

Report of...

Particulate Emission Testing

performed for the...

Hillman Power Company
Hillman, Michigan

on the

Wood Fired Boiler

April 8-9, 2014

130.27

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I. INTRODUCTION

Network Environmental, Inc. was retained by the Hillman Power Company of Hillman, Michigan to conduct a particulate emission study at their facility. The purpose of the study was to demonstrate compliance with Renewable Operating Permit (ROP) No. MI-ROP-N1266-2009.

Particulate emission sampling was conducted on the wood fired boiler exhaust during three (3) different operating loads. The operating loads were as follows: 175, 165 and 155 thousand pounds of steam per hour (1000 Lbs/Hr Steam). Three (3) samples, each sixty (60) minutes in duration, were collected during each of the 3 operating loads.

The following is a list of the applicable emission limits for the boiler exhaust:

Emission Limit(s)

Particulate: 0.014 Grains/DSCF, 0.1 Lbs/MMBTU of Heat Input & 7.8 Lbs/Hr

The following reference test methods were employed to conduct the emission sampling:

- Particulate Matter – U.S. EPA Method 17
- Exhaust Gas Parameters (air flow rate, temperature, moisture & density) – U.S. EPA Methods 1- 4

During the sampling the boiler was firing a combination of wood waste and tire derived fuel (TDF).

The sampling was performed over the period of April 8-9, 2014 by Stephan K. Byrd and David D. Engelhardt of Network Environmental, Inc.. Assisting with the study were Mr. Keith Mulka of the Hillman Power Company and the operating staff of the facility. Mr. Jeremy Howe and Mr. William Rogers, Jr. of the Michigan Department of Environmental Quality (MDEQ) – Air Quality Division were present to observe the sampling and source operation.

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II. PRESENTATION OF RESULTS

**II.1 TABLE 1
PARTICULATE EMISSION RESULTS
WOOD FIRED BOILER EXHAUST
HILLMAN POWER COMPANY
HILLMAN, MI**

Operating Condition	Sample	Date	Time	Air Flow Rate DSCFM ⁽¹⁾	Particulate Emissions		
					Grains/DSCF ⁽²⁾	Lbs/MMBTU ⁽³⁾	Lbs/Hr ⁽⁴⁾
155,000 Lbs/Hr of Steam	1	4/8/14	08:39-09:42	61,945	0.0060	0.012	3.17
	2	4/8/14	10:00-11:03	62,866	0.0056	0.011	3.02
	3	4/8/14	11:19-12:22	63,809	0.0058	0.012	3.16
	Average				62,873	0.0058	0.012
165,000 Lbs/Hr of Steam	4	4/8/14	14:04-15:07	68,132	0.0132	0.027	7.69
	5	4/8/14	15:25-16:28	67,219	0.0112	0.023	6.45
	6	4/8/14	16:42-17:45	64,249	0.0098	0.019	5.40
	Average				66,533	0.0114	0.023
175,000 Lbs/Hr of Steam	7	4/9/14	09:26-10:29	69,944	0.0174	0.034	10.43
	8	4/9/14	10:51-11:54	70,663	0.0185	0.037	11.23
	9	4/9/14	12:14-13:17	71,378	0.0200	0.039	12.26
	Average				70,662	0.0187	0.037

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F and 29.92 in. Hg)

(2) Grains/DSCF = Grains Per Dry Standard Cubic Foot (STP = 68 °F and 29.92 in. Hg)

(3) Lbs/MMBTU = Pounds Of Particulate Per Million BTU of Heat Input. Calculated Using The Formula Found In Section 2.1 Of Method 19 For O₂ On A Dry Basis With An F Factor Of 9,127.2.

(4) Lbs/Hr = Pounds Per Hour.

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Table 1 (Section II.1). The results are presented as follows:

III.1 Particulate Emission Results (Table 1)

Table 1 summarizes the particulate emission results as follows:

- Operating Condition
- Sample
- Date
- Time
- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentration (Grains/DSCF) – Grains of Particulate Per Dry Standard Cubic Foot of Exhaust Gas
- Particulate Mass Emission Rate (Lbs/MMBTU) – Pounds of Particulate Per Million BTU of Heat Input. Calculated Using The Formula Found In Section 2.1 Of Method 19 For O₂ On A Dry Basis With An F Factor of 9,127.2.
- Particulate Mass Emission Rate (Lbs/Hr) – Pounds of Particulate Per Hour

IV. SOURCE DESCRIPTION

The source tested was the exhaust of a wood fired boiler rated at 300 million BTU per hour maximum heat input. Emission control is performed by multi-classes, an electrostatic precipitator and a selective non-catalytic reduction system. The boiler was operated at three (3) different operating loads (155,000, 165,000 and 175,000 pounds per hour of steam). During the sampling the boiler was firing a combination of wood waste and tire derived fuel (TDF). Source operating parameters can be found in Appendix B.

V. SAMPLING AND ANALYTICAL PROTOCOL

The sampling location for the boiler exhaust was on the 72 inch diameter exhaust at a location that meets the 8 duct diameter downstream and 2 duct diameter upstream requirement of U.S. EPA Method 1. There are 2 sample ports. Twelve (12) sampling points (6 per port) were used for the isokinetic sampling. The sampling point dimensions were as follows:

<u>Sample Point</u>	<u>Dimension (Inches)</u>
1	3.20
2	10.50
3	21.30
4	50.70
5	61.50
6	68.80

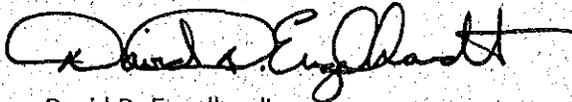
V.1 Particulate – The particulate emission sampling was conducted in accordance with U.S. EPA Reference Method 17. Method 17 is an In-stack filtration method.

The sampling system was operated isokinetically. Three (3) samples were collected during each of the three (3) operating conditions. Each sample was sixty (60) minutes in duration, and had a minimum sample volume of thirty (30) dry standard cubic feet.

The filters and nozzle rinses were analyzed for total particulate by gravimetric analysis. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis. Figure 1 is a diagram of the particulate sampling train.

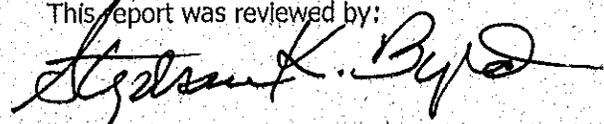
V.2 Exhaust Gas Parameters – The exhaust gas parameters (air flow rate, temperature, moisture and density) were determined in conjunction with the other sampling by employing U.S. EPA Methods 1 through 4. Air flow rates, temperatures, moistures and densities were determined using the isokinetic sampling trains. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

This report was prepared by:



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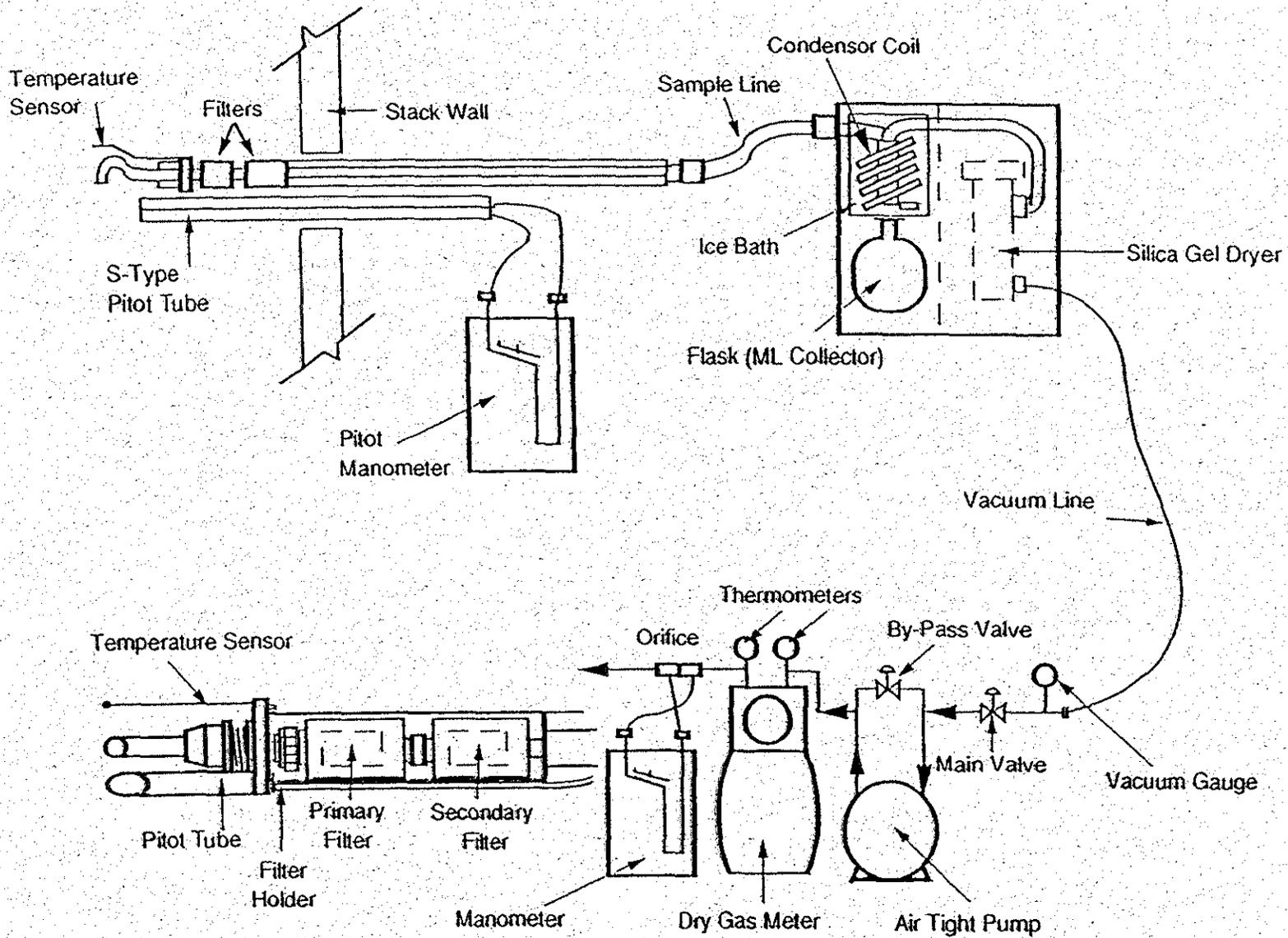


Figure 1

Particulate Sampling Train