

# TEST REPORT

for the

## REGENERATIVE THERMAL OXIDIZER

Controlling 3 Heatset Web Offset Lithographic Presses



Sheridan Publishing Grand Rapids, Inc.

5100 33<sup>rd</sup> Street SE  
Grand Rapids, Michigan

Test Date – May 6, 2021  
Report Date – May 19, 2021

*Prepared by:*

*Environmental Partners, Inc.  
305 Hoover Boulevard, Suite 200  
Holland, Michigan 49423*

**EPI**  
Environmental Partners Inc.

## 1.0 Introduction

Sheridan Publishing Grand Rapids, Inc., in conjunction with Environmental Partners, Inc., has prepared the following air emissions compliance test report for the determination of the Volatile Organic Compound (VOC) destruction efficiency of the Adwest regenerative thermal oxidizer (RTO) used to control the VOC emissions from the dryers of the heat set web offset lithographic printing presses located at 5100 33<sup>rd</sup> St SE, Grand Rapids, Michigan. The compliance test was performed on Thursday May 6, 2021.

The purpose of the test program was to satisfy the requirement of Special Condition V.2 of emission unit FG-Offset Litho, permit to install number 114-13A, issued by the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD). The VOC destruction efficiency results will be used to determine compliance with Special Condition FG-Offset Litho IV.1 which requires a minimum 95% VOC destruction efficiency. The average VOC destruction efficiency determined during the test program was 99.38%.

The test plan and approval letter are included in the report as Attachment 1. The process and control device data are included in the report as Attachment 2. The complete Stack Test Group test report is included in the report as Attachment 3.

## 2.0 VOC Destruction Efficiency Testing Methodologies

Testing of the Adwest RTO was conducted during a single day of production. Testing was conducted utilizing USEPA Methods 1, 2, 3, 4, and 25A as described in the *Code of Federal Regulations, Title 40, Part 60, Appendix A*.

Descriptions of these methods are as follows:

### VOC Destruction Efficiency Test Methods

USEPA Method	Description
1	Sample and Velocity Traverses for Stationary Sources
2	Determination of Stack Gas Velocity and Volumetric Flow Rate
3	Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight
4	Determination of Moisture Content in Stack Gases
25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

Three separate one-hour test runs were performed utilizing USEPA Methods 1 - 4 and 25A. The average oxidizer outlet VOC concentrations were below 50 ppmv as carbon, therefore U.S. EPA Method 25A was the appropriate test method. For each test run, the concentration and mass emission rate of VOC in the oxidizer exhaust was compared to the corresponding concentration and mass input rate of VOC into the oxidizer for the determination of the average VOC destruction efficiency.

Test locations, volumetric flow rates, and concentrations of oxygen, carbon dioxide and moisture in the exhaust streams were determined in accordance with EPA Methods 1 - 4. Velocity measurements were made in accordance with USEPA Methods 1 and 2. Molecular weight and moisture determinations were made in accordance with USEPA Methods 3 and 4.

Gaseous samples were extracted and analyzed continuously and simultaneously at the inlet and outlet of the oxidizer to determine total gaseous organic concentrations during each test run using flame ionization analyzers, in accordance with Method 25A. The sample streams were collected through a heated filter and stainless steel probe, and drawn to the analyzer via heated Teflon sample lines. The sampling line was heated to at least 250°F to prevent condensation of the high molecular weight heatset ink oil. The flame ionization analyzers were pre-calibrated in the applicable ranges. Appropriate mid-range span and zero calibration gases were introduced and the analyzer response was checked between each test run, as well as after the final test run. Calibration gases consisted of certified Protocol 1 concentrations of propane in air. See Attachment 3.

Sixty one-minute averages were totaled and averaged to determine the average VOC concentration for each test run. VOC emission results for each test are presented on a concentration basis (parts per million by volume as propane, ppmv C<sub>3</sub>H<sub>8</sub>), and mass input or emission rate basis (pounds per hour as propane). The VOC destruction efficiency of the regenerative thermal oxidizer for each test run was calculated by comparing the mass rate of VOC measured at the RTO inlet to the mass emission rate of VOC measured in the RTO exhaust. The overall VOC destruction efficiency for the test was determined by calculating the arithmetic average of the three test run efficiencies.

### 3.0 Operating Conditions and Process and Control Device Monitoring

Testing was conducted while the three heatset web offset lithographic presses listed below were operated under normal conditions as specified in the 04/26/21 letter from EGLE AQD:

<u>Emission Unit</u>	<u>Press Manufacturer</u>	<u>Press Model</u>
EU-T9	Timson	32
EU-T47	Timson	32
EU-T54	Timson	32

The following process and control device parameters were recorded during each test run and are included in Attachment 2:

1. RTO operating temperature;
2. Web speeds and widths for each press;
3. Print job names and example signatures;
4. Identification of the ink applied and its VOC content.

#### 4. Summary of Test Results

The results of the compliance test program are summarized below:

Parameter	Run 1	Run 2	Run 3	Average
Inlet VOC Mass Flow Rate (lbs/hr C <sub>3</sub> H <sub>8</sub> )	14.254	18.465	26.430	19.716
Outlet VOC Mass Flow Rate (lbs/hr C <sub>3</sub> H <sub>8</sub> )	0.075	0.113	0.191	0.127
VOC Destruction Efficiency (%)	99.47	99.39	99.28	<b>99.38</b>
Average RTO Operating Temperature (°F)	1675	1680	1685	<b>1680</b>

#### 5. List of Attachments

<u>Attachment</u>	<u>Description</u>
1	Test Plan and Approval Letter
2	Process and Control Device Data
3	Stack Test Group Report

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*Attachment 1*

*Test Plan*  
*And*  
*Approval Letter*

# TEST PLAN

for the

## REGENERATIVE THERMAL OXIDIZER

Controlling 3 Heatset Web Offset Lithographic Presses

**Sheridan**



A CJK Group Company

Sheridan Publishing Grand Rapids, Inc.

5100 33<sup>rd</sup> Street SE  
Grand Rapids, Michigan

March 2021

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**EPI**  
Environmental Partners Inc.



## 2.0 VOC Destruction Efficiency Testing Methodologies

VOC destruction testing of the Adwest RTO will be conducted during a single day of production utilizing USEPA Methods 1, 2, 3, 4, and 25A as described in the *Code of Federal Regulations, Title 40, Part 60, Appendix A*.

Descriptions of these methods are as follows:

### VOC Destruction Efficiency Test Methods

USEPA Method	Description
1	Sample and Velocity Traverses for Stationary Sources
2	Determination of Stack Gas Velocity and Volumetric Flow Rate
3	Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight
4	Determination of Moisture Content in Stack Gases
25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

Three separate one-hour test runs will be performed utilizing USEPA Methods 1 - 4 and 25A. The oxidizer outlet VOC concentrations are expected to be below 50 ppmv as carbon based on the expected high efficiency of the control device and the projected inlet loadings, therefore U.S. EPA Method 25A is proposed for the test method. For each test run, the concentration and mass emission rate of VOC in the oxidizer exhaust will be compared to the corresponding concentration and mass input rate of VOC to the oxidizer in order to determine the average VOC destruction efficiency.

Specific test locations, volumetric flow rates, and concentrations of oxygen, carbon dioxide and moisture in the exhaust streams will be determined in accordance with EPA Methods 1 - 4. Two velocity measurements will be made at each test location for each one hour test run: one just before and one just after each test. Velocity measurements will be made in accordance with USEPA Methods 1 and 2. Molecular weight and moisture determinations will be made in accordance with USEPA Methods 3 and 4.

### 3.0 Operating Conditions and Process and Control Device Monitoring

Testing will be conducted while the three heatset web offset lithographic presses are being operated at maximum routine operating conditions, in accordance with Michigan Air Pollution Control Rule 1003(3) and FG-OffsetLitho Special Condition V.2 of permit to install number 114-13A.

The dryer exhausts from the following heatset web offset lithographic presses are controlled by the RTO:

<u>Emission Unit</u>	<u>Press Manufacturer</u>	<u>Press Model</u>
EU-T9	Timson	32
EU-T47	Timson	32
EU-T54	Timson	32

The following process and control device parameters will be recorded during each test run:

1. RTO operating temperature;
2. Web speeds and widths for each press;
3. Print job names and example signatures;

At the conclusion of the test program, a comprehensive test report will be prepared detailing the methodologies, findings and conclusions of the test program. The report will include all test data, descriptions of test methods, calculation summaries, copies of applicable calibration data, and the process and control device parameters.