Report of...

VOC Emission Sampling

Performed for...

Worthen Coated Fabrics

Grand Rapids, Michigan

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On the...

Thermal Oxidizer

October 11, 2016

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By...

Network Environmental, Inc.
Grand Rapids, MI

I. INTRODUCTION

Network Environmental, Inc. was retained by Worthen Coated Fabrics to conduct VOC (total hydrocarbons) emission sampling at their new facility located at 1125 41st Street, Grand Rapids, MI. The purpose of the study was to document compliance with MDEQ Air Quality Division Permit To Install (PTI) No. 151-15. PTI No. 151-15 has established a 98% 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 October 11, 2016 by Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc.. Assisting in the study were Mr. Roy Davis of Worthen Coated Fabrics, Mr. Frank DeSantis of NESTEC and the operating staff of the facility. Ms. April Lazzaro and Mr. Jeremy Howe of the Michigan Department of Environmental Quality (MDEQ) – Air Quality Division were present to observe the sampling and source operation.

II.1 TABLE 1
VOC DESTRUCTION EFFICIENCY (DE) RESULTS
RTO
WORTHEN COATED FABRICS
GRAND RAPIDS, MICHIGAN
OCTOBER 11, 2016

Sample	Time	Air Flow Rate SCFM (1)		Concentration PPM (2)		Mass Emission Rate Lbs/Hr (3)		Percent Destruction Efficiency (4)
		Inlet	Exhaust	Inlet	Exhaust	Inlet	Exhaust	
1	11:25-12:41	21,320	21,843	1,105.8	12.9	161.09	1.93	98.80
2	13:07-14:07	21,257	21,633	1,100.7	12.7	159.87	1.88	98.82
3	14:45-15:45	21,373	21,774	1,120.2	13.2	163.59	1.96	98.80
Average		**21,317**	**21,750**	**1,108.9**	**12.9**	**161.52**	**1.92**	**98.81**

(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) Destruction Efficiencies were calculated using the mass emission rates (Lbs/Hr)

III. DISCUSSION OF RESULTS

The results of the emission sampling are summarized in Table 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 first run at 12:22 and restarted at 12:38, because the line went down. This was to ensure that sampling only occurred when the process was operating. Sample Runs 2 & 3 ran for a continuous sixty (60) minutes. There were no process operating disturbances during these two samples.

IV. SAMPLING AND ANALYTICAL PROTOCOL

The exhaust sampling was conducted on the 46 inch I.D. exhaust stack at a location approximately six (6) duct diameters downstream and approximately three (3) duct diameters upstream from the nearest disturbances. The inlet sampling was conducted on the 43 inch I.D. inlet duct at a location approximately four (4) duct diameters downstream and two (2) duct diameters upstream from the nearest disturbances.

IV.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 96.49 PPM (exhaust) were used to establish the initial instrument calibrations. Calibration gases of 2,019 PPM & 959.3 PPM (for the inlet) and 50.19 PPM & 29.17 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 29.17 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.

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. 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 during each traverse (3 at each location) and analyzed by Orsat to determine the oxygen (O_2) and carbon dioxide (CO_2) content at each location.

This report was prepared by:

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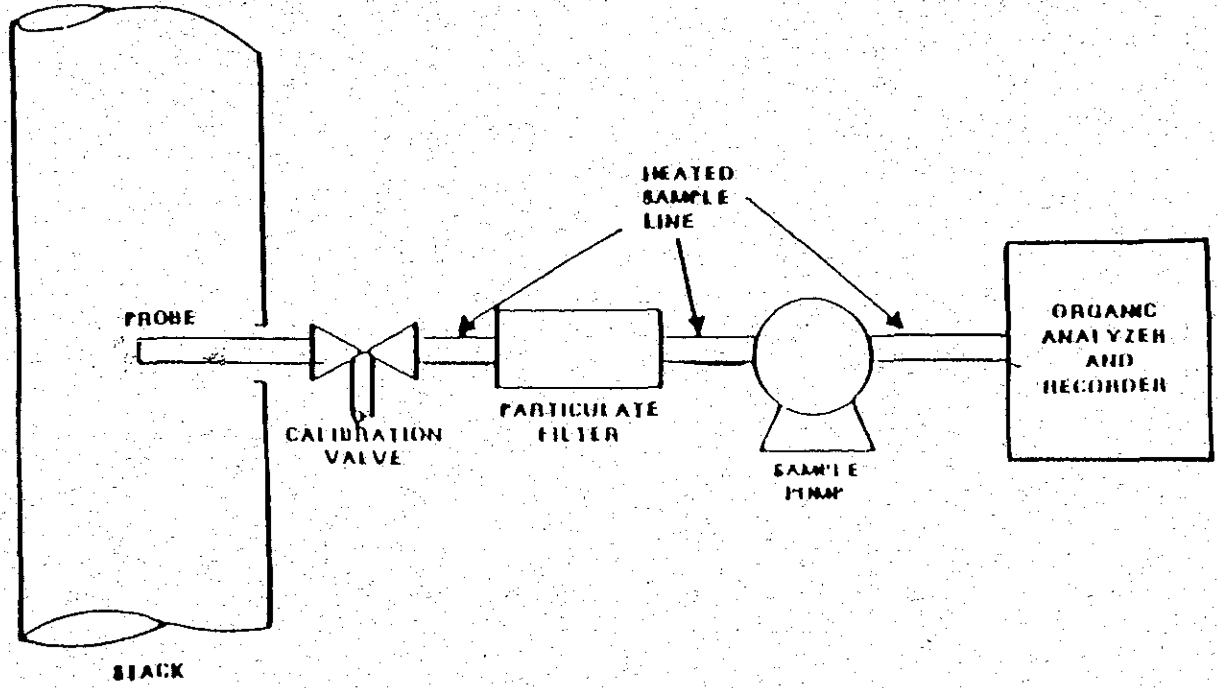

Figure 1

VOC Sampling Train