Report of...

# VOC Emission Sampling

Performed for...

## Packaging Personified, Inc.

Sparta, Michigan

On the...

## Thermal Oxidizer

December 2, 2014

257.04

By...

Network Environmental, Inc.
Grand Rapids, MI

## I. INTRODUCTION

Network Environmental, Inc. was retained by Packaging Personified, Inc. to conduct VOC (total hydrocarbons) emission sampling at their Sparta, Michigan facility. The purpose of the study was to document compliance with MDEQ Air Quality Division Permit To Install (PTI) No. 401-96D. PTI No. 401-96D has established a 96% 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 December 2, 2014 by Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc.. Assisting in the study were Mr. Allen Kupres of Packaging Personified, Inc., Mr. Andrew Nimrod and Mr. Bart VonBargen of Ship & Shore Environmental, Inc. and the operating staff of the facility. Ms. Jennifer Dixon of the Michigan Department of Environmental Quality (MDEQ) – Air Quality Division was present to observe the sampling and source operation.

**II.1 TABLE 1**
**VOC DESTRUCTION EFFICIENCY (DE) RESULTS**
**THERMAL OXIDIZER**
**PACKAGING PERSONIFIED, INC.**
**SPARTA, MICHIGAN**
**DECEMBER 2, 2014**

| Sample | Time [1] | Air Flow Rate SCFM [2] | | Concentration PPM [3] | | Mass Emission Rate Lbs/Hr [4] | | Percent Destruction Efficiency [5] |
|---|---|---|---|---|---|---|---|---|
| | | Inlet | Exhaust | Inlet | Exhaust | Inlet | Exhaust | |
| 1 | 10:30-11:46 | 10,959 | 12,190 | 830.2 | 21.0 | 62.17 | 1.75 | 97.19 |
| 2 | 12:14-13:49 | 11,176 | 12,346 | 851.9 | 20.2 | 65.05 | 1.70 | 97.39 |
| 3 | 14:43-16:00 | 10,948 | 12,210 | 825.7 | 18.7 | 61.77 | 1.56 | 97.47 |
| **Average** | | **11,028** | **12,249** | **835.9** | **20.0** | **63.00** | **1.67** | **97.35** |

(1) Testing was suspended during each run to ensure that sampling only occurred when the process was printing. Total sampling duration for each run was 60 minutes.
(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)

## 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.

Testing was suspended during each run to ensure that sampling only occurred when the process was printing. Total sampling time for each run was sixty (60) minutes. The following table shows the total sample time period for each run and the times during each run that the sampling was suspended and re-started:

| Sample | Total Sample Period | Time Sample Suspended | Time Sample Re-Started |
|---|---|---|---|
| 1 | 10:30-11:46 | 10:44 | 10:50 |
| | | 11:03 | 11:11 |
| | | 11:26 | 11:30 |
| 2 | 12:14-13:49 | 12:26 | 12:45 |
| | | 12:55 | 13:01 |
| | | 13:16 | 13:21 |
| | | 13:36 | 13:41 |
| 3 | 14:43-16:00 | 14:56 | 15:03 |
| | | 15:18 | 15:24 |
| | | 15:38 | 15:44 |

## IV. SAMPLING AND ANALYTICAL PROTOCOL

The exhaust sampling was conducted on the 31 inch I.D. exhaust stack at a location approximately eight (8) duct diameters downstream and approximately four (4) duct diameters upstream from the nearest disturbances. The inlet sampling was conducted on the 32 inch I.D. inlet duct at a location approximately two (2) 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 2,019 PPM (inlet) and 85.78 PPM (exhaust) were used to establish the initial instrument calibrations. Calibration gases of 453.7 PPM & 959.3 PPM (for the inlet) and 30.37 PPM & 50.19 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 959.3 PPM (for the inlet) and 50.19 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.

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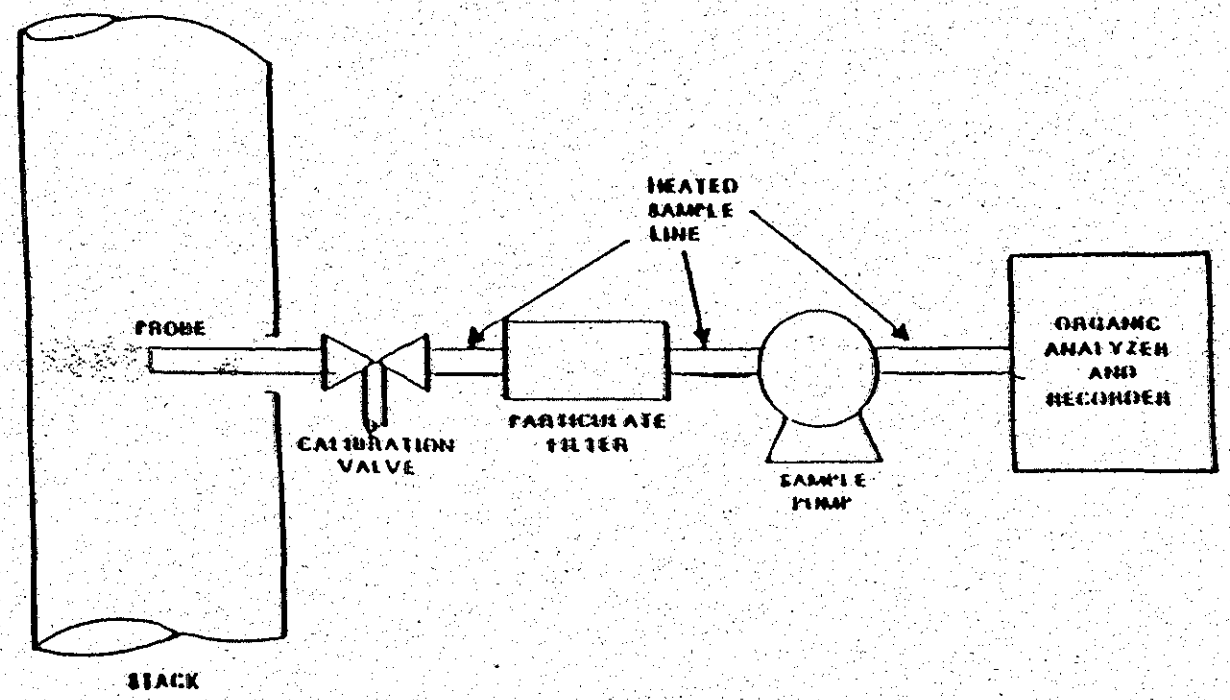


**Figure 1**

**VOC Sampling Train**