Report of...

VOC Emission Sampling

Performed for the...

FloraCraft Corporation
Ludington, Michigan

On the...

Extrusion Line 2

July 10, 2014

Project #: 298.01

By...

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Grand Rapids, MI

performed for

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I. INTRODUCTION

Network Environmental, Inc. was retained by the FloraCraft Corporation to conduct emission sampling at their facility located in Ludington, Michigan. The scope of this project was designed to meet the Extrusion Line 2 emission testing requirements of Michigan Department of Environmental Quality (MDEQ) Permit To Install No. 245-09B. Permit No. 245-09B has established the following emission limits for this source:

Pollutant	Limit
VOC	68.3 Tons/Yr.
Difluoroethane (HFC-152a)	55.8 Tons/Yr

The exhaust stack from Extrusion Line 2 was sampled for total hydrocarbons (VOC) and Difluoroethane (HFC-152a). A minimum of three (3) samples, for each of the two (2) pollutants listed above, were collected from the exhaust stack. Each sample was sixty (60) minutes in duration. The exhaust gas parameters (air flow rate, temperature, moisture and density) will also be determined in conjunction with the sampling.

The following reference test methods were used to conduct the sampling:

- Total Hydrocarbons (VOC) – U.S. EPA Method 25A
- Difluoroethane (HFC-152a) – U.S. EPA Method 18
- Exhaust Gas Parameters (flow rate, temperature, moisture & density) – U.S. EPA Methods 1- 4

The sampling in the study was performed on July 10, 2014 by Stephan K. Byrd and David D. Engelhardt of Network Environmental, Inc.. Assisting in the study were Mr. Trevor Wardle of the FloraCraft Corporation and the operating staff of the facility. Mr. Robert Dickman of the Michigan Department of Environmental Quality (MDEQ) – Air Quality Division was present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
TOTAL HYDROCARBON (VOC) EMISSION RESULTS SUMMARY
EXTRUSION LINE #2
FLORACRAFT CORPORATION
LUDINGTON, MICHIGAN
JULY 10, 2014

Sample	Time	Air Flow Rate SCFM [1]	VOC		
			Concentration PPM [2]	Emission Rate	
				Lbs/Hr [3]	Tons/Year [4]
1	09:03-10:07	1,244	176.6	1.50	6.57
2	10:26-11:26		111.3	0.94	4.12
3	11:35-12:35		175.6	1.49	6.53
4 [5]	12:42-13:42		229.4	1.94	8.50
Average			**173.2**	**1.47**	**6.43**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg). This Is The Average Of The Two Velocity Traverses Conducted (One Before The Sampling and One After The Sampling).
(2) PPM = Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
(3) Lbs/Hr = Pounds Of VOC Per Hour As Propane
(4) Tons/Year = Tons Of VOC Per Year As Propane. The Tons/Year Were Calculated Using 8,760 Hours/Year Of Operation.
(5) During Sample 2, The Bag Sample For Difluoroethane Did Not Work. Because Of This, A Fourth Sample Was Collected For VOC's.

II.2 TABLE 2
DIFLUOROETHANE (R-152a) EMISSION RESULTS SUMMARY
EXTRUSION LINE #2
FLORACRAFT CORPORATION
LUDINGTON, MICHIGAN
JULY 10, 2014

Sample	Time	Air Flow Rate SCFM (1)	Difluoroethane		
			Concentration PPM (2)	Emission Rate	
				Lbs/Hr (3)	Tons/Year (4)
1	09:03-10:07	1,244	84.2	1.07	4.69
2	11:35-12:35		218.0	2.77	12.13
3	12:42-13:42		144.0	1.83	8.02
Average			**148.7**	**1.89**	**8.28**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 In. Hg). This Is The Average Of The Two Velocity Traverses Conducted (One Before The Sampling and One After The Sampling).
(2) PPM = Parts Per Million (v/v) On An Actual (Wet) Basis
(3) Lbs/Hr = Pounds Of Difluoroethane Per Hour
(4) Tons/Year = Tons Of Difluoroethane Per Year. The Tons/Year Were Calculated Using 8,760 Hours/Year Of Operation.

III. DISCUSSION OF RESULTS

The results of the emission sampling are presented in Tables 1 – 2 (Sections II.1 – II.2) as follows:

III.1 Table 1 – Total Hydrocarbon (VOC) Results

- Sample Number
- Sample Time
- Air Flow Rate in terms of Standard Cubic Feet Per Minute (SCFM). Standard Temperature and Pressure (STP) = 68 °F and 29.92 inches Hg.
- VOC Concentration in terms of Parts Per Million (v/v) on a Actual (Wet) Basis (PPM)
- VOC Mass Emission Rates in terms of Pounds Per Hour (Lbs/Hr)
- VOC Mass Emission Rates in terms of Tons Per Year (Tons/Year). The Tons/Year were calculated using 8,760 Hours/Year of operation.

Four (4) VOC samples were collected. During Sample 2, the bag sample for difluoroethane did not fill properly. A fourth VOC sample was collected in order to match up the VOC data with the difluoroethane data.

III.2 Table 2 – Difluoroethane (HFC-152a) Results

- Sample Number
- Sample Time
- Air Flow Rate in terms of Standard Cubic Feet Per Minute (SCFM). Standard Temperature and Pressure (STP) = 68 °F and 29.92 inches Hg.
- Difluoroethane Concentration in terms of Parts Per Million (v/v) on a Actual (Wet) Basis (PPM)
- Difluoroethane Mass Emission Rates in terms of Pounds Per Hour (Lbs/Hr)
- Difluoroethane Mass Emission Rates in terms of Tons Per Year (Tons/Year). The Tons/Year were calculated using 8,760 Hours/Year of operation.

IV. SOURCE DESCRIPTION

Extrusion Line 2 is a tandem extrusion system with primary and secondary extruders and a die to manufacture extruded polystyrene foam. Pentane, butane and difluoroethane (HFC-152a) are the

blowing agents. During the sampling, 100 Lbs/Hr of blowing agents were used (50% HFC-152a & 50% butane).

V. SAMPLING AND ANALYTICAL PROTOCOL

V.1 Total Hydrocarbon (VOC) – The VOC sampling was conducted in accordance with U.S. EPA Reference Method 25A. A J.U.M. Model 3-500 flame ionization detector (FID) analyzer was used to monitor the source sampled. Sample gas was extracted through a heated probe. A heated teflon sample line was used to transport the exhaust gases to the analyzer. The analyzer produces instantaneous readouts of the VOC concentrations (PPM).

The analyzer was calibrated by system injection (from the back of the stack probe to the analyzer) prior to the testing. A span gas of 247.1 PPM Propane was used to establish the initial instrument calibration. Calibration gases of 85.78 PPM, 151.1 PPM, 453.6 PPM, 959.3 PPM & 2,520 PPM Propane were used to determine the calibration error of the analyzer. After each sample, a system zero and system injection of 151.1 PPM Propane were performed to establish system drift and system bias during the test period. All calibration gases used were EPA Protocol Calibration Gases. Four (4) samples were collected from the exhaust duct. Each sample was sixty (60) minutes in duration.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust. The analyzer averages were corrected for calibration error and drift using formula EQ.7E-5 from 40 CFR Part 60, Appendix A, Method 7E. Figure 1 is a diagram of the VOC sampling train.

V.2 Difluoroethane (HFC-152a) – The difluoroethane emissions were determined in accordance with U.S. EPA Reference Method 18. Three (3) samples were collected from the exhaust duct. Each sample was sixty (60) minutes in duration.

Samples were withdrawn from the duct using a Teflon probe which led to a Cali-5-Bond (Calibrated Instruments) bag. The samples were collected in Cali-5-Bond bags and analyzed for difluoroethane by GC/FID. The samples were sent over night to the laboratory and analyzed upon receipt. A diagram of the sampling train is shown in Figure 2.

All the quality assurance and quality control procedures listed in the method were incorporated in the sampling and analysis.

V.3 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.

A bag was collected and analyzed by Orsat to determine oxygen (O_2) and carbon dioxide (CO_2) content. Moisture was determined using the wet bulb/dry bulb technique. Two (2) velocity traverses were conducted (one before and one after the sampling). All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

V.4 Sampling Locations – The sampling location was on the 12 inch diameter exhaust at a location approximately 16 duct diameters downstream and approximately 2.5 duct diameters upstream from the nearest disturbances. There are two (2) sampling ports at the sampling location.

Prior to the emission testing, a preliminary velocity/cyclonic (turbulent) flow measurement/check was conducted to determine the acceptability of the sampling location. The location met the criteria as outlined in U.S. EPA Method 1.

This report was prepared by:

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This report was reviewed by:

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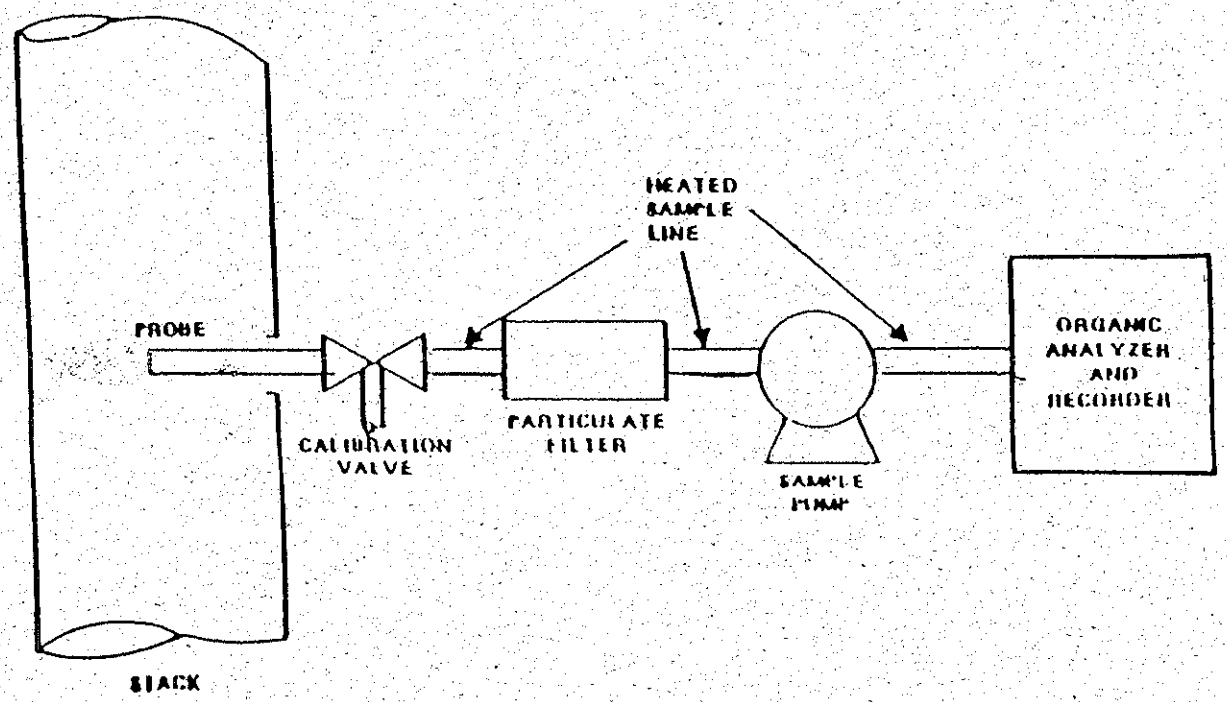

Figure 1

VOC Sampling Train

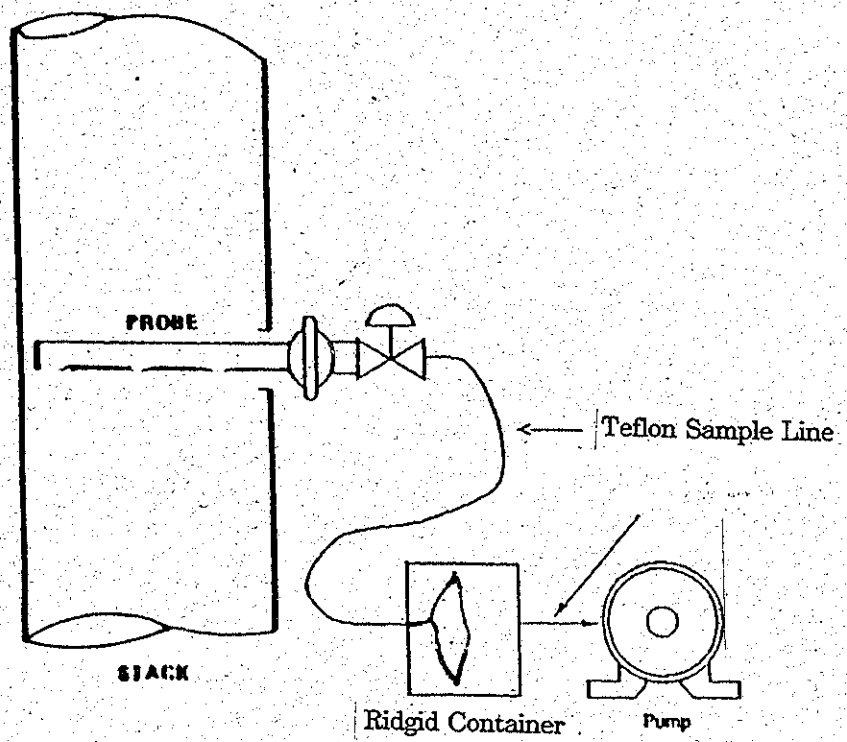

Figure 2

Difluoroethane Sampling Train