

performed for

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## **I. INTRODUCTION**

Network Environmental, Inc. was retained by Martin Marietta Magnesia Specialties of Manistee, Michigan (SRN: A3900) to conduct an emission study at their facility. The purpose of the study was to meet the 2023 emission testing requirements (for the #3 Rotary Kiln) of Renewable Operating Permit (ROP) No. MI-ROP-A3900-2021a.

The scope of this project was to determine the particulate emissions from the #3 Rotary Kiln exhaust (EURK3). Three (3) test runs were conducted on the exhaust. Each test run was sixty (60) minutes in duration.

The following test methods were employed to conduct the sampling:

- Particulate – U.S. EPA Reference Method 5
- Exhaust Gas Parameters – U.S. EPA Reference Methods 1 through 4

The sampling in the study was conducted by Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. on December 12, 2023. Assisting in the study was Mr. Zac Chisholm of Martin Marietta Magnesia Specialties. Ms. Lindsey Wells of the Michigan Department of Environment, Great Lakes and Energy (EGLE) - Air Quality Division was present to observe the testing and source operation.

**II.1 TABLE 1  
PARTICULATE EMISSION RESULTS SUMMARY  
MARTIN MARIETTA MAGNESIA SPECIALTIES  
MANISTEE, MICHIGAN  
DECEMBER 12, 2023**

Source	Sample	Date	Time	Air Flow Rate DSCFM <sup>(1)</sup>	Particulate Concentration		Particulate Mass Rates Lbs/Hr <sup>(4)</sup>
					Lbs/1000 Lbs <sup>(2)</sup>	Lbs/1000 Lbs, Dry <sup>(3)</sup>	
#3 Rotary Kiln	1	12/12/23	09:15-10:26	13,863	0.0135	0.0187	1.21
	2	12/12/23	11:00-12:05	14,067	0.0081	0.0113	0.74
	3	12/12/23	12:55-13:59	14,301	0.0123	0.0171	1.14
	<b>Average</b>				<b>14,077</b>	<b>0.0113</b>	<b>0.0157</b>

- (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 Actual Basis (Stack Conditions)  
 (3) Lbs/1000 Lbs, Dry = Pounds of Particulate Per Thousand Pounds of Exhaust Gas On a Dry Basis  
 (4) Lbs/Hr = Pounds of Particulate Per Hour

### **III. DISCUSSION OF RESULTS**

#### **III.1 Particulate Emission 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. Table 1 consists of the following information:

- Source
- Sample
- Date
- Time
- Air Flow Rates in terms of Dry Standard Cubic Feet Per Minute (DSCFM) (where standard temperature and pressure = 68 °F & 29.92 in. Hg)
- Particulate Concentrations in terms of Pounds of Particulate Per Thousand Pounds of Exhaust Gas On A Actual Basis (Lbs/1000 Lbs)
- Particulate Concentrations in terms of Pounds of Particulate Per Thousand Pounds of Exhaust Gas On A Dry Basis (Lbs/1000 Lbs, Dry)
- Particulate Mass Emission Rates in terms of Pounds of Particulate Per Hour (Lbs/Hr)

#### **III.2 Emission Limit**

Permit No. MI-ROP-A3900-2021a has established the following particulate emission limits for this source:

- #3 Rotary Kiln – Particulate: 0.13 Lbs/1000 Lbs of exhaust gases on a dry basis

### **IV. SOURCE DESCRIPTION**

#3 Rotary Kiln: This kiln is a calciner used to remove free and chemically bound water from a magnesium hydroxide slurry to produce magnesium oxide. The kiln is fired with natural gas. Exhaust air from the #3 Rotary Kiln is first passed through an electrostatic precipitator (ESP) before being emitted to the atmosphere through the 42 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 for the #3 Rotary Kiln was on the 42 inch I.D. exhaust stack at a location that exceeded the 8 duct diameters downstream (approximately 17) and 2 duct diameters upstream (approximately 12) requirement of U.S. EPA Method 1. Twelve (12) sampling points were used for the particulate and air flow determinations. A diagram of the sampling location can be found in Appendix F.

The day before 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:

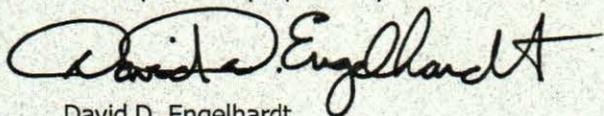
<u>Sample Point</u>	<u>Dimension (Inches)</u>
1	1.84
2	6.13
3	12.43
4	29.56
5	35.86
6	40.15

**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 source. 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 248 °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 Methods 1 through 4. Air flow rates, temperatures and moistures were determined using the Method 5 sampling train.

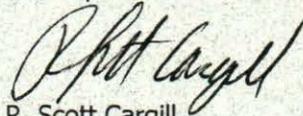
Integrated bag samples were collected off of the Method 5 sampling train and analyzed by Orsat analysis in order to determine the oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) content of the exhaust gases. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

This report was prepared by:

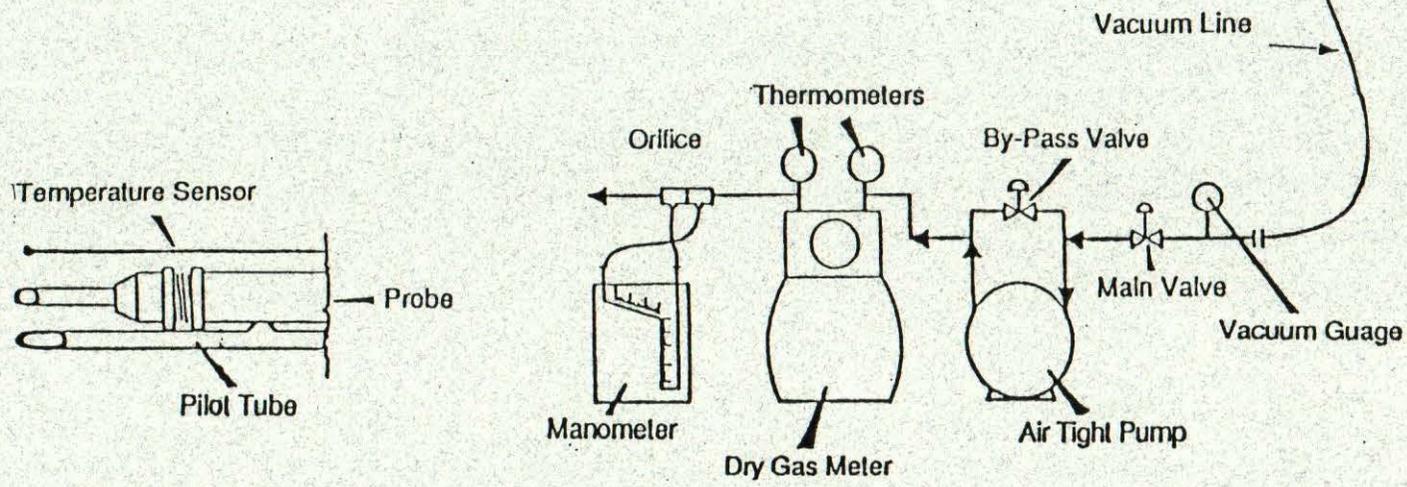
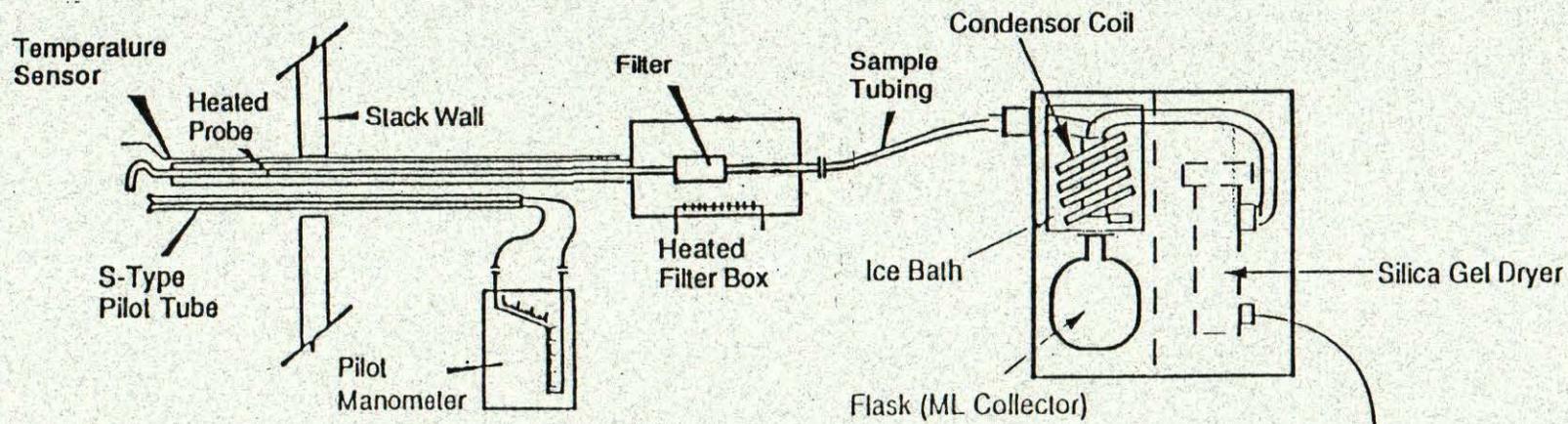


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This report was reviewed by:



R. Scott Cargill  
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**Figure 1**  
**Particulate**  
**Sampling Train**