Report of ...

MATS Emission Testing

Performed for ...

Grand Haven Board of Light and Power
J.B. Sims Generating Station

Grand Haven, Michigan

On

Boiler #3 FGD Exhaust

August 14 and 15, 2018

Project #: 245.03

By...

Network Environmental, Inc.
Grand Rapids, MI

I. INTRODUCTION

Network Environmental, Inc. was retained by Grand Haven Board Of Light and Power of Grand Haven, Michigan to conduct an emission study at the Sims Generating Station. The purpose of the study was to determine the particulate and HCL emissions from the boiler to document compliance with EPA MATS, Michigan ROP# MI-ROP-B1976-2018 and MI-PTI-B1976-2018.

The pollutants monitored and test methods used were as follows:

- Particulate (Filterable) – U.S. EPA Reference Method 5 MATS
- Hydrogen Chloride (HCL) – U.S. EPA Reference Method 26A MATS
- Exhaust Gas Parameters (air flow rate, temperature, moisture & density) – U.S. EPA Methods 1-4

The emission limits for this source are:
Particulate – 0.03 Lbs/mmBTU
Hydrogen Chloride (HCL) – 0.0020 Lbs/mmBTU

The sampling was conducted over the period of August 14 and 15, 2018 by R. Scott Cargill and Richard D. Eerdmans of Network Environmental, Inc. Assisting in the study was Mr. Paul Cederquist of Grand Haven Board of Light and Power.

Mr. Jeremy Howe and Ms. Kaitlyn Devries of the Michigan Department of Environmental Quality – Air Quality Division were present to observe the testing and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
PARTICULATE EMISSION RESULTS SUMMARY
BOILER 3
GRAND HAVEN BLP
GRAND HAVEN, MICHIGAN
AUGUST 14, 2018

Compound	Sample	Time	Air Flow Rate DSCFM(1)	%CO2(2)	Lbs/Hr(3)	Lbs/mmBTU(4)
Particulate	1	8:04-10:24	179,141	11.9	1.670	0.0024
	2	11:04-13:48	184,133	12.5	1.603	0.0021
	3	14:30-16:47	181,691	12.8	0.721	0.00093
	Average		**181,655**	**12.4**	**1.331**	**0.00181**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)
(2) $\%CO_2$ = Percent Carbon Dioxide On A Dry Basis
(3) Lbs/Hr = Pounds of particulate per hour
(4) Lbs/MMBTU = Pounds Per Million BTU of Heat Input (Calculated using Equation 2.4 from EPA Method 19 with an F_c of 1,800).

II.2 TABLE 2
HCl EMISSION RESULTS SUMMARY
BOILER 3
GRAND HAVEN BLP
GRAND HAVEN, MICHIGAN
AUGUST 15, 2018

Compound	Sample	Time	Air Flow Rate DSCFM[1]	%CO2[2]	Lbs/Hr[3]	Lbs/mmBTU[4]
HCl	1	8:01-9:59	180,574	12.8	0.0547	$7.100E^{-5}$
	2	10:18-12:19	178,573	12.5	0.0960	$1.290E^{-4}$
	3	12:33-14:26	178,695	12.7	0.0977	$1.292E^{-4}$
	Average		**179,281**	**12.7**	**0.0828**	**$1.097E^{-4}$**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)
(2) $\%CO_2$ = Percent Carbon Dioxide On A Dry Basis
(3) Lbs/Hr = Pounds of HCL and particulate per hour
(4) Lbs/MMBTU = Pounds Per Million BTU of Heat Input (Calculated using Equation 2.4 from EPA Method 19 with an F_c of 1,800

III. DISCUSSION OF RESULTS

The results of the testing are summarized in Tables 1 through 2 (Sections II.1 through II.2) as follows:

Table 1 – Particulate Emission Results

- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- % CO_2 – Percent Carbon Dioxide
- Mass Emission Rates (Lbs/MMBTU) – Pounds Per Million BTU Of Heat Input (Calculated Using Equation 2.4 From EPA Method 19 With An F_c Of 1,800) and Pounds Per Hour (Lbs/Hr)

Table 2 – HCl Emission Results

- Air Flow Rate (DSCFM) – Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- % CO_2 – Percent Carbon Dioxide
- Mass Emission Rates (Lbs/MMBTU) – Pounds Per Million BTU Of Heat Input (Calculated Using Equation 2.4 From EPA Method 19 With An F_c Of 1,800)) and Pounds Per Hour (Lbs/Hr)

IV. SAMPLING AND ANALYTICAL PROTOCOL

The sampling location for the boiler exhaust was on the 160 inch diameter exhaust at a location that meets the minimum requirements of U.S. EPA Method 1. There were 4 sample ports and 24 sampling points (6 per port) used for the testing.

Prior to the sampling, a preliminary cyclonic/turbulent flow check was conducted on the exhaust stack. The sampling met the requirements of Method 1.

Twenty four (24) sampling points (6 per port) were used for the isokinetic sampling. The sampling point dimensions for the isokinetic sampling were as follows:

Sample Point	Dimension (Inches)
1	3.36
2	10.72
3	18.88
4	28.32
5	40.00
6	56.96

IV.1 Particulate – The particulate emission sampling was conducted by employing U.S. EPA Method 5 MATS. This is an out of stack filtration method, where the sampling probe and filter are heated at 320 °F (plus or minus 25 °F). Each sample was 120 minutes in duration with a minimum sample volume of 2.0 dry standard cubic meters collected. The samples were collected isokinetically on glass fiber filters. Three (3) samples were collected from the exhaust.

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

IV.2 HCl – The HCL emission sampling was conducted in accordance with U.S. EPA Method 26A MATS. The sampling was performed isokinetically in accordance with the method. The HCL was collected in the first two impingers of the sampling train, which contained 100 mls of 0.1 normal sulfuric acid. The probe rinse and the impinger catch were combined and analyzed for HCL using Ion-chromatography as described in the methods. The filter was heated to between 248 °F and 273 °F .

Three (3) samples were collected from the exhaust. Each sample was ninety (90) minutes in duration with a minimum sample volume of 1.5 dry standard cubic meters. All the quality assurance and quality control requirements specified in the methods were incorporated in the sampling and analysis. A diagram of the sampling train is shown in Figure 2.

IV.3 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 and moistures were determined using the isokinetic sampling trains. Oxygen & carbon dioxide were determined by Orsat in order to determine gas density.

This report was prepared by:

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This report was reviewed by:

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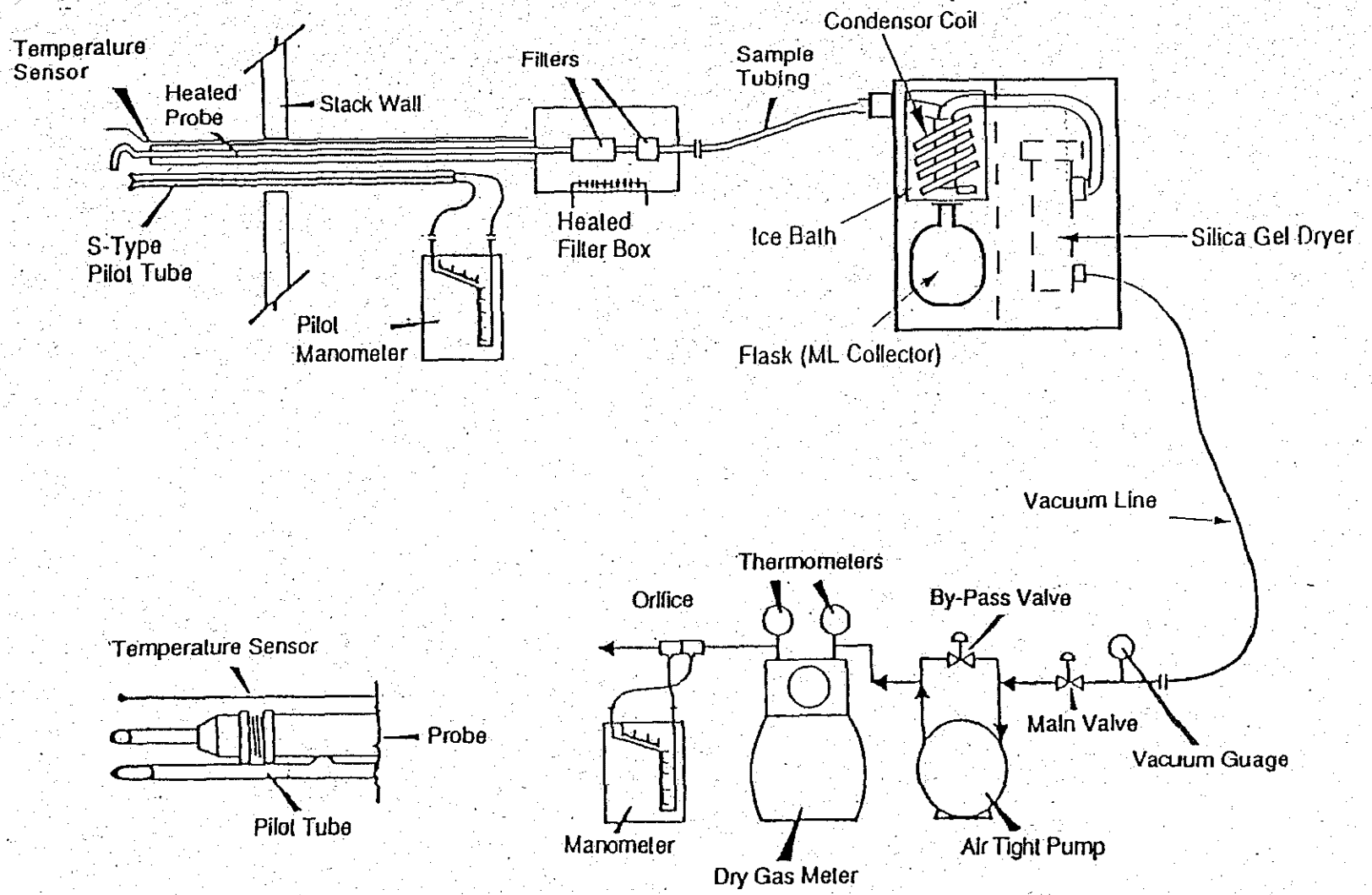

FIGURE 1

EPA METHOD 5

SAMPLING TRAIN

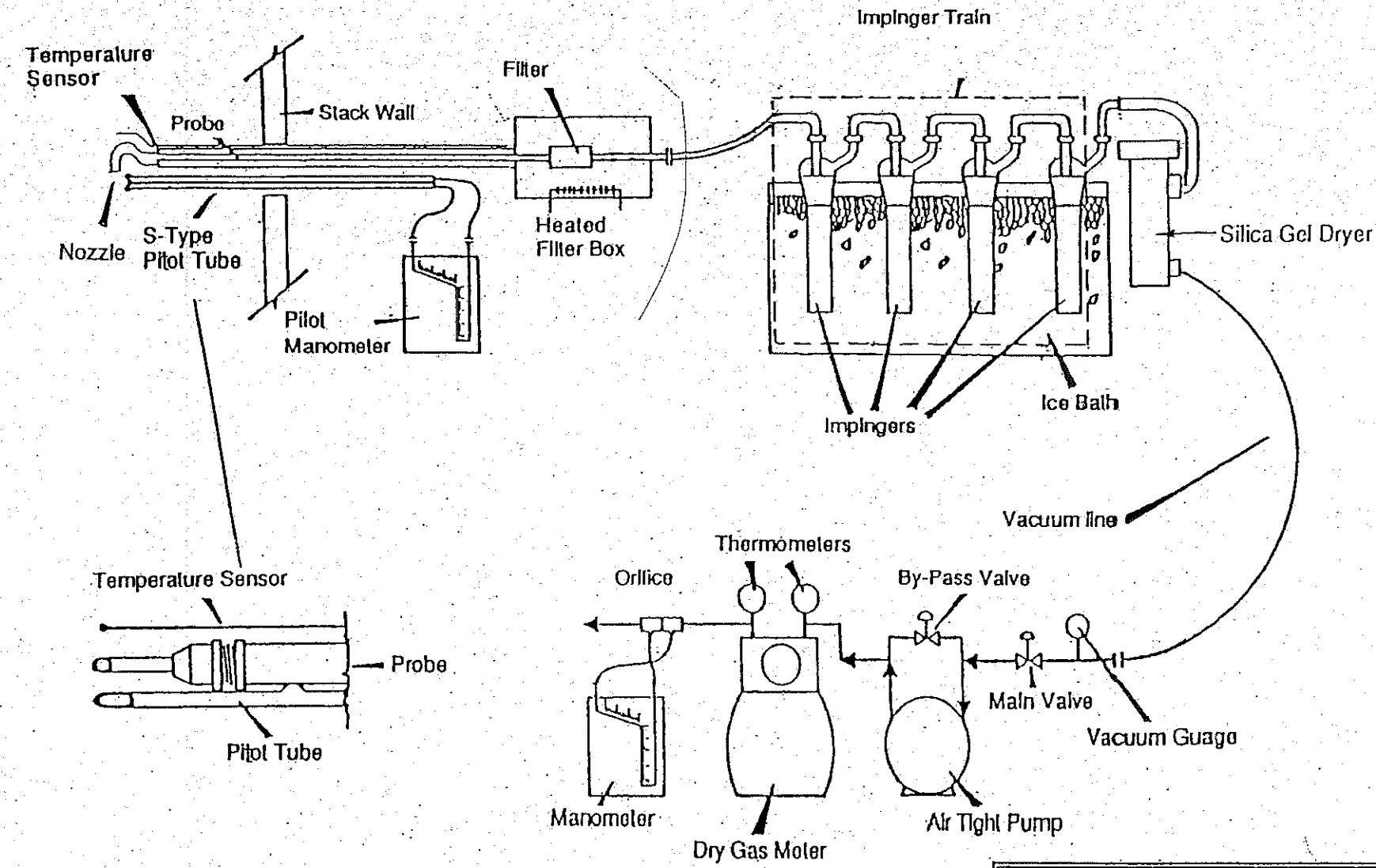

FIGURE 2

EPA 26A SAMPLING TRAIN