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Report on Particulate Matter, Metal HAP, Opacity of Visible Emissions, Compliance with MACT EEEEE

Metal Technologies - RDI
Ravenna, MI

Wilcox Project# 353.14

January 16th, 2015

Prepared For:

Metal Technologies
3800 Adams Road
Ravenna, MI 49451

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EXECUTIVE SUMMARY

Wilcox Environmental Engineering, Inc. – Air Analysis Services was contracted by Metal Technologies, to sample air emissions at the Ravenna Ductile Iron (RDI) facility in Ravenna, Michigan on November 19th – 21st, 2014. The FG-MACT EEEEE was tested. The objective of the testing was to evaluate compliance with Michigan Department of Environmental Quality operating permit no. MI-ROP-N5866-2014.

FG MACT EEEEE tested to evaluate emission levels of Particulate Matter, Opacity of Visible Emissions. The pouring unit was also tested for Total Metal HAPs. The results are summarized below in Table ES-1.

Table ES-1. Emissions Results Summary – FG-MACT EEEEE

Date	Parameter	Equipment	Result	Permit Limit
11/21/2015	PM	Electric Induction Furnaces	9.72e-4 gr/dscf	5.00e-3 gr/dscf
	PM	Scrap Preheater		
11/19/2015 & 11/21/2015	PM	Pouring	7.57e-3 gr/dscf	1.0e-2 gr/dscf
11/19/2015 & 11/21/2015	Total Metal HAP	Pouring	1.24e-4 gr/dscf	8.00e-4 gr/dscf
11/19/2015	Opacity	All Units	0.00%	20%

FG-MACT EEEEE is made up of 3 processes (as described in 40 CFR 63 subpart EEEEE); Preheating (consisting of 1 natural gas-fired scrap preheater), Melting (consisting of 3 electric induction furnaces, or EIFs), and Pouring (consisting of 2 molten iron pouring stations). EEEEE stipulates a common concentration limit for Preheating and Melting (.005 gr/dscf) and a limit of .010 gr/dscf for Pouring. Since RDI's Preheating and Melting processes are exhausted through a common stack (SV-MELT-01) and they share a common limit, they were tested together and the results are presented together. The Pouring process at RDI is exhausted through a common stack (SV-SAND-02) with many other processes. The concentration of PM was tested at the exhaust point knowing that the results would include PM from other processes. This was done in order to simplify testing. If the results had come back high, additional testing would have been conducted in order to verify that the Pouring process does not emit PM in a concentration greater than allowed by EEEEE. Pouring emissions were also tested for Total Metal HAPs at RDI's request, and since EEEEE includes the option to verify compliance using Total Metal HAPs concentration (.0008 gr/dscf), the results are included in this report.

1.0 INTRODUCTION

Wilcox Environmental Engineering, Inc. (Wilcox) has prepared this source test report on behalf of Metal Technologies for submittal to the Michigan Department of Environmental Quality Air Quality Division (MDEQ AQD). This report describes the procedures, methodologies and results that demonstrate compliance with the aforementioned air permit. The testing performed is summarized below in Table 1-1.

Table 1-1. Emissions Sampling Summary

Parameter	Methods	Location
Traverse Point Determination	EPA RM 1	SV-SAND-02 & SV-MELT-01
Flow Rate / Gas Velocity	EPA RM 2	SV-SAND-02 & SV-MELT-01
Gas Determination	EPA RM 3	SV-SAND-02 & SV-MELT-01
Moisture Determination	EPA RM 4	SV-SAND-02 & SV-MELT-01
Filterable Particulate Matter	EPA RM 5	SV-SAND-02 & SV-MELT-01
Visible Emissions	EPA RM 9	All Processes
Metals Emissions	EPA RM 29	SV-SAND-02

The persons involved with testing are listed below in Table 1-2.

Table 1-2. Project Personnel

Firm	Contact	Title	Phone No.
Wilcox	Mike Murphy	Project Manager	317.472.0999
Wilcox	Taz Ziegler	Senior Technician	317.472.0999
Wilcox	Bob Willis	Technical Director	317.472.0999
Wilcox	Ernest Brummett	Project Engineer	317.472.0999
Wilcox	Mary Dunlap	Technician	317.472.0999
Metal Technologies	Dan Plant	Corporate Environmental Manager	260.920.2137
MDEQ	Jeremy Howe	Environmental Scientist	231.876.4416

2.0 FACILITY DESCRIPTION AND SOURCE INFORMATION

2.1 Facility and Process Description

Metal Technologies Ravenna Ductile Iron (RDI) facility is a ductile iron foundry specializing in high volume and high requirement castings, especially those used in safety and braking applications. An aerial view of the facility is pictured below.

Figure 2-1. Aerial View of Facility

RDI consists of several emissions sources related to melting iron, pouring iron, cleaning iron, and sand handling. 40 CFR 63 subpart EEEEE affects 3 specific processes as previously noted. These are the only processes included in this report.

3.0 SUMMARY OF EVENTS AND RESULTS

3.1 Site Test Plan & Deviation from Test Plan

The submitted protocol (see Appendix G) included additional test methods to what are included in this report. Due to severe cold weather, test equipment, specifically sampling probes and sample lines, froze repeatedly, making it impossible to complete certain tests. Other tests had to be paused and re-started multiple times. Wilcox personnel Mike Murphy and Ernest Brummett coordinated with Metal Technologies' Corporate Environmental Manager Dan Plant and MDEQ representative Jeremy Howe to select which tests to prioritize. Those are the test methods represented in this report, the remainder of the testing will be completed at a later date.

3.2 Pouring Results.

Testing was conducted in accordance with US EPA Methods 1-5, 9, and 29 to evaluate emissions from Pouring on November 19th & 21st. Results are summarized below in Table 3-1 and 3-2.

Table 3-1. Pouring – Particulate Matter Results

Stack Gas Characteristics	Run 1	Run 2	Run 3	Average
Particulate Matter (gr/dscf)	3.03E-03	9.52E-03	0.0102	7.57E-03
Opacity	0.00	0.00	0.00	0.00
Oxygen %	20.9	20.9	21.0	20.9
Carbon Dioxide %	0.00	0.00	0.00	0.00
Actual Cubic Feet / Minute	129,747	124,672	125,699	126,706
Dry Standard Cubic Feet / Minute	121,185	115,725	114,963	117,291
Avg. Stack Temp. (deg. F)	97	100	109	102
Stack Gas Velocity (feet/sec)	61.9	59.5	60.0	60.5
Avg. Velocity Head (inches)	1.15	1.05	1.05	1.08
Avg. Sq. Rt of Delta P (inches)	1.07	1.03	1.03	1.04
%Isokinetics (Vn/Vs)	98.3	98.6	98.9	98.6
% Moisture of Stack Gas	2.11	2.14	2.09	2.11
Sample Volume (cubic ft)	78.5	75.2	74.9	76.2

Table 3-2. Pouring – Metal HAPs Results

Stack Gas Characteristics	Run 1	Run 2	Run 3	Average
Total HAP Metals (gr/dscf)	3.29E-04	2.78E-05	1.47E-05	1.24E-04
Oxygen %	20.9	21.0	21.0	21.0
Carbon Dioxide %	0.00	0.00	0.00	0.00
Actual Cubic Feet / Minute	124,613	125,477	124,797	124,963
Dry Standard Cubic Feet / Minute	114,095	116,029	112,021	114,048
Avg. Stack Temp. (deg. F)	107	104	105	106
Stack Gas Velocity (feet/sec)	59.5	59.9	59.6	59.7
Avg. Velocity Head (inches)	1.04	1.06	1.03	1.04
Avg. Sq. Rt of Delta P (inches)	1.02	1.03	1.02	1.02
%Isokinetics (Vn/Vs)	98.4	96.4	98.6	97.8
% Moisture of Stack Gas	2.24	1.69	4.03	2.65
Sample Volume (cubic ft)	36.998	36.864	36.383	36.748

3.3 Melting & Preheater

Testing for Particulate Matter was conducted in accordance with US EPA Methods 1-5 on November 21st, 2014. The results are summarized below in Table 3-2.

Table 3-3. Melting & Preheater – Particulate Matter Results

Stack Gas Characteristics	Run 1	Run 2	Run 3	Average
Filterable (gr/dscf)	3.38E-04	1.25E-03	1.33E-03	9.72E-04
Opacity	0.00	0.00	0.00	0.00
Oxygen %	17.5	17.0	17.0	17.2
Carbon Dioxide %	2.00	2.00	2.00	2.00
Actual Cubic Feet / Minute	84,564	89,406	85,500	86,490
Dry Standard Cubic Feet / Minute	77,186	81,218	77,086	78,497
Avg. Stack Temp. (deg. F)	118	121	126	122
Stack Gas Velocity (feet/sec)	71.8	75.9	72.6	73.4
Avg. Velocity Head (inches)	1.50	1.66	1.51	1.56
Avg. Sq. Rt of Delta P (inches)	1.22	1.29	1.23	1.25
%Isokinetics (Vn/Vs)	100	99	101	100
% Moisture of Stack Gas	0.32	0.31	0.31	0.31
Sample Volume (cubic feet)	63.9	66.6	64.0	64.9

4.0 METHODOLOGY

The sampling procedures used by Wilcox were performed according to Title 40 CFR Part 60 Appendix A and are as follows:

Table 4-1. Sampling Procedures

Method	Description
US EPA Method 1	Determination of Velocity Traverses for Stationary Sources
US EPA Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate
US EPA Method 3	Gas Analysis for the Determination of Molecular Weight
US EPA Method 4	Determination of Moisture Content in Stack Gas
US EPA Method 5	Determination of Particulate Matter Emissions
US EPA Method 9	Determination of Visible Emissions
US EPA Method 29	Determination of Metals Emissions

4.1 Sample Point Determination-EPA Method 1

Sampling point locations were determined according to EPA Reference Method 1.

Table 4-2. Sampling Points

Locations	Dimensions	Ports	Points Per Port	Total Points
SV-SAND-02 Particulate Traverse	80" ID	2	12	24
SV-MELT-01 Particulate Traverse	60" ID	2	12	24

** Exact measurement points and distances to disturbances are listed in Appendix C - Field Data.

4.2 Velocity and Volumetric Flow Rate – EPA Method 2

EPA Method 2 was used to determine the gas velocity and flow rate at the stack. Each set of velocity determinations included the measurement of gas velocity pressure and gas temperature at each of the Method 1 determined traverse points. The velocity pressures were measured with a Type S pitot tube. Gas temperature measurements were made with a Type K thermocouple and digital pyrometer.

4.3 Gas Composition and Molecular Weight – EPA Method 3

The oxygen and carbon dioxide concentrations were determined in accordance with EPA Method 3 using a Fyrite analyzer kit. The remaining stack gas constituent was assumed to be nitrogen for the stack gas molecular weight determination.

4.4 Moisture Content – EPA Method 4

The flue gas moisture content at the testing locations was determined in accordance with EPA Method 4. The gas moisture was determined by quantitatively measuring condensed moisture in the chilled impingers and silica absorption. The amount of moisture condensed was determined gravimetrically. A dry gas meter was used to measure the volume of gas sampled. Moisture content is used to determine stack gas velocity.

4.5 Determination of Filterable PM– EPA Method 5

Particulate matter (PM) is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after the removal of uncombined water. A diagram of the Method 5 train is shown below in Figure 4-1.

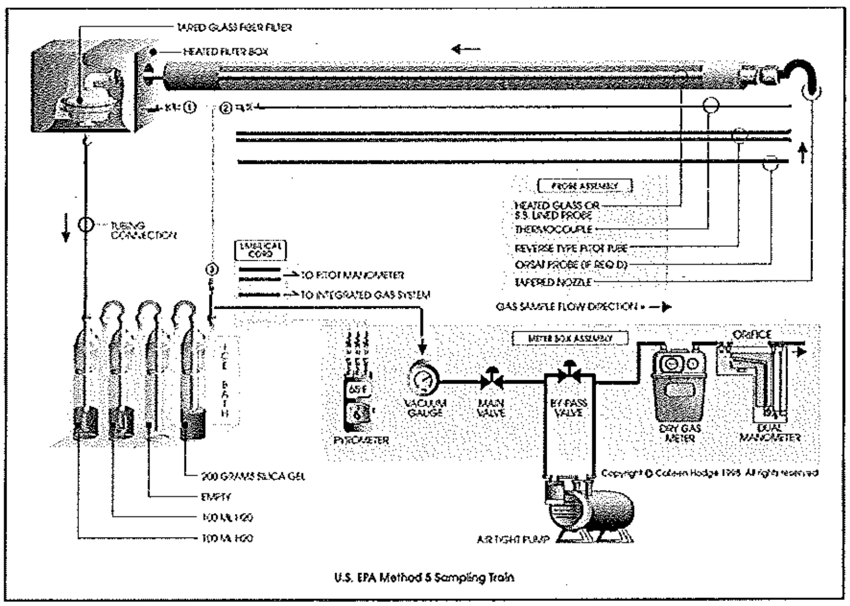

Figure 4-1. Method 5 Sampling Train

4.6 Visible Emissions – EPA Method 9

Stack opacity readings are taken for 60 minutes at 15 second intervals for NSPS and 30 minutes at 15 second intervals for state permitted, non-federal sources, by a certified visible emissions reader. The visible emissions reading are conducted during each of the particulate test runs. The results are reported as an average opacity reading for the testing period. A copy of the visible reader's current certification is included in Appendix D.

4.7 Metals – EPA Method 29

A gas sample is withdrawn isokinetically form the source, particulate emissions are collected in the probe and on a heated filter, and gaseous emissions are then collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all metals including Hg) and an aqueous acidic solution of potassium permanganate (analyzed only for Hg). The recovered samples are digested and fractions are analyzed for Hg by cold vapor atomic absorption spectroscopy and for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, and An by atomic absorption spectroscopy. Graphite furnace atomic absorption spectroscopy is used for analysis of Sb, As, Cd, Co, Pb, Se and Tl if these elements require greater analytical sensitivity than can be obtained by ICASP.

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Sincerely,
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APPENDICES