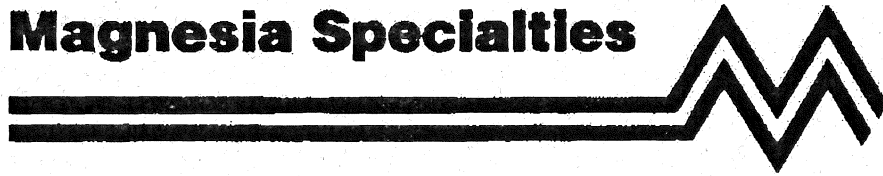


Report of a...

Particulate Emission Study

Performed for...

**Martin Marietta
Magnesia Specialties**



Manistee, Michigan

On the...

#1 Herreshoff Exhaust

November 26, 2019

Project #: 043.20

Performed by...

**Network Environmental, Inc.
Grand Rapids, MI**

performed for

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I. INTRODUCTION

Network Environmental, Inc. was retained by Martin Marietta Magnesia Specialties of Manistee, Michigan to conduct an emission study at their facility. The purpose of the study was to determine the total particulate emissions from their #1 Herreshoff exhaust in order to meet the 2019 emission testing requirements of Renewable Operating Permit (ROP) No. MI-ROP-A3900-2015b.

The sampling in the study was conducted by Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. on November 26, 2019. U.S. EPA Reference Method 5 was used for the total particulate determinations. In addition to the particulate sampling, the exhaust gas parameters (air flow rate, temperature, moisture and density) were determined by employing U.S. EPA Reference Methods 1 through 4.

Assisting in the study were Mr. Robert Gutowski of Martin Marietta Magnesia Specialties and the operating staff of the facility. Mr. Kurt Childs and Mr. Jeremy Howe of the Michigan Department of Environment, Great Lakes and Energy (EGLE) – Air Quality Division were present to observe the testing and source operation.

II. PRESENTATION OF RESULTS

**II.1 TABLE 1
PARTICULATE EMISSION RESULTS SUMMARY
#1 HERRESHOFF EXHAUST
MARTIN MARIETTA MAGNESIA SPECIALTIES
MANISTEE, MICHIGAN
NOVEMBER 26, 2019**

Sample	Time	Air Flow Rate DSCFM ⁽¹⁾	Particulate Concentration Lbs/1000 Lbs ⁽²⁾	Particulate Mass Rates Lbs/Hr ⁽³⁾
1	09:40-10:45	14,586	0.0360	3.40
2	11:20-12:26	14,833	0.0364	3.48
3	12:56-14:02	14,916	0.0352	3.41
Average		14,779	0.0359	3.43

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

(2) Lbs/1000 Lbs = Pounds of Particulate Per Thousand Pounds of Exhaust Gas On a Wet (Actual) Basis

(3) Lbs/Hr = Pounds of Particulate Per Hour

III. DISCUSSION OF RESULTS

The total particulate emission results are summarized in Table 1 (Section II.1). A more detailed presentation of the particulate sampling can be found in Appendix A.

III.1 Particulate Concentrations – The particulate emission concentrations in terms of pounds of particulate per thousand pounds of exhaust gas on a wet (actual) basis (Lbs/1000 Lbs) were 0.0360 Lbs/1000 Lbs for sample one, 0.0364 Lbs/1000 Lbs for sample two, and 0.0352 Lbs/1000 Lbs for sample three. The average of the three samples was 0.0359 Lbs/1000 Lbs.

III.2 Particulate Mass Emission Rates – The particulate mass emission rates in terms of pounds of particulate per hour (Lbs/Hr) were 3.40 Lbs/Hr for sample one, 3.48 Lbs/Hr for sample two, and 3.41 Lbs/Hr for sample three. The average of the three samples was 3.43 Lbs/Hr.

III.3 Emission Limit – According to ROP No. MI-ROP-A3900-2015b, "the particulate emissions from the No. 1 Herreshoff furnace shall not exceed 0.2 pounds per 1,000 pounds of exhaust gases".

IV. SOURCE DESCRIPTION

The source sampled is the exhaust of the #1 Herreshoff. Exhaust air from the herreshoff is first passed through an electrostatic precipitator (ESP) before being emitted to the atmosphere through the 53 inch I.D. exhaust stack. The source operating parameters were monitored by Martin Marietta Magnesia Specialties staff and can be found in Appendix B.

V. SAMPLING AND ANALYTICAL PROTOCOL

The sampling location was on the 53 inch I.D. exhaust stack at a location approximately ten (10) duct diameters downstream and seven (7) duct diameters upstream from the nearest disturbances. Twelve (12) sampling points (six per port) were used for the particulate and air flow determinations. A diagram of the sampling location can be found in Appendix F.

Prior to the sampling, a preliminary velocity traverse, cyclonic/turbulent flow check and moisture train were conducted. The measurement location and air flows met the criteria established in U.S. EPA Reference Method 1.

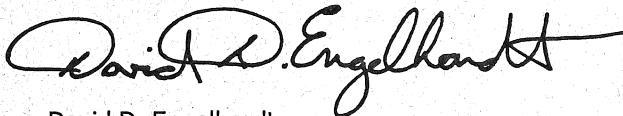
The sampling/traverse points were as follows:

<u>Sample Point</u>	<u>Dimension (Inches)</u>
1	2.31
2	7.75
3	15.69
4	37.31
5	45.25
6	50.69

V.1 Particulate - The total particulate emission sampling was conducted in accordance with U.S. EPA Reference Method 5. Method 5 is an out of stack filtration method. Three (3) samples were collected from the Herreshoff exhaust. Each sample was sixty (60) minutes in duration, and had a minimum sample volume of thirty (30) dry standard cubic feet. The samples were collected isokinetically from the exhaust through a heated probe and collected on a heated filter (maintained at 250 °F plus or minus 25 °F). The filters and probe/nozzle rinses were analyzed for total particulate by gravimetric analysis. All the quality assurance and quality control procedures listed in the method were incorporated in the sampling and analysis. The particulate sampling train is shown in Figure 1.

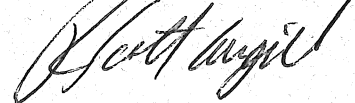
V.2 Exhaust Gas Parameters - The exhaust gas parameters (air flow rate, temperature, moisture, and density) were determined in conjunction with the other sampling by employing U.S. EPA Reference Methods 1 through 4. Moisture was determined from the Method 5 sampling train. Integrated bag samples were collected from the back of the Method 5 sampling train and analyzed by Orsat to determine gas density. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

This report was prepared by:

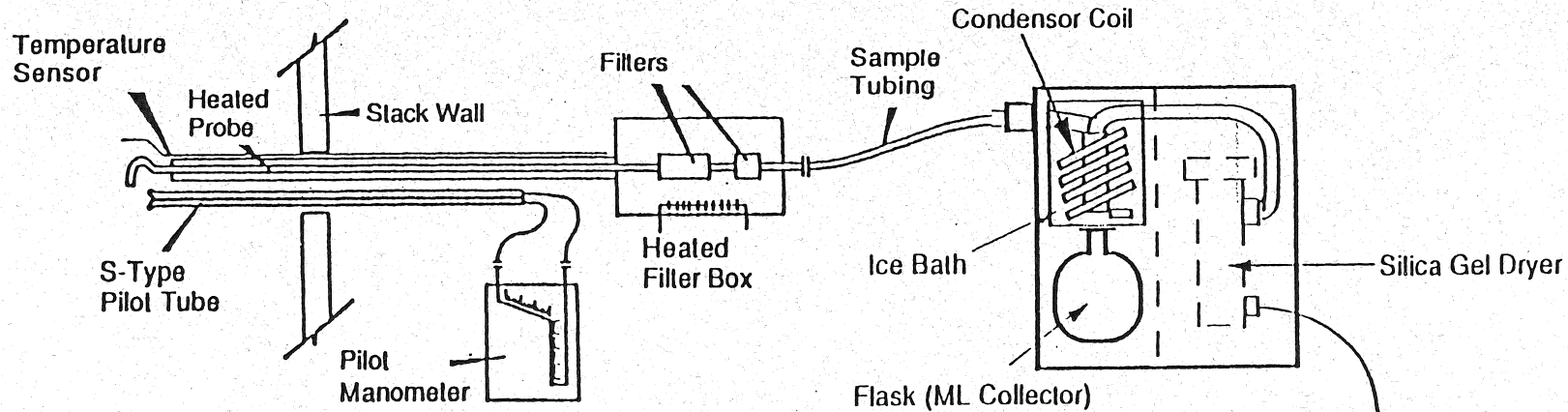


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R. Scott Cargill
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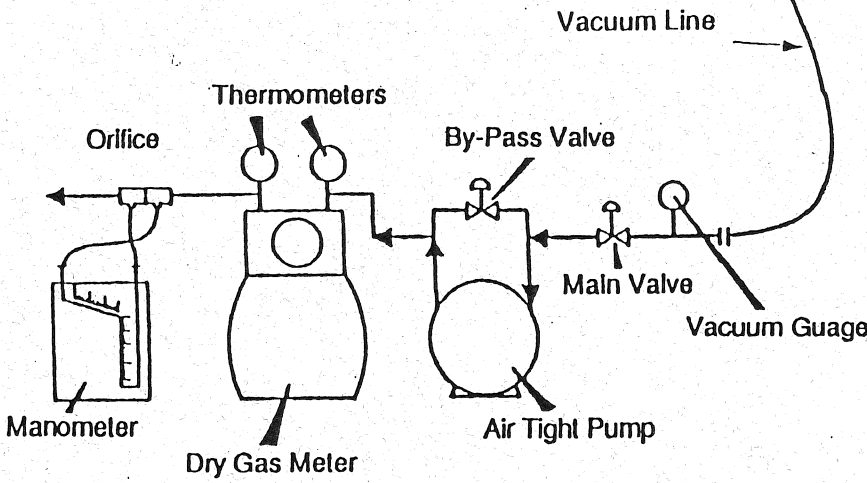
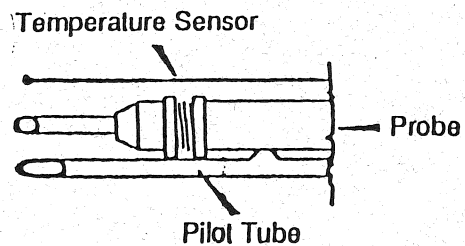


Figure 1
Particulate
Sampling Train