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A COMPLIANCE AIR EMISSIONS TEST REPORT
CARBON MONOXIDE AND VOLATILE ORGANIC COMPOUNDS

Performed At The
Otsego Paper, Inc.
Otsego Facility – South Turbine Unit
EUTURBINE2 and EUDUCTBURNER2
Otsego, Michigan

Test Dates
April 16 and 17, 2014

Report No.
TRC Environmental Corporation Report 214112B

Report Submittal Date
May 15, 2014

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

T (312) 533-2042
F (312) 533-2070

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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).

Paul Coleman
Project Manager

Nizar Hindi
Principal Consultant

May 15, 2014
Date

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

Jeffrey W. Burdette
TRC Air Measurements Technical Director

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1.0 INTRODUCTION

TRC Environmental Corporation (TRC) performed a compliance air test program to verify emission rates of volatile organic compounds (VOC) and carbon monoxide (CO) at the south turbine unit (EUTURBINE2) including the natural gas-fired duct burner associated with a heat recovery steam generator and coupled to the tunrbine (EUDUCTBURNER2) operating at the Otsego Paper, Inc. facility located in Otsego, Michigan. The tests were authorized by and performed for Otsego Paper, Inc.

The purpose of this test program was to determine CO and VOC emission rates at EUTURBINE2 without the natural gas-fired duct burner, and also while EUDUCTBURNER2 was on and in operation.

This test program was performed on April 16 and 17, 2014 to demonstrate compliance with Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. MI-ROP-A0023-2013 and the CAIR Ozone Nitrogen Oxide Budget Permit No. MI-NOO-55799-2013 in Appendix 9 of the ROP.

1.1 Project Contact Information

Participants		
Test Facility	Otsego Paper, Inc. Otsego Facility 320 N. Farmer Street Otsego, Michigan 49078	Gary Roys Environmental Compliance Manager 269-384-6345 (phone) groys@usg.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Benigno Cacao Field Team Leader 312-533-2042 (phone) bcacao@trcsolutions.com
State Representative	MDEQ Kalamazoo District Office 7953 Adobe Road Kalamazoo, Michigan 49009	Dale Turton, P.E. 269-567-3554 (phone) turtond@michigan.gov

The tests were coordinated through Mr. Gary Roys, Environmental Compliance Manager, of Otsego Paper and conducted by Ryan Novosel, Chris Miller and Benigno Cacao of TRC. Mr. Dale Turton of Michigan Department of Environmental Quality (MDEQ) observed the testing. 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 T-15000 gas turbines, designated as EUTURBINE1 and EUTURBINE2, with a maximum heat input rate of 141.5 million British thermal unit per hour (MMBtu/hr) 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

The results of this test program are summarized in the table below and appear to be well within the allowable permit limits. The detailed test results are presented in Section 7.0 and within the Appendix.

Unit ID	Pollutant Tested		Measured Emissions	Permitted Emission Limit
EUTURBINE2 (South)	CO	lb/hr	0.17	---
		ton/year	0.76	74.2 ton/year
		lb/MMBtu	0.002	---
	VOC as Propane*	lb/hr	0.00	---
		ton/year	0.00	1.3 ton/year
		lb/MMBtu	0.000	---
EUDUCTBURNER2 (South)	CO	lb/hr	1.52	---
		ton/year	6.64	37.3 ton/year
		lb/MMBtu	0.007	---
	VOC as Propane*	lb/hr	0.00	---
		ton/year	0.00	9.6 ton/year
		lb/MMBtu	0.000	---

*Note: VOC concentration less than zero are presented as zero value for VOC emission rate.

The table below summarizes the test methods used, as well as the number and duration of each test run:

Unit ID/ Sample Location	Parameter Measured	Test Method	No. of Runs	Run Duration
EUTURBINE2 and EUDUCTBURNER2	Volumetric Flow rate	USEPA 1-4	4	--
	Carbon Monoxide	USEPA 10 and 19	3	60 min
	VOC	USEPA 25A and 19	3	60 min

4.0 DISCUSSION OF RESULTS

No problems were encountered with the testing equipment during the test program. The operation of the south turbine unit appeared normal during the entire test program and operated within 90% of maximum load.

Volumetric flow rates used to determine CO and VOC emission rates are the average of volumetric flow traverses performed before and after each test at the EUTURBINE2 and EUDUCTBURNER2 test conditions.

Data collected from the CO and VOC analyzers were averaged for each test run. The emission rates were calculated as pounds per hour (lb/hr) and tons per year (ton/year). Also, a standard fuel factor of 8,710 dscf/MMBtu was used to calculate the CO and VOC emission rates on a pound per million Btu basis (lb/MMBtu) following the guidelines of USEPA Method 19.

5.0 SAMPLING AND ANALYSIS 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 Sample Point Locations by USEPA Method 1

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

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

5.2 Volumetric Flow Rate Determination by USEPA Method 2

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

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

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

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

A straight-extractive sampling system was used. A data logger was used which continuously recorded pollutant concentrations and generated one-minute averages of those concentrations. All calibrations and system checks were conducted using USEPA Protocol 1 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.

5.3.1 CO_2 Determination by USEPA Method 3A

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

5.3.2 O_2 Determination by USEPA Method 3A

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

5.3.3 CO Determination by USEPA Method 10

This method is applicable for the determination of CO concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations. The non-dispersive infrared analyzer (NDIR) CO analyzer was equipped with an internal gas correlation filter wheel, which eliminates potential detector interference. As such, use of an interference removal trap was not required.

5.4 Moisture Determination by USEPA Method ALT-008

This method is an approved alternative to USEPA Method 4 for the determination of stack gas moisture content using midget impingers. A gas sample was extracted at a constant rate from the source. Moisture was removed from the sample stream by a series of pre-weighed impingers immersed in an ice bath.

5.5 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.

5.6 Total Organic Concentration Determination by USEPA Method 25A

This method is applicable for the determination of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane.

A gas sample was extracted from the source through a heated sample line and glass fiber filter to a flame ionization analyzer (FIA). If necessary, a source-specific response factor was developed for the FIA.

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:

- Louisiana Environmental Lab Accreditation Program (LELAP) accreditation;
- Interim accreditation from the Stack Testing Accreditation Council (STAC) that our operations conform with the requirements of ASTM D 7036-04

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.

7.0 TEST RESULTS SUMMARY

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Instrumental Reference Method
Calibration Corrected Test Data

Project Number:	214112	Start Date:	4/16/14
Customer:	Otsego Paper, Inc.	End Date:	4/16/14
Unit Identification:	EUTURBINE2 (South)	Facility:	Otsego Facility
Sample Location:	Stack	Recorded by:	Ben Cacao
RM Probe Type:	Extractive (Dry)	Fc Factor:	-
Load Level/Condition:	> 90 %	Fd Factor:	8710

Reference Method Results, As Measured Moisture Basis						
Run #	Date	Start Time	End Time	CO ppmvd	CO_2 % v/v dry	O_2 % v/v dry
1	4/16/14	15:00	15:59	0.6	2.9	16.0
2	4/16/14	16:33	17:32	0.5	2.9	16.0
3	4/16/14	18:05	19:04	0.6	2.9	16.0
Average				0.6	2.9	16.0

Emission Rate Calculation Summary				
Run #	CO lb/MMBtu	CO lb/hr	Flow DSCFM	CO tons/year
1	0.002	0.17	72,243	0.76
2	0.001	0.17	72,633	0.76
3	0.002	0.18	73,021	0.77
Average	0.002	0.17	72,632	0.76

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Method 25A Test Results Summary

Project Number: 214112
Customer: Otsego Paper, Inc.
Unit Identification: EUTURBINE2 (South)
Test Date(s): 04/16/14
Facility: Otsego Facility
Recorded by: Ben Cacao

Location	Stack			
Test Run No.	1	2	3	Average
Test Date	4/16/2014	4/16/2014	4/16/2014	
Test Time - Start	15:00	16:33	18:05	
Test Time - End	15:59	17:32	19:04	
VOC (ppmvw as Propane)	-0.07	-0.08	-0.08	-0.08
Volumetric Flow Rate (scfm)	76,552	76,914	77,158	76,874
VOC (lb/hr)* as Propane	0.00	0.00	0.00	0.00
Moisture Content (%)	0.055	0.058	0.054	0.056
O_2 (% dry)	16.00	16.00	16.00	16.00
F_d	8710	8710	8710	8710
VOC - F_d Basis (lb/MMBTU)*	0.000	0.000	0.000	0.000
VOC (tons/year as Propane)*	0.00	0.00	0.00	0.00

*Note: Negative value result presented as zero value for VOC emission value.

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Instrumental Reference Method
Calibration Corrected Test Data

Project Number:	214112	Start Date:	4/17/14
Customer:	Otsego Paper, Inc.	End Date:	4/17/14
Unit Identification:	EUDUCTBURNER2 (South)	Facility:	Otsego Facility
Sample Location:	Stack	Recorded by:	Ben Cacao
RM Probe Type:	Extractive (Dry)	Fc Factor:	-
Load Level/Condition:	> 90 %	Fd Factor:	8710

Reference Method Results, As Measured Moisture Basis						
Run #	Date	Start Time	End Time	CO ppmvd	CO_2 % v/v dry	O_2 % v/v dry
1	4/17/14	7:32	8:31	5.2	4.9	12.3
2	4/17/14	8:58	9:57	4.6	5.0	12.3
3	4/17/14	10:25	11:24	4.3	5.0	12.2
Average				4.7	5.0	12.3

Emission Rate Calculation Summary				
Run #	CO lb/MMBtu	CO lb/hr	Flow DSCFM	CO tons/year
1	0.008	1.69	74,587	7.40
2	0.007	1.48	74,096	6.50
3	0.007	1.37	73,357	6.02
Average	0.007	1.52	74,013	6.64

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Method 25A Test Results Summary

Project Number:	214112	Test Date(s):	04/17/14
Customer:	Otsego Paper, Inc.	Facility:	Otsego Facility
Unit Identification:	EUDUCTBURNER2 (South)	Recorded by:	Ben Cacao

Location	Stack			
Test Run No.	1	2	3	Average
Test Date	4/17/2014	4/17/2014	4/17/2014	
Test Time - Start	7:32	8:58	10:25	
Test Time - End	8:31	9:57	11:24	
VOC (ppmvw as Propane)	-0.05	-0.15	-0.22	-0.14
Volumetric Flow Rate (scfm)	82,093	81,582	80,754	81,476
VOC (lb/hr as Propane)*	0.00	0.00	0.00	0.00
Moisture Content (%)	0.091	0.092	0.092	0.092
O_2 (% dry)	12.30	12.30	12.20	12.27
F_d	8710	8710	8710	8710
VOC - F_d Basis (lb/MMBTU)*	0.000	0.000	0.000	0.000
VOC (tons/year as Propane)*	0.00	0.00	0.00	0.00

*Note: Negative value result presented as zero value for VOC emission value.