Report of a...

VOC Destruction Efficiency Test

Performed for the...

Siliconature Corporation

Caledonia, Michigan

On the...

RTO No. 1

November 6, 2019

317.02

By...

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Grand Rapids, MI

Performed for:

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I. INTRODUCTION

Network Environmental, Inc. was retained by the Siliconature Corporation to conduct a VOC (total hydrocarbons) destruction efficiency test on the RTO (regenerative thermal oxidizer) No. 1 located at their Caledonia, MI facility. The RTO controls the VOC emissions from Coating Line 1 (EU-CoatingLine-01). The purpose of the study was to document compliance with EGLE Air Quality Division Permit To Install (PTI) No. 158-16A. PTI No. 158-16A has established a 99% destruction efficiency (DE) limit for the oxidizer at this facility.

The DE of the thermal oxidizer was determined by employing the following reference test methods:

- VOC's – U.S. EPA Method 25A
- Exhaust Gas Parameters (air flow rate, temperature, moisture & density) – U.S. EPA Reference Methods 1 through 4.

The sampling was performed on November 6, 2019 by R. Scott Cargill, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. Assisting in the study were Mr. Mark Horne of Environmental Partners, Inc. and the operating staff of the facility. Mr. Tom Gasloli, Mr. Matthew Karl, Ms. April Lazzaro and Ms. Lindsey Wells of the Michigan Department of Environment, Great Lakes and Energy (EGLE) – Air Quality Division were present to observe the sampling and source operation.

II.1 TABLE 1
VOC DESTRUCTION EFFICIENCY (DE) RESULTS
RTO
SILICONATURE CORPORATION
CALEDONIA, MICHIGAN
NOVEMBER 6, 2019

Sample	Time	Air Flow Rate SCFM (1)		Concentration PPM (2)		Mass Emission Rate Lbs/Hr (3)		Percent (4) Destruction Efficiency
		Inlet	Exhaust	Inlet	Exhaust	Inlet	Exhaust	
1	08:53-09:53	12,729	14,090	1,972.9	5.1	174.59	0.49	99.71
2	10:40-11:57	13,059	14,247	1,942.9	5.9	173.37	0.57	99.67
3	12:21-13:21	12,779	13,824	1,957.1	6.0	170.89	0.57	99.67
Average		**12,856**	**14,054**	**1,957.6**	**5.7**	**172.95**	**0.54**	**99.68**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg).
(2) PPM = Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
(3) Lbs/Hr = Pounds Per Hour Calculated As Propane
(4) Percent Destruction Efficiency was calculated using the mass rate (Lbs/Hr)

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Table 1 (Section II.1). The results are presented as follows:

III.1 Total Hydrocarbon (VOC) Destruction Efficiency Results (Table 1)

Table 1 summarizes the VOC DE results for the thermal oxidizer as follows:

- Sample
- Time
- Air Flow Rate (SCFM) – Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- VOC Concentrations (PPM) – Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
- VOC Mass Emission Rates (Lbs/Hr) – Pounds Of VOC Per Hour As Propane
- VOC Percent Destruction Efficiency (DE) (Calculated using the mass emission rates)

Both the inlet and exhaust concentrations and mass rates are shown.

The total sampling time for each run was sixty (60) minutes. Testing was suspended during the second run at 11:32 and restarted at 11:49, because the line went down. This was to ensure that sampling only occurred when the process was operating. Sample Runs 1 & 3 ran for a continuous sixty (60) minutes. There were no process operating disturbances during these two samples.

IV. SOURCE DESCRIPTION

Siliconature produces silicone release liners, which are plastic films coated with a silicone resin to impart non-stick properties. The coatings that are applied to the plastic substrate contain silicone polymers suspended in a solution of carrier solvents. The carrier solvents are comprised predominately of a mixture of toluene, heptane, methyl ethyl ketone (MEK) and isopropyl alcohol (IPA).

For the vast majority (>80%) of the silicone release liner products, only one (1) side of the plastic film is coated. The application of the resin solution to the plastic film web occurs within a non-fugitive enclosure (NFE) and is then dried in a series of fully enclosed dryers. The VOC's evolved are captured and directed to a Regenerative Thermal Oxidizer (RTO No. 1) for the control of emissions.

The TANN Model TR2594-3 RTO has a design maximum flow rate of 25,000 SCFM, a minimum retention time of 0.8 seconds and consists of an isolation damper, a variable speed blower, 3 ceramic media tanks with poppet valves and an exhaust stack. The RTO combustion chamber temperature is maintained at or above 1500 °F. The exhausts from the NFE and dryers are combined into a 48 inch I.D. header and directed to the RTO for control and the RTO is exhausted to atmosphere through a 48 inch I.D. stack.

Operation of the coating line is interlocked with the RTO control system such that coating is allowed only when the exhaust is directed through the RTO and the RTO is at or above the minimum required operating temperature.

Source operating data, during the sampling, can be found in Appendix F.

V. SAMPLING AND ANALYTICAL PROTOCOL

The exhaust sampling was conducted on the 48 inch I.D. exhaust stack at a location approximately four (4) duct diameters downstream and approximately six (6) duct diameters upstream from the nearest disturbances. The inlet sampling was conducted on the 48 inch I.D. inlet duct at a location approximately six (6) duct diameters downstream and four (4) duct diameters upstream from the nearest disturbances.

V.1 Total Hydrocarbon (VOC) – The VOC sampling was conducted in accordance with U.S. EPA Method 25A. A J.U.M. Model 3-500 flame ionization detector (FID) analyzer was used to monitor the exhaust. A Thermo Environmental, Inc. Model 51 flame ionization detector (FID) analyzer was used to monitor the inlet. Heated teflon sample lines were used to transport the gases to the analyzers. These analyzers produce instantaneous readouts of the total hydrocarbon concentrations (PPM).

The analyzers were calibrated by system injection (from the back of the stack probe to the analyzer) prior to the testing using propane calibration gases. Span gases of 4,008 PPM (inlet) and 94.9 PPM (exhaust) were used to establish the initial instrument calibrations. Calibration gases of 2,019 PPM & 959.3 PPM (for the inlet) and 50.6 PPM & 30.2 PPM (for the exhaust) propane were used to determine the calibration error of the analyzers. After each sample, a system zero and system injection of 2,019 PPM (for the inlet) and 30.2 PPM (for the exhaust) propane were performed to establish system drift and system bias during the

test period. All calibration gases used were EPA Protocol Calibration Gases. Three (3) samples were collected simultaneously from the inlet and exhaust. Each sample was sixty (60) minutes in duration.

The analyzers were calibrated to the output of the data acquisition system (DAS) used to collect the data from the sources. 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 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. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

Three (3) velocity traverses (at each sample location) were conducted. Moisture was determined for each velocity traverse by employing the wet bulb/dry bulb technique. Also, a grab bag sample was collected at each location and analyzed by Orsat to determine the oxygen (O_2) and carbon dioxide (CO_2) content.

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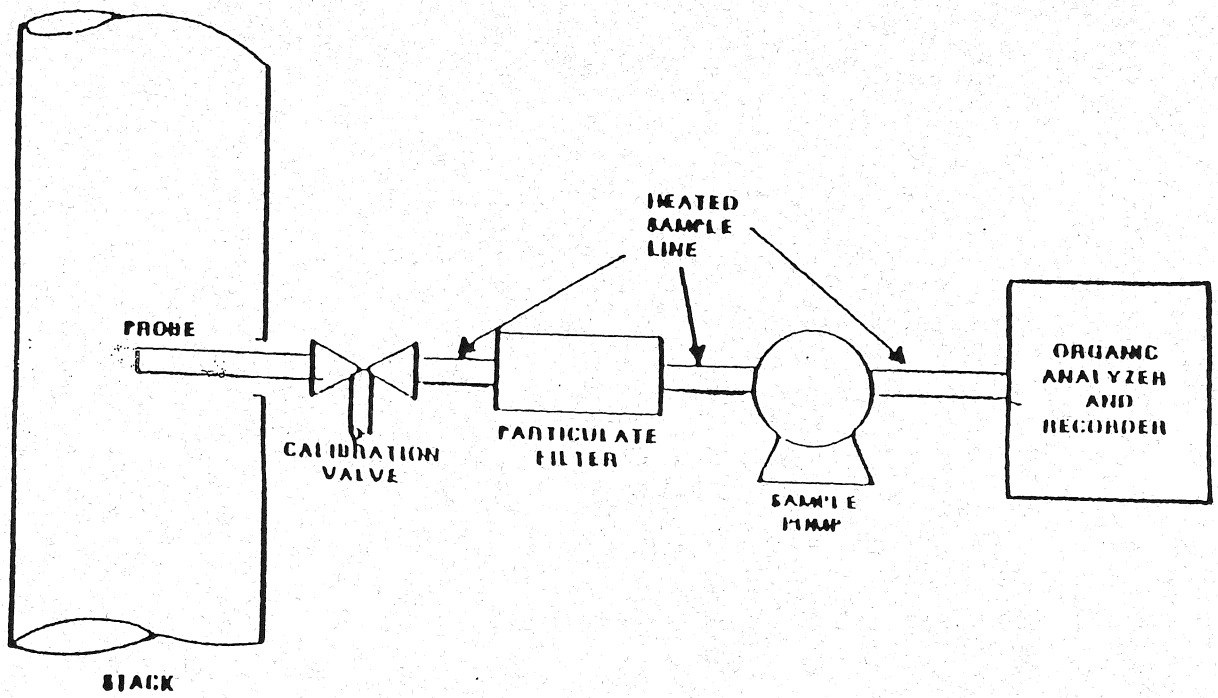

Figure 1

VOC
Sampling Train