ADVANCED INDUSTRIAL RESOURCES

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# *PERMIT (ROP) COMPLIANCE TEST REPORT*
## *NO. 9 BOILER*
## *(NORTH & SOUTH STACKS)*
## *AT*
## *ESCANABA PAPER COMPANY*
## *ESCANABA, MICHIGAN*
## *PROJECT ID: KR- 9563*

PREPARED FOR:

VERSO

**Escanaba Paper Company**

**7100 COUNTY ROAD 426**
**ESCANABA, MICHIGAN 49829**

PREPARED BY:

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Test Date:
**SEPTEMBER 1-2, 2016**

# 1.0 INTRODUCTION

## 1.1 SUMMARY OF TEST PROGRAM

The Verso Corporation operates The Escanaba Paper Company (EPC) pulp and paper mill in Escanaba, Michigan. Processes at the facility include the No. 9 Boiler. The facility is operated under the Michigan Department of Environmental Quality (MDEQ) issued Renewable Operating Permit (ROP) Number MI-ROP-A0884-2016.

Testing was conducted on the No. 9 Boiler exhaust stacks (North & South) to quantify the emissions of particulate matter (total filterable) to demonstrate compliance with the facility's ROP.

The field sampling portion of the test program was conducted on September 1-2, 2016, in accordance with the site-specific Test Plan submitted to the MDEQ. All test methods and procedures were performed by Advanced Industrial Resources, Inc. (*AIR*) in accordance with approved USEPA Methods (i.e., 40 CFR 60 Appendix A Methods 1, 2, 3a, 4, 5 and 19).

## 1.2 KEY PERSONNEL

The key personnel who coordinated the test program and their telephone numbers are:

| | |
|---|---|
| Paula LaFleur, Escanaba Paper Company | 906-233-2603 |
| Derek Stephens, *QSTI I-IV*, Advanced Industrial Resources | 404-843-2100 |
| Scott Wilson, Advanced Industrial Resources | 800-224-5007 |

# 2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

## 2.1 PROCESS & CONTROL EQUIPMENT DESCRIPTION

Escanaba Paper Company operates a pulp and paper mill in Escanaba, Michigan. Processes at the facility include the No. 9 Boiler.

The No. 9 Boiler (EU9B03) is a Babcock & Wilcox boiler rated for 250,000 pounds of steam per hour (approximately 360 million BTU per hour heat input) that provides steam for mill processes and steam turbine-generators for producing electricity. The No. 9 boiler burns primarily wood residue and natural gas, but is also permitted to burn paper cores. Emissions from the No. 9 Boiler are controlled by a multi-clone and two (2) wet scrubbers and are vented to the atmosphere from two (2) separate but identical stacks identified as the North and South stacks. The boiler utilizes an oxygen trim system to maintain optimum air to fuel ratios.

## 2.2 SAMPLING LOCATION

The sampling locations on the No. 9 Bark Boiler North and South exhaust stacks are located at least 4.3 equivalent diameters downstream from the nearest flow disturbance and at least 5.7 equivalent diameters upstream from the stack exhaust. The exhaust stacks from the No. 9 Boiler each have circular cross-sections with internal diameters of 84.0 inches. Each stack has two sampling ports oriented 90 degrees to one another in a plane perpendicular to the exhaust flow direction. A schematic diagram of the sampling locations is presented in Appendix D. Twenty-four (24) sampling points (twelve points per port) were used for USEPA Methods 2, 4, and 5 sampling, in accordance with USEPA Method 1 requirements.

# 3.0 SUMMARY AND DISCUSSION OF TEST RESULTS

## 3.1 OBJECTIVES

The purpose of the testing was to establish compliance with the applicable emissions limits set-forth in the facility's ROP. Because this testing was conducted simultaneously and in conjunction with Boiler MACT performance testing (for PM, Hg, HCl, and CO), testing was conducted under two (2) separate operating conditions – while firing bark and gas (Condition #1) and firing only bark (Condition #2).

## 3.2 FIELD TEST CHANGES, PROBLEMS, OR ITEMS OF NOTE

The testing was conducted in accordance with the Site-Specific Test Protocol submitted to the MDEQ. No problems were encountered during testing that required deviation from the planned test protocol.

*Items of note include the following:*

1) Condition #1 North Run 1 M5/26A post-test leak check was determined to be 0.023 cfm @ 9" Hg, exceeding the allowed leakage rate of 0.020 cfm @ maximum vacuum measured during test run. MDEQ representative on-site, observing test, approved this test run and did not require an additional test run to be conducted.

2) Condition #1 North Run 2 M5/26A isokinetics were determined to be 89.4% which is below the acceptable range of 90-110%. Sub-isokinetic sampling (< 90%) results in a theoretical over-estimation of emissions reporting; therefore, because the emissions were determined to be well the applicable emission standard, the 'Average' results reported are based on Runs 1-3.

## 3.3 PRESENTATION OF TEST RESULTS

Emission rates and concentrations are summarized and compared to referenced facility ROP limits in Table 3-1. Complete emissions data are presented in Appendix A and Reduced and tabulated data from the field-testing is included in Appendix B. The calculations and nomenclature used to reduce the data are presented in Appendix C. Actual raw field data sheets are presented in Appendix D. Laboratory reports and custody records are presented in Appendix E.

**TABLE 3-1: Permit (ROP) Compliance Results Summary - No. 9 Boiler**

| Source | Operating Condition | Pollutant | Average Measured | Allowable | Units | % of Allowable |
|---|---|---|---|---|---|---|
| No. 9 Boiler | **Condition 1** (Bark & Gas) | PM | 0.106 | 0.50 | lb/1000 lb exh. @ 50% EA | **21%** |
| | **Condition 2** (Bark only) | PM | 0.140 | 0.50 | lb/1000 lb exh @ 50% EA | **28%** |

## 3.4 PROCESS OPERATION DATA

All essential process and control device monitoring equipment was operating and data was being recorded throughout the test periods. Data collected is presented in Appendix G and includes heat input rates per fuel type, control device operating parameters and steam production rates.

# 4.0 SAMPLING AND ANALYTICAL PROCEDURES

Emission rate testing was performed on the No. 9 Power Boiler exhaust in accordance with 40 *CFR* 60 Appendix A. Specifically:

- EPA Method 1 was used for the qualification of the location of sampling ports and for the determination of the number and positions of stack traverse points, as applicable to sample traverses for Method 2.

- EPA Method 2 was employed for the determination of the stack gas velocity and volumetric flow rate during stack sampling using the Type "S" Pitot tube.

- EPA Method 3A was used for the calculation of the density and dry molecular weight of the effluent stack gas as well as to determine the oxygen and carbon dioxide concentrations using a calibrated instrumental analyzer.

- EPA Method 4 was used for the determination of moisture content.

- EPA Method 5 was used for the determination of total filterable particulate matter.

- EPA Method 19 was to determine the heat input of the boiler and was used to report the applicable emissions in the units of lbs/MMBtu.

All samples were stored upright in a closed sample box until final laboratory analysis. In order to limit the chain of custody, only essential *AIR* personnel are permitted access to these samples.

# 5.0 QUALITY ASSURANCE ACTIVITIES

The quality assurance/quality control (QA/QC) measures associated with the sampling and analysis procedures given in the noted EPA reference methodologies, in Subparts A of 40 *CFR* 60 and 40 *CFR 63*, and in the *EPA QA/QC Handbook*, Volume III (EPA 600/R-94/038c) were employed, as applicable. Such measures included, but were not limited to, the procedures detailed below.

## 5.1 PROBE NOZZLE DIAMETER CHECKS

Probe nozzles were calibrated before field testing by measuring the internal diameter of the nozzle entrance orifice along three different diameters. Each diameter was measured to the nearest 0.001 inch, and all measurements were averaged. The diameters were within the limit of acceptable variation of 0.004".

## 5.2 PITOT TUBE FACE PLANE ALIGNMENT CHECK

Before field testing, each Type S Pitot tube was examined in order to verify that the face planes of the tube were properly aligned, per Method 2 of 40 *CFR* 60, Appendix A. The external tubing diameter and base-to-face plane distances were measured in order to verify the use of 0.84 as the baseline (isolated) Pitot coefficient. At that time the entire probe assembly (i.e., the sampling probe, nozzle, thermocouple, and Pitot tube) was inspected in order to verify that its components met the interference-free alignment specifications given in EPA Method 2. Because the specifications were met, then the baseline Pitot coefficient was used for the entire probe assembly.

After field testing, the face plane alignment of each Pitot tube was checked. No damage to the tube orifices was noted.

## 5.3 METERING SYSTEM CALIBRATION

Every three months each dry gas meter (DGM) console is calibrated at five orifice settings according to Method 5 of 40 *CFR* 60, Appendix A. From the calibration data, calculations of the values of $Y_m$ and $\Delta H_@$ are made, and an average of each set of values

is obtained. The limit of total variation of $Y_m$ values is $\pm 0.02$, and the limit for $\Delta H_@$ values is $\pm 0.20$.

After field testing, the calibration of the DGM console was checked by performing three calibration runs at a single intermediate orifice setting that is representative of the range used during field-testing. Each DGM was within the limit of acceptable relative variation from $Y_m$ of 5.0%.

## 5.4 TEMPERATURE GAUGE CALIBRATION

After field testing, the temperature measuring instruments on each sampling train was calibrated against standardized mercury-in-glass reference thermometers. Each indicated temperature was within the limit of acceptable variation between the absolute reference temperature and the absolute indicated temperature of 1.5%.

## 5.5 GAS ANALYZER CALIBRATION

### 5.5.1 CALIBRATION GAS CONCENTRATION VERIFICATION

AIR obtained a certificate from the gas manufacturer and confirmed that the documentation included all information required by the Environmental Protection Agency Traceability Protocol No. 1. AIR confirmed that the manufacturer certification was complete and current and that calibration gases certifications had not expired. This documentation was available on-site for inspection during testing and is presented in Appendix E.

### 5.5.2 MEASUREMENT SYSTEM PREPARATION

*AIR* assembled, prepared, and preconditioned each measurement system by following the manufacturer's written instructions for preparing and preconditioning each gas analyzer and, as applicable, the other system components. *AIR* made all necessary adjustments to calibrate the analyzers and the data recorders and to achieve the correct sampling rate.

### 5.5.3 ANALYZER CALIBRATION ERROR

After sampling system and analyzer assembly, preparation and calibration, AIR conducted a 3-point analyzer calibration error test before the first run. AIR introduced the low-, mid-, and high-level calibration gases sequentially in direct calibration mode. During the test, AIR made no adjustments to the system except to maintain the correct flow rate. AIR recorded the analyzer's response to each calibration gas and calculated the system calibration error. At each calibration gas level (low, mid, and high) the calibration error was within ± 2.0 percent or 0.5 ppm of the calibration span.

### 5.5.4 INITIAL SYSTEM BIAS AND CALIBRATION ERROR CHECKS

Before sampling began, AIR determined that the high-level calibration gas best approximated the emissions and used it as the upscale gas. AIR introduced the upscale gas at the probe upstream of all sample conditioning components in system calibration mode. The time it took for the measured concentration to increase to a value that is within 95 percent of the certified gas concentration was recorded. AIR continued to observe the gas concentration reading until it reached a final, stable value and recorded the value.

Next, AIR introduced the low-level gas in system calibration mode and recorded the time required for the concentration response to decrease to a value that was within 5.0 percent of the certified low-range gas concentration.

AIR continued to observe the low-level gas reading until it reached a final, stable value and recorded the result. AIR operated the measurement system at the normal sampling rate during all system bias checks and made only the adjustments necessary to achieve proper calibration gas flow rates at the analyzer. From this data, AIR determined the initial system bias was less than 5% of the calibration span for the low- and high- level gases.

### 5.5.5 MEASUREMENT SYSTEM RESPONSE TIME

AIR calculated the measurement system response time from the data collected during the Initial System Bias Check.

## 5.6 INSTRUMENT INTERFENCE RESPONSE

*AIR* obtained instrument vendor data that demonstrates the interference performance specification is not exceeded as defined in EPA Method 7E Section 13.4. Documentation is provided in Appendix D.

## 5.7 DATA REDUCTION CHECKS

*AIR* ran an independent check (using a validated computer program) of the calculations with predetermined data before the field test, and the *AIR* Team Leader conducted spot checks on-site to assure that data was being recorded accurately. After the test, *AIR* checked the data input to assure that the raw data had been transferred to the computer accurately.

## 5.8 EXTERNAL QUALITY ASSURANCE

### 5.8.1 TEST PROTOCOL EVALUATION

A Site-Specific Test Protocol (SSTP) was submitted to MDEQ in advance of testing, which provided regulatory personnel the opportunity to review and comment upon the test and quality assurance procedures used in conducting this testing.

### 5.8.2 ON-SITE TEST EVALUATION

A test schedule was submitted with the Site-Specific Test Protocol and MDEQ personnel were notified of all changes in the schedule. No tests were performed earlier than stated in the original schedule. Therefore, regulatory personnel were afforded the opportunity for on-site evaluation of all test procedures.

# 6.0 DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) process is generally a seven-step iterative planning approach to ensure development of sampling designs for data collection activities that support decision making. The seven steps are as follows: (1) defining the problem; (2) stating decisions and alternative actions; (3) identifying inputs into the decision; (4) defining the study boundaries; (5) defining statistical parameters, specifying action levels, and developing action logic; (6) specifying acceptable error limits; and (7) selecting resource-effective sampling and analysis plan to meet the performance criteria. The first five steps are primarily focused on identifying qualitative criteria such as the type of data needed and defining how the data will be used. The sixth step defines quantitative criteria and the seventh step is used to develop a data collection design. In regards to emissions sampling, these steps have already been identified for typical monitoring parameters.

Monitoring methods presented in 40 *CFR* 60 Appendix A indicate the following regarding DQOs: Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods. At a minimum, each method provides the following types of information: summary of method; equipment and supplies; reagents and standards; sample collection, preservation, storage, and transportation; quality control; calibration and standardization; analytical procedures, data analysis and calculations; and alternative procedures. These test methods have been designed and tested according to DQOs for emissions testing and analysis. These test methods have been specified and were followed in accordance with the Site-Specific Test Protocol submitted to MDNRE to ensure that DQOs were met for this project.