Report of...

VOC Emission Sampling

Performed for the...

Grandville Printing Company

Grandville, Michigan

On the...

MEGTEC (New) & ADWEST (Old) Oxidizers

October 18-19, 2016

269.02

By...

Network Environmental, Inc.
Grand Rapids, MI

I. INTRODUCTION

Network Environmental, Inc. was retained by the Grandville Printing Company to conduct VOC (total hydrocarbons) emission sampling at their facility located at 4719 Ivanrest Ave., Grandville, MI. The purpose of the study was to document compliance with MDEQ Air Quality Division Permit To Install (PTI) No. 38-16.

There are two (2) Regenerative Thermal Oxidizers (RTO's) at this facility. The MEGTEC (New) RTO is the primary thermal oxidizer. The ADWEST (Old) RTO is the back-up thermal oxidizer. The VOC destruction efficiency (DE) was determined for each of the RTO's. DE was determined by measuring the VOC mass rates (Lbs/Hr) at the inlets and outlets of the RTO's. PTI No. 38-16 has established a 95% destruction efficiency (DE) limit for the oxidizers at this facility.

The DE's of the thermal oxidizers were 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 over the period of October 18-19, 2016 by Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc.. Assisting in the study were Mr. John Gorter of the Grandville Printing Company, Mr. John Pasterski of MEGTEC Systems, Inc. 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
(NEW) MEGTEC RTO
GRANDVILLE PRINTING
GRANDVILLE, MICHIGAN
OCTOBER 18, 2016

Sample[1]	Time	Air Flow Rate SCFM [2]		Concentration PPM [3]		Mass Emission Rate Lbs/Hr [4]		Percent Destruction Efficiency [5]
		Inlet	Exhaust	Inlet	Exhaust	Inlet	Exhaust	
2	13:06-14:06	13,546	18,118	659.4	2.4	61.03	0.30	99.51
3	15:15-16:15	14,226	15,288	834.7	3.6	81.14	0.38	99.53
4	16:48-17:48	15,305	15,238	648.9	2.6	67.86	0.27	99.60
Average		**14,359**	**16,215**	**714.3**	**2.9**	**70.01**	**0.32**	**99.55**

(1) During Sample 1, the inlet VOC concentrations exceeded the calibration span of the test analyzer. The sample was aborted and the analyzer was re-spanned (calibrated) on a higher span range. The data from the first sample is included in Appendix B, but is not displayed in the summary table.
(2) SCFM = Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
(3) PPM = Parts Per Million (v/v) On An Actual (Wet) Basis As Propane
(4) Lbs/Hr = Pounds Per Hour Calculated As Propane
(5) Destruction Efficiencies were calculated using the mass emission rates (Lbs/Hr)

II.2 TABLE 2
VOC DESTRUCTION EFFICIENCY (DE) RESULTS
(OLD) ADWEST RTO
GRANDVILLE PRINTING
GRANDVILLE, MICHIGAN
OCTOBER 19, 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	10:47-11:47	16,451	12,846	325.8	1.1	36.62	0.097	99.74
2	13:28-14:28	18,881	12,736	405.3	0.7	52.29	0.061	99.88
3	14:57-15:57	18,253	13,437	410.2	0.8	51.16	0.073	99.86
Average		**17,862**	**13,006**	**380.4**	**0.9**	**46.69**	**0.077**	**99.83**

(1) SCFM = Standard Cubic Feet Per Minute (STP = 68 ºF & 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 Tables 1 & 2 (Sections II.1 & II.2). The results are presented as follows:

III.1 Total Hydrocarbon (VOC) Destruction Efficiency Results (Tables 1 & 2)

Tables 1 & 2 summarize the VOC DE results for the thermal oxidizers 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.

It should be noted that during Sample 1 on the MEGTEC (New) RTO, the inlet VOC concentrations exceeded the calibration span of the test analyzer. The sample was aborted and the analyzer was re-spanned (calibrated) on a higher span range. The data from the first sample is included in Appendix B, but is not displayed in the summary table.

IV. SAMPLING AND ANALYTICAL PROTOCOL

The sampling locations were as follows;

MEGTEC (New) RTO Exhaust: The exhaust sampling location was on the 32 X 56 inch exhaust stack at a location approximately six (6) duct diameters downstream and approximately three (3) duct diameters upstream from the nearest disturbances.

MEGTEC (New) RTO Inlet: The inlet sampling location was on the 51 inch I.D. inlet duct at a location approximately four (4) duct diameters downstream and two (2) duct diameters upstream from the nearest disturbances.

ADWEST (Old) RTO Exhaust: The exhaust sampling location was on the 42 inch I.D. exhaust duct at a location approximately eight (8) duct diameters downstream and greater than two (2) duct diameters upstream from the nearest disturbances.

ADWEST (Old) RTO Inlet: The inlet sampling location was on the 46 inch I.D. inlet duct at a location approximately three (3) 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 exhausts. A Thermo Environmental, Inc. Model 51 flame ionization detector (FID) analyzer was used to monitor the inlets. 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 (inlets) and 96.49 PPM (exhausts) were used to establish the initial instrument calibrations. Calibration gases of 2,019 PPM & 959.3 PPM (for the inlets) and 50.19 PPM & 29.17 PPM (for the exhausts) propane were used to determine the calibration error of the analyzers. After each sample, a system zero and system injection of 959.3 PPM (for the inlets) and 29.17 PPM (for the exhausts) 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 (for each RTO respectively). 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 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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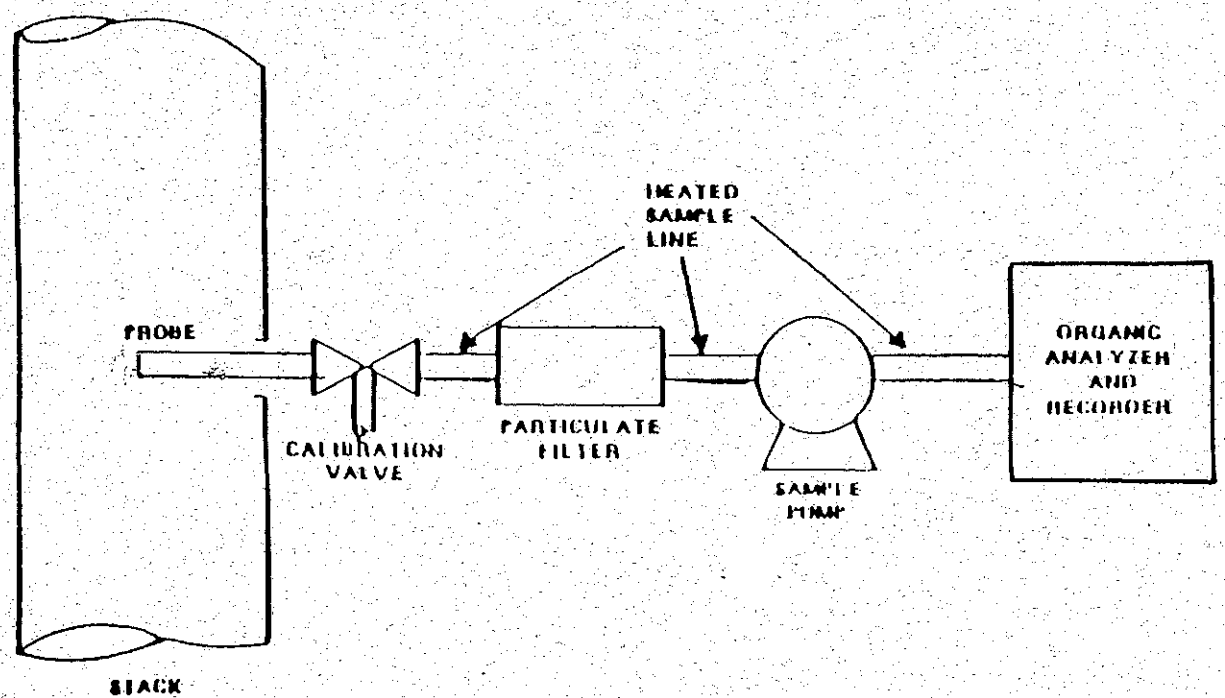

Figure 1

VOC Sampling Train