Quality Assurance (QA) procedures, the quality of data produced is evaluated by response accuracy compared to known standards,

The Cylinder Gas Audit (CGA) for this quarter was conducted in accordance with the QA/QC procedure outlined in 40 CFR 60, Appendix F.

All applicable audit gases are connected to the sampling system. Each gas is introduced into the sampling and analysis system. The gases flow through as much of the sampling path as possible.

The gases are actuated on and off by utilizing a computer and/or PLC controlled solenoids at designated time intervals.

a) Challenge each monitor (both pollutant and diluent, if applicable) with cylinder gases of known concentrations at two measurement points listed in Table 1-2.

b) Use a separate cylinder gas for measurement points 1 and 2. Challenge the CEMS three times at each measurement point and record the responses.

c) Use cylinder gases that have been certified by comparison to National Institute of Standards and Technology (NIST) gaseous standard reference material (SRM) or NIST/EPA approved gas manufacturer's certified reference material (CRM) following "Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors. (Protocol Number 1)."

NOTE: In rare cases, some operators may have pollutant cylinder gases that are not "Protocol 1". Pollutant cylinder gases in high concentrations may not be certifiable to the "Protocol 1 Standard" and are only available as a "Certified Standard" (e.g. Sulfur Dioxide [SO2] in a concentration of 3.0% - or - 30,000 ppm).

Gas	*Measurement point #1*	*Measurement point #2*
Pollutants -	20-30% of span value	50-60% of span value
Diluent - O2	4-6% by volume	8-12% by volume
Diluent - CO2	5-8% by volume	10-14% by volume

Table 1-2

NOTE: Some operators may have cylinder gas values that fall outside of these parameters. This may be a result of previous agreements with their state or local EPA authority.

d) Determine the Accuracy of each measurement point using the formula below. The "Accuracy" error must not exceed 15%.

$$A = \left(\frac{C_m - Ca}{C_a}\right) x\ 100 \qquad \leq 15 \text{ percent}$$

Where:

A = Accuracy of the CEMS, percent.

C_m = Average CEMS response during audit in units of applicable

C_a = Average audit value (CGA certified value) in units of applicable standard or appropriate concentration.

III. Cylinder Gas Audit Data Sheets

CYLINDER GAS AUDIT (CGA) ERROR DETERMINATION

CLIENT: Primary Energy
PLANT / SITE: E. Chicago, IN
UNIT ID: Stack 201

CONDUCTED BY : Dan Bowles
ATTENDEE : N/A
AUDIT DATE: 1/7/2021

MONITOR TESTED: SO2
RANGE : 0 - 700 PPM

ANALYZER SERIAL NUMBER: 1152150034

	Run	Time	Reference value	Monitor value	Difference	Error %
Low-level	1	10:44	176.50	181.80	5.30	3.00 %
	2	11:02	176.50	182.70	6.20	3.51 %
	3	11:20	176.50	182.00	5.50	3.12 %
Mid-level	1	10:38	397.10	397.30	0.20	0.05 %
	2	10:56	397.10	396.10	-1.00	-0.25 %
	3	11:14	397.10	397.20	0.10	0.03 %

Low-level

Arithmetic Mean: 182.17

CGA Error: 3.21 %

Tank S/N CC14789
Tank Expiration Date 7/25/2025

Mid-Level

Arithmetic Mean: 396.87

CGA Error: 0.06 %

Tank S/N XC018359B
Tank Expiration Date 5/14/2026

Date	Parameter	Run#	Timestamp	Type	Expected	Measured	Low Diff	------	Mid Diff	------
01/07/2021										
	SO2, PPM	1	10:38:49	QTR_MID	397.1	397.3			0.2	
	SO2, PPM	1	10:44:50	QTR_LOW	176.5	181.8	5.3			
	SO2, PPM	2	10:56:50	QTR_MID	397.1	396.1			1.0	
	SO2, PPM	2	11:02:50	QTR_LOW	176.5	182.7	6.2			
	SO2, PPM	3	11:14:51	QTR_MID	397.1	397.2			0.1	
	SO2, PPM	3	11:20:51	QTR_LOW	176.5	182.0	5.5			

Arithmetic Mean of Quarterly Low : 182.2
Linearity Error of Quarterly Low : 3.2
Calibration Tolerance: 15.0
Tank S/N: N/A
Tank Exp. Date: N/A

Arithmetic Mean of Quarterly Mid : 396.9
Linearity Error of Quarterly Mid : 0.1
Calibration Tolerance: 15.0
Tank S/N: N/A
Tank Exp. Date: N/A

Calibration Result : PASSED

CEMS Type : Full Extractive
Manufacturer: Thermo
Model Number : 43i-HL
Serial Number: 1152150034
Monitor Certification Date:

Tested By : _____

Date: _____

CYLINDER GAS AUDIT (CGA) ERROR DETERMINATION

CLIENT: Primary Energy
PLANT / SITE: E. Chicago, IN
UNIT ID: Stack 201

CONDUCTED BY : Dan Bowles
ATTENDEE : N/A
AUDIT DATE: 1/7/2021

MONITOR TESTED: O2 Dry
RANGE : 0 - 25 %

ANALYZER SERIAL NUMBER: 11400

	Run	Time	Reference value	Monitor value	Difference	Error %
Low-level	1	10:44	5.01	5.30	0.29	5.81 %
	2	11:02	5.01	5.30	0.29	5.81 %
	3	11:20	5.01	5.30	0.29	5.81 %
Mid-level	1	10:50	9.97	10.60	0.63	6.32 %
	2	11:08	9.97	10.60	0.63	6.32 %
	3	11:26	9.97	10.60	0.63	6.32 %

Low-level

Arithmetic Mean: 5.30

Tank S/N CC14789

Tank Expiration Date 7/25/2025

CGA Error: 5.81 %

Mid-Level

Arithmetic Mean: 10.60

Tank S/N CC400438

Tank Expiration Date 8/16/2025

CGA Error: 6.32 %

CGA Report

Date	Parameter	Run#	Timestamp	Type	Expected	Measured	Low Diff	-------	Mid Diff	-------
01/07/2021										
	O2 DRY, %	1	10:44:50	QTR_LOW	5.0	5.3	0.3			
	O2 DRY, %	1	10:50:50	QTR_MID	10.0	10.6			0.6	
	O2 DRY, %	2	11:02:50	QTR_LOW	5.0	5.3	0.3			
	O2 DRY, %	2	11:08:51	QTR_MID	10.0	10.6			0.6	
	O2 DRY, %	3	11:20:51	QTR_LOW	5.0	5.3	0.3			
	O2 DRY, %	3	11:26:49	QTR_MID	10.0	10.6			0.6	

Arithmetic Mean of Quarterly Low : 5.3
Linearity Error of Quarterly Low : 6.0
Calibration Tolerance: 15.0
Tank S/N: N/A
Tank Exp. Date: N/A

Arithmetic Mean of Quarterly Mid : 10.6
Linearity Error of Quarterly Mid : 6.0
Calibration Tolerance: 15.0
Tank S/N: N/A
Tank Exp. Date: N/A

Calibration Result : PASSED

CEMS Type : Full Extractive
Manufacturer: Brand Gaus
Model Number : 4705
Serial Number: 11400
Monitor Certification Date:

Tested By : _____

Date: _____

CYLINDER GAS AUDIT (CGA) ERROR DETERMINATION

CLIENT: Primary Energy
PLANT / SITE: E. Chicago, IN
UNIT ID: Stack 201

CONDUCTED BY : Dan Bowles
ATTENDEE : N/A
AUDIT DATE: 1/7/2021

MONITOR TESTED: O2 Wet
RANGE : 0 - 25 %

ANALYZER SERIAL NUMBER: 11401

	Run	Time	Reference value	Monitor value	Difference	Error %
Low-level	1	10:44	5.01	5.20	0.19	3.81 %
	2	11:02	5.01	5.20	0.19	3.81 %
	3	11:20	5.01	5.20	0.19	3.81 %
Mid-level	1	10:50	9.97	10.50	0.53	5.32 %
	2	11:08	9.97	10.50	0.53	5.32 %
	3	11:26	9.97	10.50	0.53	5.32 %

Low-level

Arithmetic Mean: 5.20

Tank S/N CC14789

Tank Expiration Date 7/25/2025

CGA Error: 3.81 %

Mid-Level

Arithmetic Mean: 10.50

Tank S/N CC400438

Tank Expiration Date 8/16/2025

CGA Error: 5.32 %

Date	Parameter	Run#	Timestamp	Type	Expected	Measured	Low Diff	------	Mid Diff	------
01/07/2021										
	O2 WET, %	1	10:44:50	QTR_LOW	5.0	5.2	0.2			
	O2 WET, %	1	10:50:50	QTR_MID	10.0	10.5			0.5	
	O2 WET, %	2	11:02:50	QTR_LOW	5.0	5.2	0.2			
	O2 WET, %	2	11:08:51	QTR_MID	10.0	10.5			0.5	
	O2 WET, %	3	11:20:51	QTR_LOW	5.0	5.2	0.2			
	O2 WET, %	3	11:26:49	QTR_MID	10.0	10.5			0.5	

Arithmetic Mean of Quarterly Low : 5.2
Linearity Error of Quarterly Low : 4.0
Calibration Tolerance: 15.0
Tank S/N: N/A
Tank Exp. Date: N/A

Arithmetic Mean of Quarterly Mid : 10.5
Linearity Error of Quarterly Mid : 5.0
Calibration Tolerance: 15.0
Tank S/N: N/A
Tank Exp. Date: N/A

Calibration Result : PASSED

CEMS Type : Full Extractive
Manufacturer: Brand Gaus
Model Number : 4705
Serial Number: 11401
Monitor Certification Date:

Tested By : _____

Date: _____

IV. Cylinder Gas Certification Sheets

Airgas
an Air Liquide company

In Service 9/29/17

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI84E15A0007	Reference Number:	54-124629354-1
Cylinder Number:	CC14789	Cylinder Volume:	150.4 CF
Laboratory:	124 - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12017	Valve Outlet:	660
Gas Code:	CO2,O2,SO2,BALN	Certification Date:	Jul 25, 2017

Expiration Date: Jul 25, 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
[redacted]	175.0 PPM	[redacted]	G1	+/- 1.0% NIST Traceable	07/17/2017, 07/25/2017
	5.000 %		G1	+/- 1.0% NIST Traceable	07/18/2017
CARBON DIOXIDE	10.00 %	10.00 %	G1	+/- 0.9% NIST Traceable	07/17/2017
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060140	CC437515	515.2 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 16, 2021
NTRM	11060719	CC338460	4.861 % OXYGEN/NITROGEN	+/- 0.4%	Dec 13, 2022
NTRM	13060635	CC413759	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 09, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801332	FTIR	Jun 21, 2017
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 17, 2017
Nicolet 6700 AHR0801332	FTIR	Jul 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:	E02NI90E15A0228	Reference Number:	54-400967311-1
Cylinder Number:	CC400438	Cylinder Volume:	145.2 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12017	Valve Outlet:	590
Gas Code:	O2,BALN	Certification Date:	Aug 16, 2017

Expiration Date: Aug 16, 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
OXYGEN	10.00 %	9.970 %	G1	+/- 1% NIST Traceable	08/16/2017
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	06120102	CC195613	9.898 % OXYGEN/NITROGEN	+/- 0.7%	Jul 26, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 17, 2017

Triad Data Available Upon Request

Signature on file
Approved for Release

Airgas
an Air Liquide company

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

... SERVICE 11/29/20

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI69E15A0052	Reference Number:	64-401193527-1
Cylinder Number:	XC018359B	Cylinder Volume:	149.9 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12018	Valve Outlet:	660
Gas Code:	CO2,SO2,BALN	Certification Date:	May 14, 2018

Expiration Date: May 14, 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
SULFUR DIOXIDE	385.0 PPM	397.1 PPM	G1	+/- 0.9% NIST Traceable	05/07/2018, 05/14/2018
CARBON DIOXIDE	10.00 %	9.975 %	G1	+/- 0.7% NIST Traceable	05/07/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060140	CC437515	515.2 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 16, 2021
NTRM	13060613	CC413592	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 09, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Apr 24, 2018
Nicolet 6700 AHR0801332	FTIR	Apr 21, 2018

Triad Data Available Upon Request

Approved for Release

OPACITY PERFORMANCE AUDIT

FOR

Primary Energy

E. Chicago, IN

Unit: Stack 201

MONITORING SOLUTIONS, INC.
MODEL: DURAG D-R 290 COMS

First (1st) Quarter Results
2021

Audit Completed On: 1/8/2021

PREPARED BY:

Monitoring | Solutions

Leaders in Environmental Monitoring Systems & Services

TABLE OF CONTENTS

I. Introduction

Monitoring Solutions, Inc. was contracted to conduct an opacity performance audit on a Durag Model D-R 290 opacity system.

Client: Primary Energy
City, State: E. Chicago, IN
Auditor: Dan Bowles
Audit Date: 1/8/2021

The performance testing consists of:

1 Zero and Span Check
2 Zero Compensation Check
3 Optical Alignment Check
4 Calibration Error Check
5 Annual Zero Alignment (When required)

All raw data, calculated data and final summary are presented. The results indicate compliance for all specifications. Testing was performed as per 40CFR60 Appendix F and 40CFR60 Appendix B, PS1 (Where Applicable).

Annual "Zero Alignment" check performed this quarter:

YES: _____ NO: X ERROR: N/A

Summary of Calibration Error Check

Filter :	Low	Mid	High
Percent of Error:	0.21	0.30	0.38
	PASS	PASS	PASS

Reviewed by: Zachary Russell

Date: 1/21/2021

Revision: March 2016

PERFORMANCE AUDIT PROCEDURES FOR THE MONITORING SOLUTIONS, INC. OPACITY MONITOR

II. Monitoring Solutions, Inc. Durag Model D-R 290

The instrument is manufactured by the Durag Corporation and distributed and serviced by Monitoring Solutions, Inc.

A. COMS Description

The Monitoring Solutions, Inc. D-R 290 opacity monitoring system consists of four major components: the Transmissometer, the terminal control box, the air-purging system and the remote control unit and data acquisition equipment. The Transmissometer component consists of an optical transmitter/receiver (transceiver) unit mounted on one side of a stack or duct and a retro reflector unit mounted on the opposite side. The transceiver unit contains the light source, the photodiode detector, and the associated electronics. The transceiver uses a single-lamp, single detector system to determine effluent opacity. A LED light source is modulated electronically at 2 KHz to eliminate any ambient light interference. The modulated beam is configured to alternately produce reference and measurement signals so that the effects of variations in the optical and electronic components of the COMS are minimized.

In a single display configuration, an AW unit is mounted in a blue housing next to the transceiver location. In a dual display configuration, an AZ unit is mounted in the blue housing next to the transceiver location and an AW is mounted in a remote location, typically, a control room. The AZ and the AW communicate via an RS 422 cable. The AZ unit provides an on stack readout and can be used as a diagnostic tool. In either configuration, only the AW provides the signals to the final recording device.

The air purging system serves a threefold purpose: 1) it provides an air window to keep exposed optical surfaces clean; 2) it protects the optical surfaces from condensation of stack gas moisture; and 3) it minimizes thermal conduction from the stack to the instrument. A standard installation has one air-purging system for each the transceiver and the retro reflector units.

The opacity monitor measures the amount of light transmitted through the effluent from the transceiver to the retro reflector and back again. The control unit uses the effluent transmittance to calculate the optical density of the effluent at the monitor location, or the "path" optical density. In order to provide stack exit opacity data, the path optical density must be corrected. The correction factor is expressed as the ratio of the stack exit inside diameter to the inside diameter of the stack at the Transmissometer location. This ratio is called the "stack correction factor" (SCF) by Monitoring Solutions, Inc. The following equations illustrate the relationship between this ratio, path optical density, and stack exit opacity.

Calculation of "Stack Correction Factor"

L_x / L_t = stack correction factor

where: L_x = stack exit inside diameter (in)

L_t = the stack inside diameter (or the duct width) at the monitor location (in).

OP_x = $1 - (1 - \frac{Opacity}{100})^{correction\ factor}$

OP_x = stack exit opacity (%)

B. Performance Audit Procedures

1. Preliminary Data

a. Obtain the stack exit inside diameter (in feet) and the stack inside diameter at the monitor location (in feet). Record these values in Blanks 1 and 2 of the Monitoring Solutions, Inc. D-R 290 Performance Audit Data Sheet.

Note: Effluent handling system dimensions may be acquired from the following sources listed in descending order of reliability: 1) physical measurements, 2) construction drawings, 3) opacity monitor installation/certification documents, and 4) source personnel recollections.

b. Calculate the stack correction factor (SCF) by dividing the value in Blank 1 by the value in Blank 2. Record the result in Blank 3.

c. Record the source-cited Stack Correction Factor (SCF) in Blank 4.

Note: The stack correction factor (SCF) is preset by the manufacturer using information supplied by the source. The value recorded in Blank 4 should be the value source personnel agree should be set inside the monitor.

d. Obtain the reference zero and span calibration values. Record these values in Blank 5 and Blank 6, respectively.

Note: The reference zero and span calibration values may not be the same as the values recorded during instrument installation and/or certification. The zero and span values recorded in Blank 5 and Blank 6 should be the reference values recorded during the most recent clear-path calibration of the CEMS.

2. Error Checks

The following steps describe the error codes for the Monitoring Solutions, Inc. D-R 290 remote control unit. The audit can continue with the error codes shown below being present, provided the source has been informed of the fault conditions. All other error codes must be corrected prior to audit.

Error code 100 = Transceiver blower fault
Error code 200 = Transceiver filter plugged
Error code 300 = Reflector blower fault
Error code 400 = Reflector filter plugged

Note: If a fault is active, an error code will be displayed on the stack mounted display and on the remote display. An explanation of the error codes can be found in the manual.

3. Instrument Range Check

a. Check the COMS measurement range by pressing the MOD button (the LED on the button will light up) and using the PLUS button to cycle through the displays.

b. Record the instrument range in Blank 11.

4. Reference Signal, Zero and Span Checks

a. Initiate the calibration cycle by pressing the arrow and plus buttons simultaneously and holding for approximately 5 seconds.

Note: The opacity monitor will automatically cycle through the internal zero (zero point check), external zero (window check), span and stack taper ratio modes. Approximately 6 minutes for a complete cycle.

b. Record the milliamp value shown for the internal zero (zero point check) displayed on the control panel display in Blank 12.

Note: The internal zero checks the instrument reference signal (Zero Point Check). Since the instrument provides a full scale output of 4 to 20 milliamps, a value of 4 milliamps displayed on the control unit display represents a zero condition. After 1 ½ minutes in the internal zero mode, the monitor will automatically switch to the external zero mode (Window Check).

c. Record the milliamp value shown for the external zero (window check) displayed on the control panel in Blank 13. Also record the external zero value (in percent opacity) displayed on the opacity data recorder in Blank 14.

(Continued on next page)

Note: During the zero calibration check, the zero mirror is moved into the path of the measurement beam by a servomotor. The zero mechanism is designed to present the transceiver with a simulated clear-path condition. The daily zero check does not test the actual clear-path zero, nor does it provide a check of cross-stack parameters such as the optical alignment of the Transmissometer or drift in the reflectance of the retro reflector. The actual clear-path zero can only be checked during clear-stack or off-stack calibration of the CEMS. In addition to simulating the instrument clear-path zero, the zero mechanism allows the amount of dust on the transceiver optics (primary lens and zero mirror) to be quantified. After 1 ½ minutes in the external zero mode, the CEMS will automatically enter the span mode.

d. Record in Blank 15 the span value (in milliamps) displayed on the control panel display. Also record the span value (in percent opacity) displayed on the data recorder in Blank 16. Go to the Transmissometer location.

Note: During the span calibration check, a servomotor moves an internal span filter into the path of the measurement beam while the zero mirror is in place. The span mechanism is designed to provide an indication of the upscale accuracy of the CEMS relative to the simulated clear-path zero. Note: The opacity monitor display will output its stack correction factor (SCF) for 1 ½ minutes when the span portion of the calibration cycle is completed. The CEMS automatically returns to the measurement mode when the SCF portion of the calibration cycle is complete.

5. Reflector Dust Accumulation Check.

a. Record the effluent opacity prior to cleaning the retroreflector optics in Blank 17.

b. Open the reflector housing, inspect and clean the retroreflector optics, and close the housing.

c. Record the post-cleaning effluent opacity in Blank 18. Go to the transceiver location.

6. Transceiver Dust Accumulation Check.

a. Record the pre-cleaning effluent opacity in Blank 19.

b. Open the transceiver, clean the optics (primary window and zero mirror) and close the transceiver.

c. Record the post-cleaning effluent opacity in Blank 20.

7. Alignment Check

a. Determine the monitor alignment by looking through the alignment port of the side of the transceiver.

b. Observe whether the image is centered in the cross hairs and record this information (YES or NO) in Blank 21.

8. Zero Compensation Check

The Durag 290 provides internal compensation for window contamination. This compensation value can be determined by performing the Window Check. This compensation cannot be disabled for testing. Remove internal compensation as follows: Clean the transceiver window and the zero mirror lens. Verify the window check value is at zero so no compensation is applied to the quarterly audit. Enter the Filter Audit Mode and verify the starting Durag opacity value is zero percent. **NOTE:** This process must be completed prior to the Calibration Error Check.

9. Zero Alignment Error Check

The Zero Alignment Error Check is performed one time each year. This check utilizes Durag's Clear Path Procedure. This procedure verifies the "measuring" zero point of the unit in a known clear path setup. The Transceiver and reflector are removed from their installation and set up on stands in a clean, dust free environment. The stands are set at the same distance as the installation location. Without performing any adjustments, the measuring zero is compared to the simulated zero - or - Window Check. The difference between the measuring zero and the simulated zero, must NOT exceed 2% opacity.

Verify the Zero Compensation Check has been performed. Since the zero compensation function cannot be disabled for the zero alignment check, the optics must be cleaned and a manual calibration performed. This will set the internal compensation value to 0.0%. This MUST be accomplished prior to the Zero Alignment Check.

Perform the following to document the "Zero Alignment Error":

a) Remove the Transceiver & Reflector from its current installation and setup on stands at the exact distance as their original location.

b) Perform the Zero Compensation Check and perform a manual calibration.

c) Record the Durag's response to the clear path zero in % opacity without any adjustment.

d) Activate the simulated zero (Window Check) and record the reading in % opacity without any adjustment.
(continued on next page)

e) The response difference between these two readings are recorded as the "zero alignment error". The maximum allowable zero alignment error is 2%.

f) Adjust the simulated zero (window check) to read the same value in % opacity as the clear path zero.

10. Calibration Error Check

The calibration error check is performed using three neutral density filters. Performing the calibration error check on-stack using the filters determines the linearity of the instrument response relative to the current clear-path zero setting. This calibration error check does not determine the accuracy of the actual instrument clear-path zero or the status of any cross-stack parameters. A true calibration check is performed by moving the on-stack components to a location with minimal ambient opacity, making sure that the proper path length and alignments are attained, and then placing the calibration filters in the measurement path.

a. Put the monitor in Filter Audit mode.

b. Wait approximately three minutes or until a clear "zero" value has been recorded and displayed on the data recorder.

c. Record the audit filter serial numbers and opacity values in Blanks 22, 23, and 24.

d. Remove the filters from their protective covers, inspect and if necessary, clean them.

e. Insert the low range neutral density filter into the filter audit slot located in front of the heated lens.

f. Wait approximately three minutes or until a clear value has been recorded and displayed on the data recorder.

Note: The audit data should be taken from a data recording/reporting device that presents instantaneous opacity (or opacity data with the shortest available integration period).

g. Record the COMS response to the low range neutral density filter.

h. Remove the low range filter and insert the mid range neutral density filter.

i. Wait approximately three minutes and record the COMS response to the mid range neutral density filter.

j. Remove the mid range filter and insert the high range filter.

k. Wait approximately three minutes and record the COMS response to the high range neutral density filter.

(continued on next page)

l. Remove the high range filter.

m. * If applicable, wait approximately three minutes, and record the zero value.

n. Repeat steps (e) through (m) until a minimum of three opacity readings are obtained for each neutral density filter.

o. If six-minute integrated opacity data is required, repeat steps (e) through (m) once more, changing the waiting periods to 13 minutes.

p. Record the six-minute integrated data.

Note: In order to acquire valid six-minute averaged opacity data, each filter must remain in for at least two consecutive six-minute periods; the first period will be invalid because it was in progress when the filter was inserted. A waiting period of 13 minutes is recommended. You should have a "starting zero" reading and an "ending zero" reading.

q. When the calibration error check is complete, return the monitor to measuring mode. Close the transceiver head and the weather cover, and return to the COMS control unit.

11. Test Conclusion

a. Obtain a copy of the audit data from the data recorder.

b. Transcribe the calibration error response from the data recorder to Blanks 25 through 50 of the audit form and complete the audit data calculations.

C. Interpretation of Audit Results

This section is designed to help the auditor interpret the D-R 290 performance audit results.

Error codes / fault analysis

Error codes are typically associated with parameters that the monitor manufacturer feels are critical to COMS function, and to the collection of valid opacity data. The parameters associated with each of the error codes are found in the manufacturer's manual. With the exception of alarms that warn of elevated opacity levels (alarm or warning lamps), the error codes indicate that the COMS is not functioning properly. An error or failure indication will be represented by a "YES" in Blanks 7 - 10.

(continued on next page)

Stack Exit Correlation Error Check

The path length correction error in Blank 51 should be within +2%. This error exponentially affects the opacity readings, resulting in over - or - underestimation of the stack exit opacity. The most common error in computing the optical path length correction factor is the use of the flange-to-flange distance in place of the stack/duct inside diameter at the monitor location. This error will result in underestimation of the stack exit opacity and can be identified by comparing the monitor optical path length to the flange-to-flange distance; the flange-to-flange distance should be greater by approximately two to four feet

Control Panel Meter Error (Optional)

The accuracy of the control panel meter (AW) is important at sources using the meter during monitor adjustment and calibration. The accuracy of the control panel meter (Blank 52 and Blank 54) is determined by comparing the zero and span reference values to the panel meter output recorded during the COMS calibration check.

Note: Some installations utilize a different "Instrument Range Setting" than the normal 100% range. The panel meter span error must be corrected for the different range in order to provide an accurate error result. Use the following equation to calculate the span error corrected for "Instrument Range" (Blank 11):

Panel Meter span error in % opacity =

$$(((\text{Blank } 15 - 4) \div 16) \times \text{Blank } 11) - \text{Blank } 6$$

Zero and Span Checks

The D-R 290 internal zero or "zero point check" (Blank 12 should be set to indicate 0% opacity (equivalent to 3.7 - 4.3 mA). An external zero error or "window check" (Blank 53) greater than 4% opacity is usually due to excessive dust accumulation on the optical surfaces, electronic drift or an electronic/mechanical offset of the data recorder. Excessive dust on the optical surfaces sufficient to cause a significant zero error would be indicated by the difference in the internal and external zero values and/or window alarm. Instrument span error (Blank 55) may be caused by the same problem(s) that cause zero errors and may be identified in a similar fashion.

If the zero and span errors are due to a data recorder offset, both errors will be in the same direction and will be of the same magnitude

(continued on next page)

The external zero displayed on the control unit panel meter (AW) also indicates the level of dust accumulation on the zero retroreflector and transceiver measurement window. The difference between the internal and external zero responses should equal the amount of dust found on the transceiver optics (Blank 57). To convert the zero responses to a value that represents lens dusting in percent opacity, use the following equation.

Meter response in % opacity = 6.25 [(Blank 13) - (Blank 12)]

Optical Alignment Check

When the transceiver and retroreflector are misaligned, a portion of the measurement beam that should be returned to the measurement detector is misdirected, resulting in a positive bias in the data reported by the COMS. One of the most common causes of misalignment is vibration which may cause the on-stack components to shift slightly on the instrument mounting flanges. Another common cause of misalignment is thermal expansion and contraction of the structure on which the transmissometer is mounted. If the COMS is being audited while the unit is off-line (cold stack), the results of the alignment analysis may not be representative of the alignment of the instrument when the stack or duct is at normal operating temperature. When checking the alignment, the reflected light beam should be centered.

Zero Compensation Check

The Zero Compensation Check should be performed and documented as such in (Blank 21a).

Annual Zero Alignment Error Check

The Zero Alignment Error Check is performed once each year. It verifies that the enegy output from the simulated zero device (Window Check) is within 2% of the Clear Path reading. The values required for this check are documented in (Blank 21b). If the difference between the Clear Path Value and the Simulated Zero (Window Check) value differ by more than 2%, then the COMS unit is considered Out Of Control. If the difference is 2% or less, then the Window Check Value is adjusted to match the Clear Path value.

Optical Surface Dust Accumulation Check

The results of the dust accumulation check (Blank 58) should not exceed 4%. A dust accumulation value of more than 4% opacity indicates that the air flow of the purge system and/or the cleaning frequency of the optical surfaces are inadequate. When determining the optical surface dust accumulation, the auditor should note whether the effluent opacity is relatively stable (within +2% opacity) before and after cleaning the optical surfaces. If the effluent opacity is fluctuating by more that +2%, the dust accumulation analysis should be omitted.

(continued on next page)

Calibration Error

Calibration error results (Blanks 68, 69 and 70) in excess of +3% are indicative of a non-linear or miss calibrated instrument. However, the absolute calibration accuracy of the monitor can be determined only when the instrument clear-path zero value is known. If the zero and span data are out-of-specification, the calibration error data will often be biased in the direction of the zero and span errors. Even if the zero and span data indicate that the COMS is calibrated properly, the monitor may still be inaccurate due to error in the clear-path zero adjustment. The optimum calibration procedure involves using neutral density filters during clear-stack or off-stack COMS calibration. This procedure would establish both the absolute calibration accuracy and linearity of the COMS. If this procedure is impractical, and it is reasonable to assume that the clear-path zero is set correctly, the monitor's calibration can be set using either the neutral density filters or the internal zero and span values.

Appendix A
COMS Audit Data Forms for the Durag Model D-R 290

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Company: Primary Energy
Unit ID: Stack 201
Auditor: Dan Bowles
Attendees: N/A
Transceiver serial number: 1248342
Reflector serial number: 1248145
Remote serial number 1248283
Date: 1/8/2021

City, ST: E. Chicago, IN
Representing: Monitoring Solutions
Representing:

COMS Flange to Flange distance (Feet / Inches): 226.125"

Preliminary Data

1	Inside diameter at Stack Exit = Lx	216.000 inches
2	Inside diameter at the Transmissometer location = Lt	216.000 inches
3	Calculated Stack Correction Factor (SCF) = Lx/Lt	1.000
4	Source-cited Stack Correction Factor (SCF)	1.000
5	Source-cited zero automatic calibration value (% opacity)	0.00 %
6	Source-cited span automatic calibration value (% opacity)	40.00 %

[START AT CONTROL UNIT / DATA RECORDER LOCATION]

(If required) [INSPECT DATA RECORDING SYSTEM AND MARK WITH "OPACITY AUDIT," AUDITOR'S NAME, AFFILIATION, DATE, SOURCE, PROCESS UNIT/STACK IDENTIFICATION, AND THE TIME OF DAY.]

Error codes / faults	YES - or - NO
7 Blower [Loss of purge air from blower - Error 100, 300]	NO
8 Filter [Air filter restriction - Error 200, 400]	NO
9 Window [Excessive dirt on transceiver window - Error 001]	NO
10 Fault [Additional CEMS fault has occurred. Note fault code on Opacity display and consult the instrument manual.]	NO

Instrument Range Check

11	Instrument range setting	100 %

Zero Check

12	Opacity Display - Internal zero value in "milliamps" (Zero Point Check) [Wait for 1½ minutes for automatic change to external zero mode.]	4.00 mA
13	Opacity Display - Zero calibration value in "milliamps" (Window Check)	4.00 mA
14	Opacity data recorder zero calibration value in "% Op" (Window Check) [Wait 1½ minutes for automatic change to span mode.]	0.00 mA

Span Check

15	Opacity Display - Span calibration value in "milliamps" (Span Check)	10.40 mA
16	Opacity data recorder span calibration value in "% Op" (Span Check)	40.00 %

[Go to reflector location.]

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Reflector Dust Accumulation Check

17 Pre-cleaning effluent opacity (% Op) 3.6 %
[Inspect and clean optical surface.]

18 Post-cleaning effluent opacity (% Op) 3.5 %
[Go to transceiver location.]

Transceiver Dust Accumulation Check and Zero Compensation Check

19 Pre-cleaning effluent opacity (% Op) 3.5 %
[Inspect and clean optical window and zero mirror.]

20 Post-cleaning effluent opacity (% Op) 2.9 %

Optical Alignment Check

[LOOK THROUGH ALIGNMENT SIGHT AND DETERMINE IF BEAM IMAGE IS CENTERED.]

21 Is the image centered? YES - or - NO: YES

Zero Compensation Check

21a Did you comply with the Zero Compensation Check? YES - or - NO: YES

Annual Zero Alignment Error Check

21b Did you comply with the Annual Zero Alignment Error Check? YES - or - NO: NO

Zero Alignment Error Check results (if applicable):

Clear Path Value % = N/A Window Check Value % = N/A Zero Alignment Error % = N/A

[Record audit filter data.]

Filter	Serial NO.	% Opacity	SCF%
22 LOW	YL05	17.40	17.40 %
23 MID	YX58	24.40	24.40 %
24 HIGH	ZQ15	42.90	42.90 %

[Remove the audit filters from the protective covers, inspect, and clean each filter]

[Set the unit up to display the initial zero. Wait 3 minutes to allow opacity data recorder to record initial zero]

[Insert a filter, wait approximately 3 minutes, and record the opacity value reported by the opacity data recorder. Repeat the process 5 times for each filter.]

[Read and transcribe final calibration error data from the opacity data recorder on the next page]

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

25 ZERO 0.00

	LOW		MID		HIGH		(If Required) ZERO
26	17.20	27	24.10	28	42.50	29	N/A
30	17.20	31	24.10	32	42.60	33	N/A
34	17.30	35	24.10	36	42.60	37	N/A
38	17.30	39	24.10	40	42.60	41	N/A
42	17.30	43	24.10	44	42.60	45	0.00

[Six-minute average data, if applicable.]

	ZERO		LOW		MID		HIGH		(If Required) ZERO
46	0.00	47	17.30	48	24.10	49	42.70	50	0.00

Reserved Area

Calculation of Audit Results

Stack Correction Factor correlation error (%):

51 $$\left[\frac{Blank\ 4 - Blank\ 3}{Blank\ 3}\right]^{\frac{1.000}{1.000}} \times 100 = 0.00$$

Zero Error (% Op.):

52 Opacity Display $6.25 * (\text{Blank } 13^{4.00} - 4.0) - \text{Blank } 5^{0.00} = 0.00\ \%$

53 Opacity Data Recorder $\text{Blank } 14^{0.00} - \text{Blank } 5^{0.00} = 0.00$

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Span Error (% Op.):

54	Opacity Display	10.40 (((Blank 15 - 4.0) ÷ 16) ×	100 Blank 11) -	40.00 Blank 6	=	0.00	%
55	Opacity Data Recorder	40 Blank 16	-	40 Blank 6	=	0.00	

Optical Surface Dust Accumulation (% OP):

56	Retroreflector	3.6 Blank 17	-	3.5 Blank 18	=	0.10	%
57	Transceiver	3.5 Blank 19	-	2.9 Blank 20	=	0.60	%
58	Total	0.1 Blank 56	+	0.6 Blank 57	=	0.70	%

Optical Path Length Correction (SCF)
Audit Filters Corrected for Path Length:

59 LOW: 17.40 1.000

$$1 - (1 - (\frac{Blank\ 22}{100})^{Blank\ 4})\ x\ 100$$ = 17.40 %

60 MID: 24.40 1.000

$$1 - (1 - (\frac{Blank\ 23}{100})^{Blank\ 4})\ x\ 100$$ = 24.40 %

61 HIGH 42.90 1.000

$$1 - (1 - (\frac{Blank\ 24}{100})^{Blank\ 4})\ x\ 100$$ = 42.90 %

AUDIT DATA SHEET
MONITORING SOLUTIONS DURAG D-R 290 COMS

Auditor: Dan Bowles Date: 01/08/21
Source: Primary Energy Unit: Stack 201

PARAMETER		Blank No.	Audit Results	Specifications
Error Codes/Faults				
Blower failure		7	NO	NO
Filter Blockage		8	NO	NO
Window		9	NO	NO
Fault		10	NO	NO
SCF Correlation Error		51	0.00	+/- 2% Op
Internal Zero Error	Display	52	0.00	+/- 4% Op
	Data	53	0.00	+/- 4% Op
Internal Span Error	Display	54	0.00	+/- 4% Op
	Data	55	0.00	+/- 4% Op
Optical Alignment Analysis		21	YES	YES = Centered
Zero Compensation Check		21a	YES	YES = Complied With
Zero Alignment Error		21b	N/A	≤ 2% Op
Optical Surface Dust Accumulation				
Retroreflector		56	0.10	≤ 2% Op
Transceiver		57	0.60	≤ 2% Op
Total		58	0.70	≤ 4% Op
Calibration Error Analysis				
Arithmetic Mean Difference				
	LOW	62	-0.14	
		71a	-0.10	
	MID	63	-0.30	
		72a	-0.30	
	HIGH	64	-0.32	
		73a	-0.20	
Confidence Coeffecient				
		65	0.07	
		66	0.00	
		67	0.06	
Calibration Error				
		68	0.21	≤ 3% Op
		69	0.30	≤ 3% Op
		70	0.38	≤ 3% Op

Revision: March, 2016

OPACITY LOW FILTER AUDIT
Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 1/8/2021

LOW FILTER RUN	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Difference^2
		RM	(X_i)	X_i^2
1	17.20	17.40	-0.20	0.0400
2	17.20	17.40	-0.20	0.0400
3	17.30	17.40	-0.10	0.0100
4	17.30	17.40	-0.10	0.0100
5	17.30	17.40	-0.10	0.0100

n = 5

t(0.975) = 2.776

Mean Ref. Method Value	**17.4000**	*RM*
Sum of Differences	**-0.7000**	*Xi*
Arithmetic Mean Difference	**-0.1400**	*Xi ave*
Sum of Differences Squared	**0.1100**	*Xi^2*
Standard Deviation	**0.0548**	*sd*
2.5% Error Conf.Coef	**0.0680**	*CC*
Calibration Error	**0.2080**	*percent*

OPACITY MID FILTER AUDIT
Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 1/8/2021

MID FILTER RUN	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Difference^2
		RM	(X_i)	X_i^2
1	24.10	24.40	-0.30	0.0900
2	24.10	24.40	-0.30	0.0900
3	24.10	24.40	-0.30	0.0900
4	24.10	24.40	-0.30	0.0900
5	24.10	24.40	-0.30	0.0900

n = 5

t(0.975) = 2.776

Mean Ref. Method Value	**24.4000**	***RM***
Sum of Differences	**-1.5000**	***Xi***
Arithmetic Mean Difference	**-0.3000**	***Xi ave***
Sum of Differences Squared	**0.4500**	***Xi^2***
Standard Deviation	**0.0000**	***sd***
2.5% Error Conf.Coef	**0.0000**	***CC***
Calibration Error	**0.3000**	***percent***

OPACITY HIGH FILTER AUDIT
Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 1/8/2021

HIGH FILTER RUN	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Difference^2
		RM	(X_i)	X_i^2
1	42.50	42.90	-0.40	0.1600
2	42.60	42.90	-0.30	0.0900
3	42.60	42.90	-0.30	0.0900
4	42.60	42.90	-0.30	0.0900
5	42.60	42.90	-0.30	0.0900

n = 5

t(0.975) = 2.776

Mean Ref. Method Value	**42.9000**	***RM***
Sum of Differences	**-1.6000**	***Xi***
Arithmetic Mean Difference	**-0.3200**	***Xi ave***
Sum of Differences Squared	**0.5200**	***Xi^2***
Standard Deviation	**0.0447**	***sd***
2.5% Error Conf.Coef	**0.0555**	***CC***
Calibration Error	**0.3755**	***percent***

Scans Report

01/08/2021	OPACITY, %	
10:16		
10:16:00	0.0	MOS
10:16:02	0.0	MOS
10:16:04	0.0	MOS
10:16:06	0.0	MOS
10:16:08	0.0	MOS
10:16:10	0.0	MOS
10:16:12	0.0	MOS
10:16:14	0.0	MOS
10:16:16	0.0	MOS
10:16:18	0.0	MOS
10:16:20	0.0	MOS
10:16:22	0.0	MOS
10:16:24	0.0	MOS
10:16:26	0.0	MOS
10:16:28	0.0	MOS
10:16:30	0.0	MOS
10:16:32	0.0	MOS
10:16:34	0.0	MOS
10:16:36	0.0	MOS
10:16:38	0.0	MOS
10:16:40	0.0	MOS
10:16:42	0.0	MOS
10:16:44	0.0	MOS
10:16:47	0.0	MOS
10:16:49	0.0	MOS
10:16:51	0.0	MOS
10:16:53	0.0	MOS
10:16:55	0.0	MOS
10:16:57	0.0	MOS
10:16:59	0.0	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:17		
10:17:01	0.5	MOS
10:17:03	5.2	MOS
10:17:05	9.9	MOS
10:17:07	15.8	MOS
10:17:09	18.8	MOS
10:17:11	18.8	MOS
10:17:13	18.8	MOS
10:17:15	18.8	MOS
10:17:17	18.8	MOS
10:17:19	18.8	MOS
10:17:21	18.8	MOS
10:17:23	18.8	MOS
10:17:25	18.8	MOS
10:17:27	18.8	MOS
10:17:29	18.8	MOS
10:17:31	18.8	MOS
10:17:33	18.8	MOS
10:17:35	18.7	MOS
10:17:37	14.0	MOS
10:17:39	9.3	MOS
10:17:41	4.6	MOS
10:17:43	0.0	MOS
10:17:45	0.0	MOS
10:17:47	0.0	MOS
10:17:49	0.0	MOS
10:17:51	0.0	MOS
10:17:53	0.0	MOS
10:17:55	0.0	MOS
10:17:57	0.0	MOS
10:17:59	0.0	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %
10:18	
10:18:01	0.0 MOS
10:18:03	0.0 MOS
10:18:05	0.0 MOS
10:18:07	0.0 MOS
10:18:09	0.0 MOS
10:18:11	0.0 MOS
10:18:13	13.6 MOS
10:18:15	29.3 MOS
10:18:17	39.4 MOS
10:18:19	48.4 MOS
10:18:21	34.7 MOS
10:18:23	18.9 MOS
10:18:25	8.7 MOS
10:18:27	0.0 MOS
10:18:29	0.0 MOS
10:18:31	0.0 MOS
10:18:33	0.0 MOS
10:18:35	0.0 MOS
10:18:37	0.0 MOS
10:18:39	0.0 MOS
10:18:41	0.7 MOS
10:18:43	5.1 MOS
10:18:45	9.5 MOS
10:18:47	15.0 MOS
10:18:49	17.2 MOS
10:18:51	17.2 MOS
10:18:53	17.2 MOS
10:18:55	17.2 MOS
10:18:57	17.2 MOS
10:18:59	17.2 MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:19		
10:19:01	17.2	MOS
10:19:03	17.2	MOS
10:19:05	17.2	MOS
10:19:07	17.2	MOS
10:19:09	17.2	MOS
10:19:11	15.5	MOS
10:19:13	15.4	MOS
10:19:15	17.1	MOS
10:19:17	18.8	MOS
10:19:19	22.3	MOS
10:19:21	24.1	MOS
10:19:23	24.1	MOS
10:19:25	24.1	MOS
10:19:28	24.1	MOS
10:19:30	24.1	MOS
10:19:32	24.1	MOS
10:19:34	24.1	MOS
10:19:36	24.1	MOS
10:19:38	24.1	MOS
10:19:40	24.1	MOS
10:19:42	24.1	MOS
10:19:44	24.1	MOS
10:19:46	21.3	MOS
10:19:48	24.1	MOS
10:19:50	28.7	MOS
10:19:52	33.3	MOS
10:19:54	39.3	MOS
10:19:56	42.5	MOS
10:19:58	42.5	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %
10:20	
10:20:00	42.5 MOS
10:20:02	42.5 MOS
10:20:04	42.5 MOS
10:20:06	42.5 MOS
10:20:08	42.5 MOS
10:20:10	42.5 MOS
10:20:12	42.5 MOS
10:20:14	42.5 MOS
10:20:16	39.9 MOS
10:20:18	30.3 MOS
10:20:20	24.0 MOS
10:20:22	17.6 MOS
10:20:24	13.1 MOS
10:20:26	17.2 MOS
10:20:28	17.2 MOS
10:20:30	17.2 MOS
10:20:32	17.2 MOS
10:20:34	17.2 MOS
10:20:36	17.2 MOS
10:20:38	17.2 MOS
10:20:40	17.2 MOS
10:20:42	17.3 MOS
10:20:44	17.2 MOS
10:20:46	17.2 MOS
10:20:48	17.2 MOS
10:20:50	17.2 MOS
10:20:52	16.4 MOS
10:20:54	15.5 MOS
10:20:56	16.8 MOS
10:20:58	18.5 MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:21		
10:21:00	21.0	MOS
10:21:02	24.1	MOS
10:21:04	24.1	MOS
10:21:06	24.1	MOS
10:21:08	24.0	MOS
10:21:10	24.1	MOS
10:21:12	24.0	MOS
10:21:14	24.1	MOS
10:21:16	24.1	MOS
10:21:18	24.1	MOS
10:21:20	24.1	MOS
10:21:22	24.1	MOS
10:21:24	19.6	MOS
10:21:26	24.0	MOS
10:21:28	28.7	MOS
10:21:30	33.3	MOS
10:21:32	41.3	MOS
10:21:34	42.6	MOS
10:21:36	42.6	MOS
10:21:38	42.6	MOS
10:21:40	42.6	MOS
10:21:42	42.6	MOS
10:21:44	42.6	MOS
10:21:46	42.6	MOS
10:21:48	42.6	MOS
10:21:50	42.6	MOS
10:21:52	37.4	MOS
10:21:54	30.6	MOS
10:21:56	24.2	MOS
10:21:58	17.9	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %
10:22	
10:22:00	16.8 MOS
10:22:02	17.3 MOS
10:22:04	17.3 MOS
10:22:06	17.3 MOS
10:22:08	17.3 MOS
10:22:11	17.3 MOS
10:22:13	17.3 MOS
10:22:15	17.3 MOS
10:22:17	17.3 MOS
10:22:19	17.3 MOS
10:22:21	17.3 MOS
10:22:23	17.3 MOS
10:22:25	17.3 MOS
10:22:27	15.9 MOS
10:22:29	15.3 MOS
10:22:31	17.1 MOS
10:22:33	18.7 MOS
10:22:35	23.4 MOS
10:22:37	24.1 MOS
10:22:39	24.1 MOS
10:22:41	24.0 MOS
10:22:43	24.0 MOS
10:22:45	24.1 MOS
10:22:47	24.1 MOS
10:22:49	24.1 MOS
10:22:51	24.1 MOS
10:22:53	24.1 MOS
10:22:55	24.1 MOS
10:22:57	24.1 MOS
10:22:59	20.9 MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:23		
10:23:01	24.4	MOS
10:23:03	30.2	MOS
10:23:05	34.8	MOS
10:23:07	42.6	MOS
10:23:09	42.6	MOS
10:23:11	42.6	MOS
10:23:13	42.6	MOS
10:23:15	42.6	MOS
10:23:17	42.6	MOS
10:23:19	42.6	MOS
10:23:21	42.6	MOS
10:23:23	42.6	MOS
10:23:25	40.0	MOS
10:23:27	31.7	MOS
10:23:29	25.4	MOS
10:23:31	18.0	MOS
10:23:33	15.4	MOS
10:23:35	17.3	MOS
10:23:37	17.3	MOS
10:23:39	17.3	MOS
10:23:41	17.3	MOS
10:23:43	17.3	MOS
10:23:45	17.3	MOS
10:23:47	17.3	MOS
10:23:49	17.3	MOS
10:23:51	17.3	MOS
10:23:53	17.3	MOS
10:23:55	16.0	MOS
10:23:57	15.7	MOS
10:23:59	17.8	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:24		
10:24:01	19.5	MOS
10:24:03	23.6	MOS
10:24:05	24.1	MOS
10:24:07	24.1	MOS
10:24:09	24.1	MOS
10:24:11	24.1	MOS
10:24:13	24.1	MOS
10:24:15	24.1	MOS
10:24:17	24.1	MOS
10:24:19	24.1	MOS
10:24:21	22.5	MOS
10:24:23	27.1	MOS
10:24:25	31.7	MOS
10:24:27	36.4	MOS
10:24:29	42.6	MOS
10:24:31	42.6	MOS
10:24:33	42.6	MOS
10:24:35	42.6	MOS
10:24:37	42.6	MOS
10:24:39	42.6	MOS
10:24:41	42.6	MOS
10:24:43	42.6	MOS
10:24:45	42.6	MOS
10:24:47	42.6	MOS
10:24:49	42.6	MOS
10:24:51	34.8	MOS
10:24:54	27.0	MOS
10:24:56	20.6	MOS
10:24:58	12.8	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:25		
10:25:00	15.8	MOS
10:25:02	17.3	MOS
10:25:04	17.3	MOS
10:25:06	17.3	MOS
10:25:08	17.3	MOS
10:25:10	17.3	MOS
10:25:12	17.3	MOS
10:25:14	17.3	MOS
10:25:16	17.3	MOS
10:25:18	15.1	MOS
10:25:20	16.6	MOS
10:25:22	18.3	MOS
10:25:24	20.5	MOS
10:25:26	24.1	MOS
10:25:28	24.1	MOS
10:25:30	24.1	MOS
10:25:32	24.1	MOS
10:25:34	24.1	MOS
10:25:36	24.1	MOS
10:25:38	24.1	MOS
10:25:40	24.1	MOS
10:25:42	24.1	MOS
10:25:44	24.1	MOS
10:25:46	21.5	MOS
10:25:48	15.3	MOS
10:25:50	19.0	MOS
10:25:52	23.6	MOS
10:25:54	30.9	MOS
10:25:56	41.6	MOS
10:25:58	42.6	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:26		
10:26:00	42.6	MOS
10:26:02	42.6	MOS
10:26:04	42.6	MOS
10:26:06	42.6	MOS
10:26:08	42.6	MOS
10:26:10	42.6	MOS
10:26:12	42.6	MOS
10:26:14	42.6	MOS
10:26:16	40.0	MOS
10:26:18	31.9	MOS
10:26:20	25.6	MOS
10:26:22	17.6	MOS
10:26:24	16.6	MOS
10:26:26	17.3	MOS
10:26:28	17.3	MOS
10:26:30	17.3	MOS
10:26:32	17.3	MOS
10:26:34	14.4	MOS
10:26:36	16.4	MOS
10:26:38	18.0	MOS
10:26:40	19.5	MOS
10:26:42	23.7	MOS
10:26:44	23.8	MOS
10:26:46	24.0	MOS
10:26:48	24.1	MOS
10:26:50	18.7	MOS
10:26:52	23.3	MOS
10:26:54	27.9	MOS
10:26:56	32.6	MOS
10:26:58	42.5	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

01/08/2021	OPACITY, %	
10:27		
10:27:00	42.6	MOS
10:27:02	42.6	MOS
10:27:04	42.6	MOS
10:27:06	42.6	MOS
10:27:08	37.3	MOS
10:27:10	26.5	MOS
10:27:12	15.8	MOS
10:27:14	5.0	MOS
10:27:16	0.0	MOS
10:27:18	0.0	MOS
10:27:20	0.0	MOS
10:27:22	0.0	MOS
10:27:24	0.0	MOS
10:27:26	0.0	MOS
10:27:28	0.0	MOS
10:27:30	0.0	MOS
10:27:32	0.0	MOS
10:27:35	0.0	MOS
10:27:37	0.0	MOS
10:27:39	0.0	MOS
10:27:41	0.0	MOS
10:27:43	0.0	MOS
10:27:45	0.0	MOS
10:27:47	0.0	MOS
10:27:49	0.0	MOS
10:27:51	0.0	MOS
10:27:53	0.0	MOS
10:27:55	0.0	MOS
10:27:57	0.0	MOS
10:27:59	0.0	MOS

Status Code Definitions

MOS = MONITOR OUT OF SERVICE

OPACITY FILTER AUDIT
* 6-minute Averages *
Accuracy Determination

Primary Energy | E. Chicago, IN | Stack 201 | 1/8/2021

6 Minute Averages	Opacity Output from Recording Device	Audit Filter Value Corrected for Path Length (SCF)	(FILTER-MONITOR) Difference	Opacity Error
		RM	(Xi)	
ZERO	0.00	0.00	0.00	**0.00**
LOW	17.30	17.40	-0.10	**0.10**
MID	24.10	24.40	-0.30	**0.30**
HIGH	42.70	42.90	-0.20	**0.20**
ZERO	0.00	0.00	0.00	**0.00**

Primary Energy Coke

Opacity Report

Created on : Jan 08, 2021 11:44:43

East Chicago, IN

01/08/2021 - 01/08/2021

01/08/2021

STACK 201

Hour	Minutes 0 - 5	Minutes 6 - 11	Minutes 12 - 17	Minutes 18 - 23	Minutes 24 - 29	Minutes 30 - 35	Minutes 36 - 41	Minutes 42 - 47	Minutes 48 - 53	Minutes 54 - 59
0	3.4 SVC	3.4 SVC	3.6 SVC	3.6 SVC	3.4 SVC	3.4 SVC	3.2 SVC	3.4 SVC	3.5 SVC	3.5 SVC
1	3.6 SVC	3.7 SVC	3.6 SVC	3.6 SVC	3.4 SVC	3.5 SVC	3.4 SVC	3.4 SVC	3.3 SVC	3.4 SVC
2	3.3 SVC	3.4 SVC	3.3 SVC	3.4 SVC	3.4 SVC	3.3 SVC	3.4 SVC	3.5 SVC	3.2 SVC	3.4 SVC
3	3.2 SVC	3.4 SVC	3.3 SVC	3.4 SVC	3.4 SVC	3.6 SVC	3.4 SVC	3.4 SVC	3.4 SVC	3.4 SVC
4	3.3 SVC	3.3 SVC	3.4 NSA	3.6 SVC	3.4 SVC	3.4 SVC	3.4 SVC	3.4 SVC	3.5 SVC	3.4 SVC
5	3.5 SVC	3.6 SVC	3.4 SVC	3.4 SVC	3.5 SVC	3.4 SVC	3.2 SVC	3.3 SVC	3.2 SVC	3.5 SVC
6	3.2 SVC	3.2 SVC	3.4 SVC	3.4 SVC	3.3 SVC	3.3 SVC	3.4 SVC	3.5 SVC	3.5 SVC	3.4 SVC
7	3.5 SVC	3.5 SVC	3.4 SVC	3.4 SVC	3.3 SVC	3.3 SVC	3.5 SVC	3.2 SVC	3.4 SVC	3.4 SVC
8	3.2 SVC	3.1 SVC	3.2 SVC	3.4 SVC	3.4 SVC	3.2 SVC	3.2 SVC	3.3 SVC	3.2 SVC	3.3 SVC
9	3.3 SVC	3.3 SVC	3.3 SVC	3.3 SVC	3.3 SVC	3.4 SVC	3.4 SVC	3.2 SVC	3.1 SVC	3.4 SVC
10	3.7 NSA	3.3 MOS	3.4 MOS	23.1 MOS	15.1 MOS	0.0 MOS	4.3 MOS	17.3 MOS	17.6 MOS	24.1 MOS
11	24.1 MOS	39.9 MOS	42.7 MOS	19.5 MOS	0.0 MOS	0.6 MOS	1.7 NSA			

Status Code Definitions

MOS = MONITOR OUT OF SERVICE NSA = NO SAMPLE AVAILABLE SVC = MONITOR IN SERVICE

The average OPACITY, % period average for the day was 3.4 % for 99 periods of valid data.

The Fan was in operation for 117 periods

The maximum OPACITY, % period average for the day was 3.7 %

There were 18 periods of invalid data

APPENDIX B
AUDIT FILTER CERTIFICATION SHEETS

Monitoring Solutions

Leaders in Environmental Monitoring Systems & Services

4404 Guion Rd., Indianapolis, Indiana 46254 Tel: 317.856.9400

REPORT OF CERTIFICATION OF NEUTRAL DENSITY AUDIT FILTERS

Date of Filter Certification: **August 29, 2020**
Date of Filter Expiration: **Febuary 28, 2021** **Filter Set - E**

Audit Device / Filter Slot Angle of Incidence **10** Degrees
Path-Length Correction **1.000** (Straight Stack)

Table 1: Individual Filter Certification Data

Serial Number	Opacity Value (%)	Transmittance (%)	Previous Opacity (%)	Change in Opacity (%)
VJ84	8.3	91.7	8.3	0.0
YL05	17.4	82.6	17.4	0.0
YX58	24.4	75.6	24.3	0.1
ZQ15	42.9	57.1	43.2	0.3
YF64	59.0	41.0	58.9	0.1
YF67	86.7	13.3	86.5	0.2

J. T. Updaudt Jr.

Laboratory-Based Transmissometer Operator

See second page for Instrument Information and Details of Certification

Monitoring | Solutions
Leaders in Environmental Monitoring Systems & Services
4440 S. High School Rd., Suite D, Indianapolis, Indiana 46241 Tel: 317.856.9400

REPORT OF CERTIFICATION OF NEUTRAL DENSITY AUDIT FILTERS

- **Calibration of Laboratory-Based Transmissometer**

  Instrument:
  Durag Model 290
  Transceiver S/N 414847, Reflector S/N 412508, Remote S/N 414861
  Reference Material:
  Primary Filters calibrated as specified in section 7.1.(2)(i) of Pt. 60, App. B, spec.1 of a nominal luminous transmittance of 50, 70, and 90 percent.

- **Description of Certification** (Pt. 60, App. B, Spec. 1, 7.2(i)(ii)(iii))
  Conduct the secondary attenuator calibration using a laboratory-based transmissometer calibrated as follows:
  Use at least three primary filters of nominal luminous transmittance 50, 70, and 90 percent, calibrated as specified in section 7.1(2)(i),to calibrate the laboratory-based transmissometer. Determine and record the slope of the calibration line using linear regression through zero opacity. The slope of the calibration line must be between 0.99 and 1.01 and the laboratory-based transmissometer reading for each primary filter must not deviate by more than +/- 2 percent from the linear regression line.
  Immediately following the laboratory-based transmissometer calibration, insert the secondary attenuators and determine and record the percent effective opacity value per secondary attenuator from the calibration curve (linear regression line).
  Recalibrate the secondary attenuators semi-annually if they are used for the required calibration error test.

ATTACHMENT 3

2020 Annual Compliance Certification

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

256239

March 31, 2021

Via UPS

Indiana Department of Environmental Management
Compliance and Enforcement Branch
Office of Air Quality
100 N. Senate Avenue
Mail Code 61-53, IGCN 1003
Indianapolis, IN 46204 - 2251

RE: Cokenergy, LLC – 2020 Annual Compliance Certification
Part 70 Permit No. T089-41033-00383

To Whom It May Concern:

In accordance with section B.9 of the subject permit and 326 IAC 2-7-6(5), we have enclosed the Annual Compliance Certification for the Cokenergy, LLC facility.

If you have any questions concerning this report, please contact Luke Ford, Primary Energy Director EH&S, at (219) 397-4626.

Sincerely,

Seth Acheson
General Manager
Cokenergy, LLC

Enclosure

File: X:\\615.1

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR MANAGEMENT
COMPLIANCE AND ENFORCEMENT SECTION
PART 70 OPERATING PERMIT
CERTIFICATION

Source Name: Cokenergy LLC

Source Address: 3210 Watling Street, MC 2-991, East Chicago, Indiana 46312-1610

Part 70 Permit No.: T089-41033-00383

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.

Please check what document is being certified:

☒ Annual Compliance Certification Letter

☐ Test Result (specify) _____

☐ Report (specify) _____

☐ Notification (specify) _____

☐ Affidavit (specify) _____

☐ Other (specify) _____

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Signature: Seth Acheson

Printed Name: Seth Acheson

Title/Position: General Manager, Cokenergy, LLC

Phone: (219) 397-4521

Date: March 31, 2012

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE BRANCH
100 North Senate Avenue
MC 61-53 IGCN 1003
Indianapolis, IN 46204-2251

Cokenergy, LLC

PART 70 / FESOP PERMIT- ANNUAL COMPLIANCE CERTIFICATION

This form can be used to satisfy the annual compliance certification requirements for Part 70 sources under 326 IAC 2-7-5, 326 IAC 2-7-6(5)(C) and FESOP sources under 326 IAC 2-8-5(a)(1)(C).

SOURCE INFORMATION					
(1) Source name:	Cokenergy, LLC				
(2) Source address:	3210 Watling Street MC 2-991				
(3) City:	East Chicago	(4) State:	IN	(5) Zip code:	46312
(6) Mailing address (if different from above):					
(7) Mailing City:		(8) State:	IN	(9) Zip code:	46312
(10) Permit numbers:	089-41033-00383	(11) Reporting Period:		1/1/2020 – 12/31/2020	
(12) Contact person:	Luke Ford	(13) Email Address:		lford@primaryenergy.com	
(14) Phone number:	219-397-4626	(15) Fax number:		219-397-8313	
(16) Comments:					

SOURCE COMPLIANCE INFORMATION	
(17) CHECK THE BOX NEXT TO EITHER (A) OR (B) BELOW. (The terms "continuous compliance" and "intermittent compliance" are defined on the Definitions page).	
(A) This source was in **CONTINUOUS COMPLIANCE** with **all of the permit terms and conditions** that impose a work practice or emission standard or requires performance testing, monitoring, record keeping or reporting based on the monitoring methods in the permit.	X
(B) This source was in **CONTINUOUS COMPLIANCE** with **all of the permit terms and conditions** that impose a work practice or emission standard or requires performance testing, monitoring, record keeping or reporting based on the monitoring methods in the permit, **except** for the terms and conditions listed in the following table for which the source reported intermittent compliance.	

IMPORTANT: If you select option (B), you must complete the following table in which you list any permit terms for which compliance was intermittent during the permit for the reporting period covered by this Compliance Certification.

(18) PERMIT TERMS FOR WHICH COMPLIANCE WAS INTERMITTENT

Source Name: Cokenergy, LLC		**Source Permit Number:** 089-41033-00383	
Permit Term/ Condition	**Description of Permit Condition**	***Method Codes**	**Report Date/Comments**
NA			

*Method Codes:

Monitoring methods: CEMS = continuous emissions monitoring system; COMS = continuous opacity monitoring system; ST = stack test; VE = visible emissions; RK = record keeping; RR = review of records; MB = mass balance; EF = emissions factor: Insp = inspections; FA = fuel analysis; WP = work practice; PM = parametric monitoring; Calc = calculations; O = other (specify in Comments)

For Part 70 sources: The submittal by the Permittee requires the certification by the "responsible official" as defined by 326 IAC 2-7-1(34).
For FESOP sources: The notification which shall be submitted by the Permittee requires the certification by the "authorized individual" as defined by 326 IAC 2-1.1-1(1).

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.			
Signature:		Title/Position:	General Manager
Printed Name:	Seth Acheson	Date:	March 31, 2021
Phone number:	219-397-4521	Email Address:	sacheson@primaryenergy.com

PLEASE NOTE: YOU MUST EITHER SIGN THIS FORM OR ATTACH THE CERTIFICATION FORM INCLUDED IN YOUR PERMIT.

LUKE FORD
219-397-4626
COKENERGY
3210 WATLING STREET
EAST CHICAGO IN 46312

2 LBS PAK 1 OF 1
DWT: 17,13,1

SHIP TO:
ELIZABETH A. ZLATOS
(317) 232-8603
IDEM OFFICE OF LEGAL COUNSEL
MC-60-01, IGCN 1307
100 NORTH SENATE AVENUE
INDIANAPOLIS IN 46204

IN 461 9-01

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