

Report of an...

# Air Flow Study

performed for...

**Viking Energy**  
McBain, Michigan

on the

## Wood Fired Boiler

August 29, 2017

126.35

Network Environmental, Inc.  
Grand Rapids, MI

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OCT 30 2017

AIR QUALITY DIVISION

## **I. INTRODUCTION**

Network Environmental, Inc. was retained by Viking Energy of McBain, 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 29, 2017. 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 were Mr. Matt Doolittle of Viking Energy McBain and the operating staff of the facility.

## II. PRESENTATION OF RESULTS

**II.1 TABLE 1  
AIR FLOW RESULTS  
WOOD FIRED BOILER EXHAUST  
VIKING ENERGY  
McBAIN, MICHIGAN  
AUGUST 29, 2017**

Sample	Time	Air Flow Rates	
		SCFM <sup>(1)</sup>	DSCFM <sup>(2)</sup>
1	16:36-16:46	61,907	50,342
2	16:56-17:06	64,002	52,046
3	17:16-17:26	63,998	52,044
<b>Average</b>		<b>63,302</b>	<b>51,477</b>

(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)

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**III. SAMPLING AND ANALYTICAL PROTOCOL**

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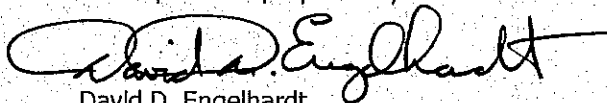
**III.1 Moisture** – The moisture sample was collected in accordance with U.S. EPA Method 4. The sample was withdrawn from the stack and passed through a condensing coil with drop out before being passed through pre-weighed silica gel. The water collected was measured to the nearest 1 ml and the silica 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 obtaining a bag sample from the exhaust of the moisture train and Orsat analysis.

This report was prepared by:

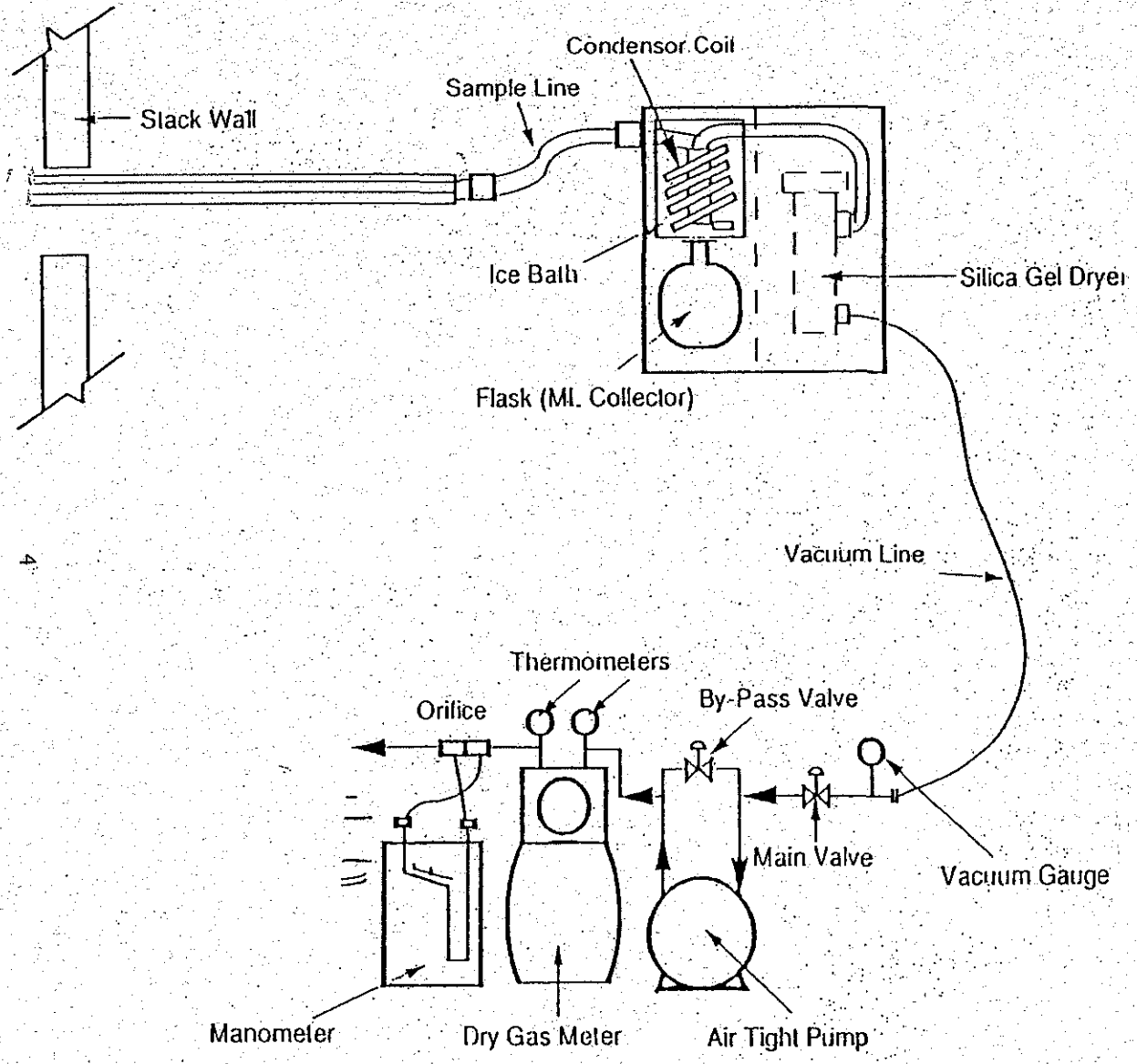


David D. Engelhardt  
Vice President

This report was reviewed by:



R. Scott Cargill  
Project Manager



**Figure 1**  
**Moisture Sampling Train**

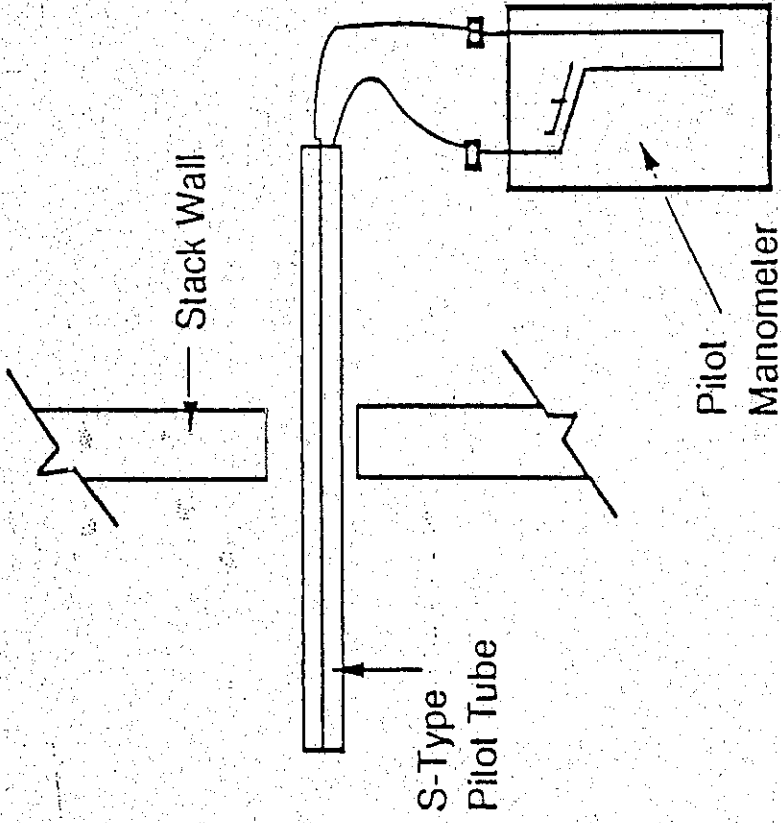


Figure 2  
Air Flow Sampling Train