CONTINUOUS EMISSIONS MONITORING SYSTEM
RELATIVE ACCURACY TEST AUDIT DETERMINATION

Performed At
USG-Otsego Paper, Inc.
USG-Otsego Facility
EUTURBINE1 (North – Unit 24)
EUTURBINE2 (South – Unit 25)
Otsego, Michigan

Test Dates
May 16 and 17, 2023

Report No.
TRC Environmental Corporation Report 525974A

Report Submittal Date
June 19, 2023

TRC Environmental Corporation
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Report Certification

I certify that to the best of my knowledge:

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

Gavin Lewis
Project Manager

June 19, 2023
Date

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

Bruce Randall
TRC Emission Testing Technical Director

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CONTINUOUS EMISSIONS MONITORING SYSTEM
RELATIVE ACCURACY TEST AUDIT DETERMINATION

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) performed an oxide of nitrogen (NO_x) and oxygen (O_2) relative accuracy test audit (RATA) determination of the continuous emission monitoring system (CEMS) associated with the natural gas fired combustion turbines EUTURBINE1 (North-Unit 24) and EUTURBINE2 (South-Unit 25) on May 16 and 17, 2023 at the USG-Otsego Paper, Inc. facility located in Otsego, Michigan. The tests were authorized by and performed for USG-Otsego Paper, Inc.

This test program was performed to demonstrate compliance with Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. MI-ROP-A0023-2019b. The test program was conducted according to the TRC Test Protocol 525974 dated February 27, 2023.

1.1 Project Contact Information

Participants		
Test Facility	USG-Otsego Paper, Inc. USG-Otsego Facility 320 N. Farmer Street Otsego, Michigan 49078	Franklin Knowles Environmental Compliance Supervisor 269-384-6351 (phone) fkonowles@usg.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 207C Eisenhower Lane South Lombard, Illinois 60148	Gavin Lewis Project Manager 219-613-0163 (phone) glewis@trccompanies.com

The tests were coordinated through Franklin Knowles, Environmental Compliance Supervisor, of Otsego Paper and conducted by Anthony sakellariou and Gavin Lewis of TRC. Documentation of the on-site ASTM D7036-04 Qualified Individual(s) (QI) can be found in the appendix to this report.

2.0 FACILITY DESCRIPTION

Otsego Paper, Inc is a subsidiary of the United States Gypsum Company. The facility manufactures gypsum paper.

The Otsego Paper facility produces electricity from two (2) Mars gas turbines. Turbine 1 is a Mars T-15000 gas turbine and Turbine 2 is a Mars T-16000 designated as EUTURBINE1 and EUTURBINE2, with a maximum heat input rate of 141.5 million British thermal unit per hour (MMBtu/hr) on EUTURBINE1 and a maximum heat input rate of 150.8 MMBtu/hr on EUTURBINE2 at low temperature operating conditions as measured on a higher heating value (HHV) basis. Energy is generated at the combustion turbine by drawing in ambient air by means of burning fuel and expanding the hot combustion gases in the turbine. The hot exhaust gases of each turbine are directed to a multi-pressure ABCO heat recovery steam generator (HRSG). There are also natural gas-fired duct burners associated with each HRSG and coupled to a turbine, designated as EUDUCTBURNER1 and EUDUCTBURNER2, respectively.

The facility has one paper machine, No. 1 Paper Machine (EUPAPERMACHINE1), used to produce paper from 100 percent recycle stock and corrugated material. The paper machine has three fourdriniers and is capable of producing a triple ply sheet.

Plant capacity for base load operations is 11 megawatts (MW) for each turbine and 160,000 pounds per hour (lb/hr) of steam for each HRSG.

EUTURBINE1 and EUTURBINE2 each have a maximum heat input rate of 141.5 MMBtu/hr at low temperature operating conditions.

3.0 SUMMARY OF RESULTS

3.1 CEMS RATA Test Matrix

Location	Parameter	Reference Methods (RM)	No. of Test Runs	Test Run Length (min)
EUTURBINE1 (Unit 24)	NO_X	7E, 3A	10	21
	O_2	3A	10	21
EUTURBINE2 (Unit 25)	NO_X	7E, 3A	10	21
	O_2	3A	10	21

3.2 CEMS RATA Results

EUTURBINE1 (Unit 24)						
			Performance Specifications (40CFR75)		CEMS Performance	
Load (MW)	Parameter	Units	Semi-Annual	Annual	Relative Accuracy	Bias Adjustment Factor
~10.3	NO_X	lb/MMBtu	7.5% < RA ≤ 10.0%	RA ≤ 7.5%	3.97 %	1.000

			Performance Specifications (40CFR60)		CEMS Performance
Load (MW)	Parameter	Units	Specification No.	Acceptance Criteria	Relative Accuracy
~10.3	NO_X	ppmvd @ 15% O_2	2	RA ≤ 20%	4.28 %
	O_2	%	3	RA ≤ 1.0% difference for %O_2	0.05 %

EUTURBINE2 (Unit 25)						
			Performance Specifications (40CFR75)		CEMS Performance	
Load (MW)	Parameter	Units	Semi-Annual	Annual	Relative Accuracy	Bias Adjustment Factor
~10.9	NO_X	lb/MMBtu	7.5% < RA ≤ 10.0%	RA ± 0.015 lb/MMBtu [1]	0.011 lb/MMBtu	1.111

			Performance Specifications (40CFR60)		CEMS Performance
Load (MW)	Parameter	Units	Specification No.	Acceptance Criteria	Relative Accuracy
~10.9	NO_X	ppmvd @ 15% O_2	2	RA ≤ 10% of applicable standard of 42 ppmvd	7.46 %
	O_2	%	3	RA ≤ 1.0% difference for %O_2	0.01 %

[1] The performance specification based on the difference between CEMS and RM mean values may be used for: NOx when the mean RM value during the RATA is ≤0.200 lb/MMBtu.

Based on the above summary of results, the facility CEMS passed the RATA. The complete test results from this program are tabulated in Section 7.0

4.0 DISCUSSION OF RESULTS

The data acquisition and handling system (DAHS) computer printout for the same time periods as TRC's reference method (RM) testing was used to determine the relative accuracy (RA) of the CEMS. The watches of the test crew were synchronized with the facility's CEM system prior to the commencement of and during each test run. A minimum of nine (9) RATA runs, each 21-minutes in duration, were performed at each turbine unit location while operating greater than 50% of maximum load. The CEMS RATA data, comprised of twenty-one (21) minutes of data points for each test run, was provided to TRC by the facility.

Source operation appeared normal during the entire test program. Each turbine was operated near base load during the RATA.

Data collected from the O_2 and NO_x analyzers were averaged for each test run. A standard fuel factor of 8,710 dscf/MMBtu was used to calculate the NO_x emission rates on a pound per million Btu basis (lb/MMBtu) following the guidelines of USEPA Method 19.

5.0 TEST PROCEDURES

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

5.1 Determination of the Concentration of Gaseous Pollutants

Concentrations of the pollutants in the following sub-sections were determined using one sampling system. The number of points at which sample was collected was determined in accordance with 40CFR75 Appendix A, Section 6.5.6. Sampling was performed at three points (16.7%, 50%, and 83.3%) across one diameter of each turbine exhaust stack.

A straight-extractive sampling system was used. A data logger continuously recorded pollutant concentrations and generated one-minute averages of those concentrations. All calibrations and system checks were conducted using USEPA Protocol gases. Three-point linearity checks were performed prior to sampling, and in the event of a failing system bias or drift test (and subsequent corrective action). System bias and drift checks were performed using the low-level gas and either the mid- or high-level gas prior to and following each test run.

The Low Concentration Analyzers (those that routinely operate with a calibration span of less than 20 ppm) used by TRC are ambient-level analyzers. Per Section 3.12 of Method

7E, a Manufacturer's Stability Test is not required for ambient-level analyzers. Analyzer interference tests were conducted in accordance with the regulations in effect at the time that TRC placed an analyzer model in service.

5.1.1 O_2 Determination by USEPA Method 3A

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

5.1.2 NO_X Determination by USEPA Method 7E

This method is applicable for the determination of NO_X concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The NO_X analyzer used a photomultiplier tube to measure the light emitted from the chemiluminescent decomposition of NO_2. A NO_x converter efficiency test was performed on site. The results show the NO_x analyzer passed. Results are appended.

5.1.3 Determination of F-Factors by USEPA Method 19

This method is applicable for the determination of the pollutant emission rate using oxygen (O_2) concentrations and the appropriate F factor (the ratio of combustion gas volumes to heat inputs) and the pollutant concentration. The appropriate F-Factor was selected from Table 19-2 of Method 19.

6.0 QUALITY ASSURANCE PROCEDURES

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

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

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

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

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

7.0 TEST RESULTS SUMMARIES

RATA Type: **Nitrogen Oxides (NO_X), lb/MMBtu**
Regulation: **40CFR75**
RM Used: **3A, 7E**

Customer:	USG-Otsego Paper	Project #:	525974
Unit ID:	EUTURBINE1 (North-U24)	CEM Model:	Horiba/CMA-EC622
Sample Loc:	Stack	CEM Serial #:	41678240071

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X lb/MMBtu	CEM NO_X lb/MMBtu	(RM-CEM) Difference (di)
1	1	5/16/2023	7:48	8:08	0.029	0.029	0.000
1	2	5/16/2023	8:22	8:42	0.028	0.028	0.000
1	3	5/16/2023	8:53	9:13	0.028	0.029	-0.001
1	4	5/16/2023	9:25	9:45	0.028	0.029	-0.001
1	5	5/16/2023	9:57	10:17	0.028	0.029	-0.001
1	6	5/16/2023	10:28	10:48	0.028	0.029	-0.001
1	7	5/16/2023	11:03	11:23	0.028	0.029	-0.001
0	8	5/16/2023	11:36	11:56	0.027	0.029	-0.002
1	9	5/16/2023	12:09	12:29	0.028	0.029	-0.001
1	10	5/16/2023	12:45	13:05	0.028	0.029	-0.001

n	9	
t(0.025)	2.306	
Mean RM Value	0.028	RM avg
Mean CEM Value	0.029	CEM avg
Sum of Differences	-0.007	di
Mean Difference	-0.0008	d avg
Sum of Differences^2	0.000	di^2
Standard Deviation	0.000	sd
Confidence Coefficient	0.000	CC
RA based on RM	3.97	%
Bias Adjustment Factor	1.000	BAF

RATA Type: **Nitrogen Oxides (NO_X), ppmvd at** **15% Oxygen**
Regulation: **40CFR60**
RM Used: **7E**

Customer:	USG-Otsego Paper	Project #:	525974
Unit ID:	EUTURBINE1 (North-U24)	CEM Model:	Horiba/CMA-EC622
Sample Loc:	Stack	CEM Serial #:	41678240071

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X ppmvd at 15% Oxygen	CEM NO_X ppmvd at 15% Oxygen	(RM-CEM) Difference (di)
1	1	5/16/2023	7:48	8:08	7.8	7.8	0.022
1	2	5/16/2023	8:22	8:42	7.5	7.7	-0.212
1	3	5/16/2023	8:53	9:13	7.5	7.8	-0.270
1	4	5/16/2023	9:25	9:45	7.5	7.8	-0.305
1	5	5/16/2023	9:57	10:17	7.5	7.8	-0.257
1	6	5/16/2023	10:28	10:48	7.5	7.8	-0.268
1	7	5/16/2023	11:03	11:23	7.6	7.8	-0.169
0	8	5/16/2023	11:36	11:56	7.4	7.8	-0.375
1	9	5/16/2023	12:09	12:29	7.5	7.8	-0.349
1	10	5/16/2023	12:45	13:05	7.5	7.8	-0.326

n	9	
t(0.975)	2.306	
Mean RM Value	7.544	RM avg
Mean CEM Value	7.782	CEM avg
Sum of Differences	-2.134	di
Mean Difference	-0.237	d avg
Sum of Differences^2	0.606	di^2
Standard Deviation	0.112	sd
Confidence Coefficient	0.086	CC
RA based on RM	4.28	%

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

Customer:	USG-Otsego Paper	Project #:	525974
Unit ID:	EUTURBINE1 (North-U24)	CEM Model:	Horiba/CMA-EC622
Sample Loc:	Stack	CEM Serial #:	41678240071

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM O_2 % v/v dry	CEM O_2 % v/v dry	(RM-CEM) Difference (di)
1	1	5/16/2023	7:48	8:08	15.6	15.7	-0.070
1	2	5/16/2023	8:22	8:42	15.6	15.6	-0.037
1	3	5/16/2023	8:53	9:13	15.6	15.6	-0.046
1	4	5/16/2023	9:25	9:45	15.6	15.6	-0.035
1	5	5/16/2023	9:57	10:17	15.6	15.6	-0.036
1	6	5/16/2023	10:28	10:48	15.6	15.7	-0.051
1	7	5/16/2023	11:03	11:23	15.6	15.7	-0.059
1	8	5/16/2023	11:36	11:56	15.6	15.7	-0.080
0	9	5/16/2023	12:09	12:29	15.6	15.7	-0.089
1	10	5/16/2023	12:45	13:05	15.6	15.7	-0.080

n	9
t(0.975)	2.306
Mean RM Value	15.600 RM avg
Mean CEM Value	15.655 CEM avg
Mean Difference	-0.055 d avg
Standard Deviation	0.018 sd
Confidence Coefficient	0.014 CC
RA based on RM	0.44 %
RA (Absolute Mean Difference)	0.05 % vol diff.

RATA Type: **Nitrogen Oxides (NO_X), lb/MMBtu**
Regulation: **40CFR75**
RM Used: **3A, 7E**

Customer:	USG-Otsego Paper				Project #:	525974	
Unit ID:	EUTURBINE2 (South-U25)				CEM Model:	Horiba/CMA-EC622	
Sample Loc:	Stack				CEM Serial #:	41678240073	
Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X lb/MMBtu	CEM NO_X lb/MMBtu	(RM-CEM) Difference (di)
1	1	5/17/2023	8:00	8:20	0.052	0.041	0.011
1	2	5/17/2023	8:35	8:55	0.052	0.041	0.011
1	3	5/17/2023	9:07	9:27	0.052	0.042	0.010
1	4	5/17/2023	9:41	10:01	0.053	0.042	0.011
1	5	5/17/2023	11:42	12:02	0.055	0.043	0.012
1	6	5/17/2023	12:17	12:37	0.055	0.043	0.012
1	7	5/17/2023	12:48	13:08	0.055	0.044	0.011
1	8	5/17/2023	13:20	13:40	0.055	0.044	0.011
0	9	5/17/2023	13:54	14:14	0.056	0.044	0.012
1	10	5/17/2023	14:28	14:48	0.056	0.045	0.011

n	9	
t(0.025)	2.306	
Mean RM Value	0.054	RM avg
Mean CEM Value	0.043	CEM avg
Sum of Differences	0.100	di
Mean Difference	0.0111	d avg
Sum of Differences^2	0.001	di^2
Standard Deviation	0.001	sd
Confidence Coefficient	0.000	CC
Alternative for Low Emitters	0.011	lb/MMBtu
Bias Adjustment Factor	1.111	BAF

RATA Type: **Nitrogen Oxides (NO_X), ppmvd at** **15% Oxygen**
Regulation: **40CFR60**
RM Used: **7E**

Customer:	USG-Otsego Paper	Project #:	525974
Unit ID:	EUTURBINE2 (South-U25)	CEM Model:	Horiba/CMA-EC622
Sample Loc:	Stack	CEM Serial #:	41678240073

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM NO_X ppmvd at 15% Oxygen	CEM NO_X ppmvd at 15% Oxygen	(RM-CEM) Difference (di)
1	1	5/17/2023	8:00	8:20	14.1	11.1	3.005
1	2	5/17/2023	8:35	8:55	14.1	11.2	2.881
1	3	5/17/2023	9:07	9:27	14.2	11.3	2.911
1	4	5/17/2023	9:41	10:01	14.4	11.4	2.998
1	5	5/17/2023	11:42	12:02	14.9	11.7	3.173
1	6	5/17/2023	12:17	12:37	14.9	11.8	3.115
1	7	5/17/2023	12:48	13:08	15.1	12.0	3.147
1	8	5/17/2023	13:20	13:40	15.0	12.0	3.048
1	9	5/17/2023	13:54	14:14	15.2	12.0	3.172
0	10	5/17/2023	14:28	14:48	15.3	12.2	3.114

n	9	
t(0.975)	2.306	
Mean RM Value	14.656	RM avg
Mean CEM Value	11.606	CEM avg
Sum of Differences	27.450	di
Mean Difference	3.050	d avg
Sum of Differences^2	83.819	di^2
Standard Deviation	0.110	sd
Confidence Coefficient	0.084	CC
RA based on AES of 42 ppmvd at	7.46	%

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

Customer:	USG-Otsego Paper	Project #:	525974
Unit ID:	EUTURBINE2 (South-U25)	CEM Model:	Horiba/CMA-EC622
Sample Loc:	Stack	CEM Serial #:	41678240073

Use? 1 = Y 0 = N	Test Run	Date	Start Time	End Time	RM O_2 % v/v dry	CEM O_2 % v/v dry	(RM-CEM) Difference (di)
1	1	5/17/2023	8:00	8:20	15.6	15.6	0.041
1	2	5/17/2023	8:35	8:55	15.6	15.5	0.070
1	3	5/17/2023	9:07	9:27	15.5	15.5	-0.025
1	4	5/17/2023	9:41	10:01	15.5	15.5	-0.029
1	5	5/17/2023	11:42	12:02	15.5	15.5	-0.019
1	6	5/17/2023	12:17	12:37	15.5	15.5	-0.027
1	7	5/17/2023	12:48	13:08	15.5	15.5	0.001
1	8	5/17/2023	13:20	13:40	15.5	15.5	-0.028
1	9	5/17/2023	13:54	14:14	15.6	15.5	0.083
0	10	5/17/2023	14:28	14:48	15.5	15.5	-0.022

n	9
t(0.975)	2.306
Mean RM Value	15.533 RM avg
Mean CEM Value	15.526 CEM avg
Mean Difference	0.007 d avg
Standard Deviation	0.045 sd
Confidence Coefficient	0.035 CC
RA based on RM	0.27 %
RA (Absolute Mean Difference)	0.01 % vol diff.