

Report of an...

Air Flow Study

performed for...

Viking Energy
Lincoln, Michigan

on the

Wood Fired Boiler

August 13, 2019

126.36

Network Environmental, Inc.
Grand Rapids, MI

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I. INTRODUCTION

Network Environmental, Inc. was retained by Viking Energy of Lincoln, Michigan to perform an air flow study on their wood fired boiler. The purpose of the study was to document the air flow rate from the wood fired boiler under normal operating conditions.

The air flow sampling was performed on August 13, 2019. Stephan K. Byrd and David D. Engelhardt of Network Environmental, Inc. conducted the sampling in accordance with the following reference test methods:

- Exhaust Gas Parameters – U.S. EPA Methods 1 through 4

Assisting with the study was Mr. Paul Havercroft of Viking Energy Lincoln. Mr. Jeremy Howe of the Michigan Department of Environment, Great Lakes and Energy (EGLE) - Air Quality Division was present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

**II.1 TABLE 1
AIR FLOW RESULTS
WOOD FIRED BOILER EXHAUST
VIKING ENERGY
LINCOLN, MICHIGAN
AUGUST 13, 2019**

Sample	Time	Air Flow Rates	
		SCFM ⁽¹⁾	DSCFM ⁽²⁾
1	14:35-14:49	59,564	48,753
2	15:10-15:20	60,342	49,390
3	15:41-15:52	60,034	49,138
Average		59,980	49,094

(1) SCFM = Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)

(2) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)

III. SAMPLING AND ANALYTICAL PROTOCOL

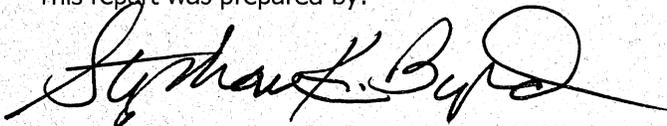
III.1 Moisture – The moisture sample was collected in accordance with U.S. EPA Method 4. The sample was withdrawn from the stack and passed through a condensing coil with drop out before being passed through pre-weighed silica gel. The water collected was measured to the nearest 1 ml and the silica gel was re-weighed to the nearest 0.5 g. The moisture collected along with the sample volume was used to determine the percent moisture in the exhaust. The sample was thirty (30) minutes in duration and had a minimum sample volume of twenty-one (21) standard cubic feet. A diagram of the moisture sampling train is shown in Figure 1.

III.2 Air Flows – The air flow rates were determined by employing U.S. EPA Reference Methods 1 and 2. The sampling for the source was conducted on the 71 inch I.D. exhaust stack. A total of 12 traverse points were used for the air flow determinations. The sample point dimensions are shown in Appendix C.

Velocity pressures were determined using an S-Type pitot tube. Temperatures were measured using a Type K thermocouple. A diagram of the air flow sampling train is shown in Figure 2.

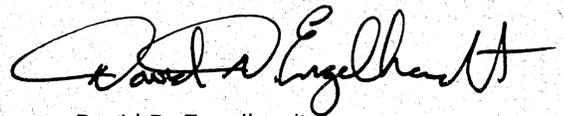
III.3 Gas Density – The gas density was determined by using data that was collected during the annual relative accuracy test audit (RATA).

This report was prepared by:

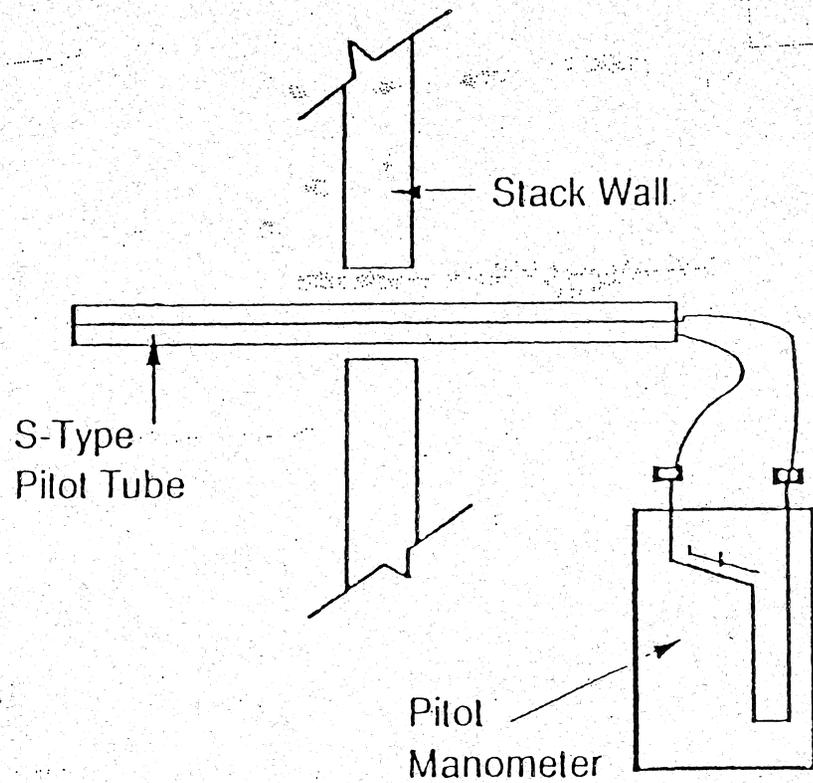


Stephan K. Byrd
President

This report was reviewed by:



David D. Engelhardt
Vice President



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Figure 1
Air Flow Sampling Train

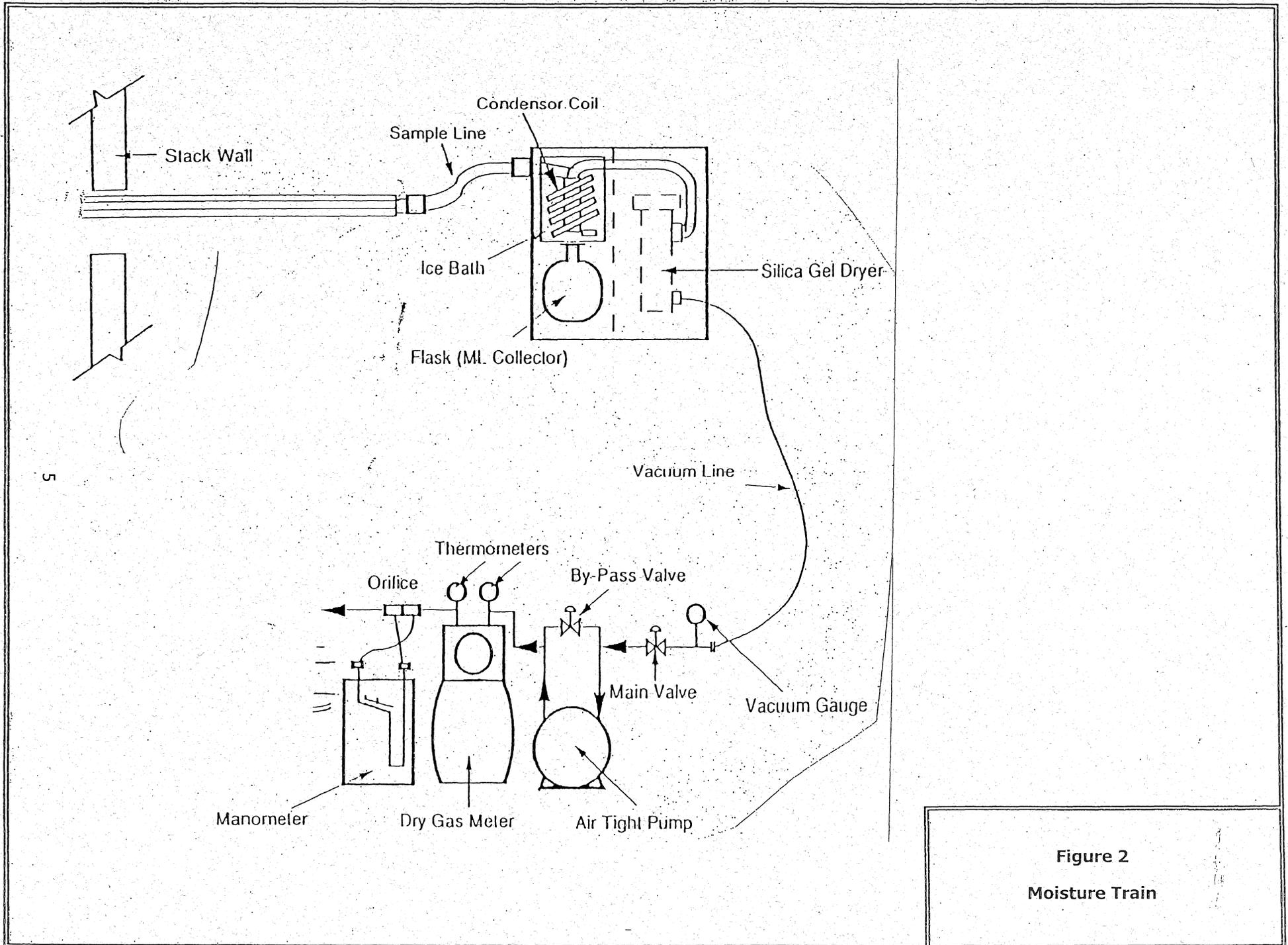


Figure 2
Moisture Train