Report of ...

ROP Compliance Emission Testing

Performed for ...

Cleveland-Cliffs, Inc.
Tilden Mining Company, L.C.
Ishpeming, Michigan

On...

Units 1 & 2

At the...

Tilden Mine
National Mine, Michigan

July 24 - 26, 2018

Project #: 053.37

Performed By:

Network Environmental, Inc.
Grand Rapids, MI

I. INTRODUCTION

Network Environmental, Inc. was retained by Cleveland-Cliffs, Inc., Tilden Mining Company L.C. to perform ROP compliance emission testing at the Tilden Mine located in National Mine, Michigan. The particulate emissions were determined from indurating furnace Units 1 & 2 (EUKILN 1 & EUKILN 2). The purpose of the testing was to document compliance with Michigan Department of Environmental Quality (MDEQ) - Air Quality Division ROP No. MI-ROP-B4885-2017.

The total particulate sampling was conducted in accordance with U.S. EPA Reference Method 5. Exhaust gas parameters (air flow rate, temperature, moisture and density) were determined by employing U.S. EPA Reference Methods 1 through 4.

The testing was performed over the period of July 24-26, 2018. Stephan K. Byrd, R. Scott Cargill, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. conducted the emission sampling. Assisting with the on-site coordination and data collection was Mr. Thomas O'Brien of Cleveland-Cliffs, Inc.. Mr. Mark Dziadosz of the MDEQ - Air Quality Division was present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
PARTICULATE EMISSION RESULTS
UNIT 2 (EUKILN 2) INDURATING FURNACE (HEMATITE)
CLEVELAND-CLIFFS, INC.
TILDEN MINING COMPANY L.C.
NATIONAL MINE, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	Concentration		Mass Rate
					Lbs/1000 Lbs, Dry (2)	Grains/DSCF (3)	Lbs/Hr (4)
Unit 2 South Waste Gas Stack	1	7/25/18	14:47-17:00	440,042	0.00404	0.00215	8.10
	2	7/26/18	09:04-11:17	425,266	0.00087	0.00046	1.67
	3	7/26/18	12:10-14:21	425,705	0.00095	0.00050	1.84
	Average			**430,338**	**0.00195**	**0.00104**	**3.87**
Unit 2 North Waste Gas Stack	1	7/25/18	14:47-17:00	252,026	0.0149	0.0078	16.90
	2	7/26/18	09:04-11:16	235,059	0.0032	0.0017	3.34
	3	7/26/18	12:10-14:21	236,390	0.0040	0.0021	4.28
	Average			**241,158**	**0.0074**	**0.0039**	**8.17**
Unit 2 Total	1	7/25/18	14:47-17:00	692,068	0.0080	0.00421	25.00
	2	7/26/18	09:04-11:17	660,325	0.0017	0.00090	5.01
	3	7/26/18	12:10-14:21	662,095	0.0020	0.00107	6.12
	Average			**671,496**	**0.0039**	**0.00206**	**12.04**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/1000 Lbs, Dry = Pounds Of Particulate Per Thousand Pounds of Exhaust Gas On A Dry Basis
(3) Grains/DSCF = Grains Of Particulate Per Dry Standard Cubic Foot Of Exhaust Gas
(4) Lbs/Hr = Pounds Of Particulate Per Hour

II.2 TABLE 2
PARTICULATE EMISSION RESULTS
UNIT 1 (EUKILN 1) INDURATING FURNACE (HEMATITE)
CLEVELAND-CLIFFS, INC.
TILDEN MINING COMPANY L.C.
NATIONAL MINE, MICHIGAN

Source	Sample	Date	Time	Air Flow Rate DSCFM (1)	Concentration		Mass Rate
					Lbs/1000 Lbs, Dry (2)	Grains/DSCF (3)	Lbs/Hr (4)
Unit 1 South Waste Gas Stack	1	7/24/18	12:28-14:58	440,228	0.0140	0.0075	28.21
	2	7/24/18	15:36-17:46	440,056	0.0097	0.0052	19.55
	3	7/25/18	09:05-11:17	441,019	0.0150	0.0080	30.26
	Average			**440,434**	**0.0129**	**0.0069**	**26.01**
Unit 1 North Waste Gas Stack	1	7/24/18	12:28-14:58	209,341	0.0135	0.0071	12.75
	2	7/24/18	15:36-17:50	210,173	0.0055	0.0029	5.26
	3	7/25/18	09:05-11:21	210,900	0.0125	0.0066	11.92
	Average			**210,138**	**0.0105**	**0.0055**	**9.98**
Unit 1 Total	1	7/24/18	12:28-14:58	649,569	0.0138	0.0074	40.96
	2	7/24/18	15:36-17:50	650,229	0.0083	0.0045	24.81
	3	7/25/18	09:05-11:21	651,919	0.0142	0.0075	42.18
	Average			**650,572**	**0.0121**	**0.0065**	**35.98**

(1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(2) Lbs/1000 Lbs, Dry = Pounds Of Particulate Per Thousand Pounds of Exhaust Gas On A Dry Basis
(3) Grains/DSCF = Grains Of Particulate Per Dry Standard Cubic Foot Of Exhaust Gas
(4) Lbs/Hr = Pounds Of Particulate Per Hour

III. DISCUSSION OF RESULTS

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

The tables consist of the following test information:

- Sample Dates & Times
- Air Flow Rates in terms of Dry Standard Cubic Feet Per Minute (DSCFM) (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentrations in terms of Pounds Per Thousand Pounds on a Dry Basis (Lbs/1000 Lbs, Dry) & Grains Per Dry Standard Cubic Foot (Grains/DSCF)
- Particulate Mass Rates in terms of Pounds Per Hour (Lbs/Hr)

The Taconite MACT Limits are as follows:

1. Existing Grate Kiln indurating furnace processing magnetite = 0.01 Grains/DSCF
2. Existing Grate Kiln indurating furnace processing hematite = 0.03 Grains/DSCF

The units were processing hematite during the testing.

In addition to the Taconite MACT Limits, the ROP has established the following limits:

1. 0.065 Lbs/1000 Lbs of Exhaust Gas
2. 200 Lbs/Hr

A more detailed breakdown of each individual sample can be found in Appendix A.

IV. SAMPLING AND ANALYTICAL PROTOCOL

IV.1 Total Particulate – The 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 each exhaust. Each sample was one hundred twenty (120) minutes in duration. Sampling for the North and South exhausts for each unit was conducted simultaneously.

The samples were collected isokinetically from the exhausts through a heated probe and collected on a heated filter (maintained at 250 °F plus or minus 25 °F) and 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 Method 5 particulate sampling train.

IV.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 train. Bag samples were collected from the Method 5 sampling trains and analyzed for oxygen (% O_2) and carbon dioxide (% CO_2) by Orsat. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

This report was prepared by:

David D. Engelhardt
Vice President

This report was reviewed by:

Stephan K. Byrd
President

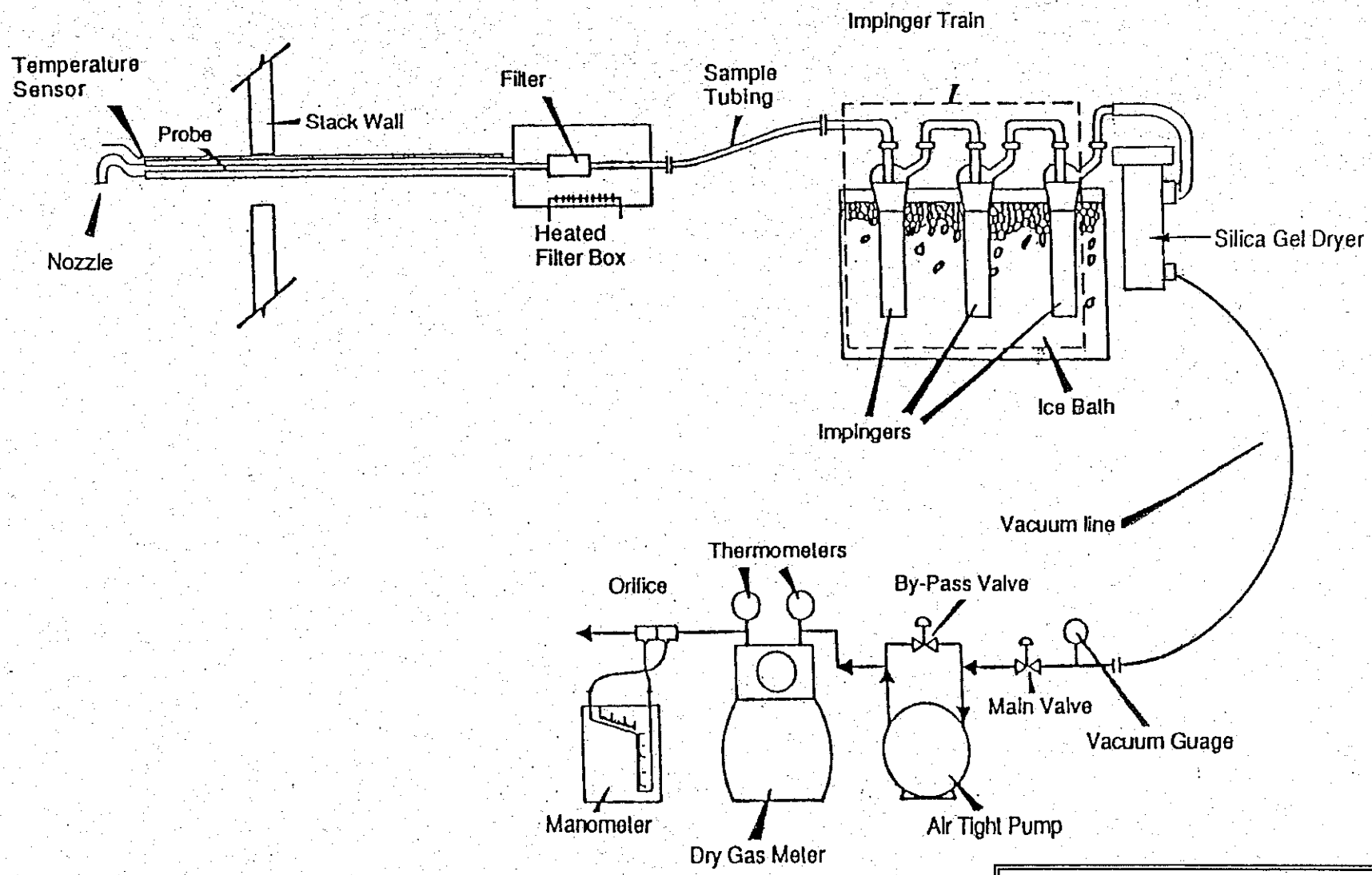

Figure 1

Particulate Sampling Train