AIRTECH
Environmental
Services Inc.

Report on the Air Emissions Test Program

Conducted for Environmental Resource Management
at the White Pigeon Paper Facility Located at
15781 River Street
White Pigeon, Michigan

Report No. 5820
April 7, 2016

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MICHIGAN DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT
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RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Natural Resources and Environment, Air Quality Division upon request.

Source Name: White Pigeon Paper Company — County: St. Joseph

Source Address: 15781 River St. — City: White Pigeon

AQD Source ID (SRN): B2024 — ROP No.: MI-ROP-B2024-2015 — ROP Section No.:

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From Jan 2016 To June 2016

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

Stack Testing Report for Boiler #3

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Paul Stofer	Mill Manager	269-464-5037
Name of Responsible Official (print or type)	Title	Phone Number
Paul Stofer		4-12-16
Signature of Responsible Official		Date

* Photocopy this form as needed.

EQP 5736 (Rev 2-10)

Project Overview

General

Airtech Environmental Services Inc. (Airtech) was contracted by White Pigeon Paper Company to perform an air emissions test program at their facility located at 15781 River Street, White Pigeon, Michigan. The specific objective of this test program was to determine the concentration of carbon dioxide and oxygen (CO_2/O_2), nitrogen oxides (NO_X), and carbon monoxide (CO) from the exhaust of one (1), natural gas fired boiler, designated as Boiler #3.

Testing was performed on March 1, 2016. Coordinating the field portion of the test program were:

Matt Kwiatkowski – Environmental Resources Management Michigan, Inc.
Paul Stofer – White Pigeon Paper
Alex Webster – Airtech Environmental Services Inc.

Methodology

EPA Methods 3A, 7E, and 10 were used to determine the concentrations of CO_2/O_2, NO_X, and CO. In EPA Methods 3A, 7E, and 10, a sample of the gas stream was continuously withdrawn from the test location and analyzed using a temporary Reference Method (RM) monitoring system. Sample gas was withdrawn from the test location at a constant rate through a stainless steel probe, a glass fiber filter, and Teflon sample line. The probe, filter and sample line were operated at a temperature of approximately 250°F to prevent the condensation of moisture. The sample gas then passed through a gas cooler system designed to unobtrusively lower the dewpoint of the sample gas to 35°F, thus removing the moisture. The dry gas was then vented to the CO_2/O_2, NO_X, and CO analyzers.

In order to convert the NO_X and CO concentrations to mass emission rates, the volumetric flow rate through the test location was determined using EPA Methods 1, 2, 3A and 4. Three (3), sixty (60) minute test runs were performed at the test location. Results for CO_2/O_2 are expressed in units of percent (%) on a dry volume basis. Results for NO_X and CO are reported in units of parts per million volume dry (ppmv), pounds per million British thermal units (lb/mmBtu) and in units of pounds per hour (lb/hr).

Parameters

The following parameters were determined at the test location:

- gas velocity
- gas temperature
- moisture content
- oxygen concentration
- carbon monoxide concentration
- nitrogen oxides concentration
- carbon dioxide concentration

Results

A complete summary of test results is presented in Table 1 on Page 4.

Prepared by:

Cathy Busse, Technical Writer

Reviewed by:

Roy Slick, Test Leader

Summary of Results

Table 1 – Summary of Results

Test Parameters	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	3/1/2016	3/1/2016	3/1/2016	
Start Time	9:19	10:32	11:45	
Stop Time	10:19	11:32	12:45	
Gas Conditions				
Temperature (°F)	340	347	341	**342**
Volume Metered Standard, $V_{m(std)}$ (ft^3)	42.67	42.15	40.91	
Volumetric Flow Rate (acfm)	25,300	26,700	24,600	**25,500**
Volumetric Flow Rate (scfm)	16,600	17,400	16,200	**16,700**
Volumetric Flow Rate (dscfm)	14,300	14,800	13,700	**14,300**
Carbon Dioxide (% dry)	8.50	8.58	8.59	**8.56**
Oxygen (% dry)	6.44	6.44	6.33	**6.40**
Moisture (%)	14.2	15.1	15.1	**14.8**
Fuel Factor, Fc	1,040	1,040	1,040	
Pollutant Results				
Nitrogen Oxides Concentration (ppmdv)	31.8	32.7	31.8	**32.1**
Nitrogen Oxides Emission rate (lb/mmBtu)	0.0465	0.0473	0.0460	**0.0466**
Nitrogen Oxides Emission rate (lb/hr)	3.26	3.46	3.13	**3.28**
Carbon Monoxide Concentration (ppmdv)	3.67	3.35	3.32	**3.45**
Carbon Monoxide Emission Rate (lb/mmBtu)	0.00326	0.00295	0.00292	**0.00304**
Carbon Monoxide Emission Rate (lb/hr)	0.228	0.216	0.199	**0.215**

Test Procedures

Method Listing

The following EPA test methods were referenced for the test program. These methods can be found in 40 CFR Part 60 Appendix A and Part 51 Appendix M.

Method 1	Sample and velocity traverse for stationary sources
Method 2	Determination of stack gas velocity and volumetric flow rate (type S pitot tube)
Method 3A	Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (Instrumental Analyzer Procedure)
Method 4	Determination of moisture content in stack gases
Method 7E	Determination of nitrogen oxides emissions from stationary sources (Instrumental Analyzer Procedure)
Method 10	Determination of carbon monoxide emissions from stationary sources (Instrumental Analyzer Procedure)
Method 19	Determination of sulfur dioxide removal efficiency and particulate matter, sulfur dioxide, and nitrogen oxides emission rates

Method Descriptions

Method 1

Method 1 was used to determine the suitability of the test location and to determine the sample points used for the particulate concentration determinations. The test location conformed to the minimum requirements of being located at least 2.0 diameters downstream and at least 0.5 diameters upstream from the nearest flow disturbance.

The Boiler 3 test location was a round, vertical stack with a diameter of 53.5 inches. Eight points were sampled for each of the two test ports. The test location was approximately 4.8 diameters downstream and approximately 13.0 diameters upstream from the nearest flow disturbances. A cross section of the sampling location, showing the sample points, can be found in Figure 1 of the Appendix.

Method 2

Method 2 was used to determine the gas velocity through each test location using a Type-S pitot tube and an incline plane oil manometer. The values measured in Method 2, along with the measurements made in Methods 3A and 4, were used to calculate the volumetric flow rate through the test locations. A diagram of the Method 2 apparatus is shown in Figure 2 of the Appendix.

The manometer was leveled and "zeroed" prior to each test run. The sample train was leak checked before and after each run by pressurizing the positive side, or "high" side, of the pitot tube, creating a deflection on the manometer of at least three inches H_2O. The

leak check was considered valid if the manometer remained stable for 15 seconds. This procedure was repeated on the negative side by generating a vacuum of at least three inches H_2O. The velocity head pressure and gas temperature were then determined at each point specified in Method 1. The static pressure of the stack was measured using a water filled U-tube manometer. In addition, the barometric pressure was measured and recorded.

Methods 3A, 7E and 10

The CO_2/O_2, NO_X, and CO concentrations at the test location were determined using EPA Methods 3A, 7E and 10. A schematic of the sample system is shown in Figure 3 in the Appendix.

The sample gas was withdrawn from the test location at a constant rate through an in-situ 0.3 micron stainless steel cintered frit, a stainless steel probe and Teflon sample line. The sample line was operated at a temperature of 250 °F to prevent the condensation of moisture. The sample gas passed through an M & C Type EC gas cooler system. The gas cooler is designed to unobtrusively lower the dewpoint of the sample gas to 35 °F, thus removing the moisture. The dry gas was then vented to the oxygen, carbon dioxide, sulfur dioxide, nitrogen oxides and carbon monoxide analyzers. Results from these analyzers were determined on a dry basis.

The analyzers that were used for this project are listed in the table below.

Parameter	Manufacturer	Model Number	Operating Principle	Units Reported	Range used
Carbon Dioxide	Servomex	1440	Infrared	(%)	0-20.85
Oxygen	Servomex	1440	Paramagnetic	(%)	0-20.97
Nitrogen Oxides	Thermo Environmental	42C	Chemi-luminescence	(ppm)	0-49.76
Carbon Monoxide	Thermo Environmental	48C	Infrared, Gas Filter Correlation	(ppm)	0-50.04

Prior to sampling, a calibration error test was performed for each analyzer using EPA Protocol 1 gases. The zero and high-range calibration gases for each constituent was introduced directly into each analyzer. Each analyzer was then adjusted to the appropriate values. The mid-range gases were introduced to each analyzer and the measured values were then recorded. The measured values for each calibration gas were compared to the calibration gas values and the differences were less than the method requirement of two percent of the span value.

A sample system bias check was performed, by introducing the zero and mid-range calibration gases into the sampling system at the base of the probe. The gas was drawn

through the entire sampling system. The measured responses were compared to the calibration error test values to determine the bias in response due to the sampling system. In all cases, the sampling system bias was less than the method requirement of five percent of the span value. In addition, the system response time was determined by measuring the time required for each analyzer to reach 95 percent of its' high-range calibration gas value.

After each test run the instrument drift for each analyzer was determined by introducing the zero and mid-range calibration gases into the sampling system at the base of the probe. The gas was drawn through the entire sampling system. The measured responses were compared to the values from the previous test run to determine the analyzer drift. For all test runs, the analyzer drift was less than the method requirement of three percent of the span value.

Method 4

The moisture content at the test location was determined using Method 4. A known volume of sample gas was withdrawn from the source and the moisture was condensed and measured. The dry standard volume of the sample gas was then compared to the volume of moisture collected to determine the moisture content of the sample gas. A diagram of the Method 4 apparatus is shown in Figure 4 of the Appendix.

To condense the water vapor, the gas sample was passed through a series of 4 impingers. The first two condensers each contained 100 ml of water. The third condenser was empty and the fourth contained a known weight of silica gel to absorb any remaining water vapor. The volume of dry gas exiting the gas condenser system was measured with a dry gas meter. After leaving the dry gas meter, the sample stream passed through an orifice used to meter the flow rate through the sample train. The pressure drop across the orifice was measured with an incline plane, oil manometer. The gas meter reading, gas meter inlet and outlet temperatures, gas meter static pressure and pump vacuum were recorded for each sample point.

After the test run, the sample train was leak checked at the highest vacuum encountered during the test run. The tests were considered valid since the leak rate was less than 0.02 cfm. The amount of water collected in the condenser system was measured gravimetrically. The net weight gain of water was converted to a volume of wet gas and then compared to the amount of dry gas sampled to determine the moisture content.

Method 19

The equations in EPA Method 19 were used to calculate the emission rates of various pollutants from the test location in units of pounds per million British thermal units (lb/mmBtu). The calculation was based on the carbon dioxide content of the sample gas and an appropriate F factor, which is the ratio of combustion gas volumes to heat inputs.