

**REPORT OF VOC CAPTURE/DESTRUCTION EFFICIENCY TESTING ON THE
CONCENTRATOR/REGENERATIVE THERMAL OXIDIZER (RTO) ASSOCIATED
WITH FIBERGLASS REINFORCED PLASTIC PRODUCTION LINE (FRPPL) AT THE
AQUATIC FACILITY LOCATED IN THREE RIVERS, MICHIGAN**

Prepared for:

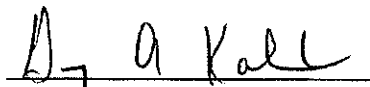
AQUATIC CO.
888 WEST BROADWAY STREET
THREE RIVERS, MI 49093

Prepared by:


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SEPTEMBER 22, 2016
STACK TEST GROUP, INC. PROJECT NO. 16-2851

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RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name Aquatic Co County St. Joseph

Source Address 888 West Broadway City Three Rivers

AQD Source ID (SRN) B2025 ROP No. MI-ROP-B2025-2015 ROP Section No. _____

Please check the appropriate box(es):

Annual Compliance Certification (Pursuant to Rule 213(4)(c))

Reporting period (provide inclusive dates): From _____ To _____

1. During the entire reporting period, this source was in compliance with ALL terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, EXCEPT for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))

Reporting period (provide inclusive dates): From 01/01/2016 To 06/30/2016

1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, EXCEPT for the deviations identified on the enclosed deviation report(s).

Other Report Certification

Reporting period (provide inclusive dates): From 2011 To 2016

Additional monitoring reports or other applicable documents required by the ROP are attached as described:
Subpart WWWW - 5 Year Stack Test Report

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Joseph Hutson Plant Manager 269-279-7461
Name of Responsible Official (print or type) Title Phone Number

Joseph Hutson Signature of Responsible Official 10-11-16 Date

1.0 EXECUTIVE SUMMARY

On September 22, 2016, The Stack Test Group, Inc. performed volatile organic compound (VOC) capture and destruction efficiency testing on the concentrator/RTO associated with the fiberglass reinforced plastic production line (FRPPL) at the Aquatic facility located in Three Rivers, MI. VOC testing was conducted simultaneously on the abatement system (concentrator & RTO) inlet and outlet ducts. Three one-hour tests were conducted on this source for the destruction/capture efficiency. Presented below are the average results of these tests.

FRPPL:

VOC Destruction Efficiency:	95.0 percent
VOC Capture Efficiency:	100.0 percent
Total Overall Efficiency:	95.0 percent

2.0 INTRODUCTION

On September 22, 2016, The Stack Test Group, Inc. performed volatile organic compound (VOC) capture and destruction efficiency testing on the concentrator/RTO associated with the fiberglass reinforced plastic production line (FRPPL) at the Aquatic facility located in Three Rivers, MI. VOC testing was conducted on the concentrator/RTO inlet and outlet ducts simultaneously. Testing was performed to verify that the FRPPL booth meets EPA Method 204 criteria and are providing 100% capture of the VOC's and to calculate the VOC destruction efficiency of the control abatement system associated with this facility. The permit number for this facility is MI-ROP-B2025-2015.

Testing was conducted while Aquatic personnel operated FRPPL at maximum rate and normal conditions. A copy of the operating data is included in Appendix G. The RTO is a Durr Model RL-10-V1-85.

Testing was supervised by Mr. Gary A. Kohnke of the Stack Test Group, Inc. Testing was coordinated by Mr. David Clouser, Director of Safety, Health and Environmental Management. Mr. David Patterson from the Michigan Department of Environmental Quality (MDEQ) was present to witness the testing.

All testing followed the guidelines of U.S. EPA Reference Methods 1 through 4, 25A and 204. This report contains a summary of results for the above mentioned tests and all the supporting field, process, and computer generated data.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 **Exhaust Gas Parameters**

3.1.1 *Traverse and Sampling Points*

Testing was conducted on the inlet and outlet ducts associated with the RTO/concentrator. The number of velocity traverse and sample measurement points for each duct was determined using EPA Method 1.

RTO/Concentrator Inlet:

The oxidizer inlet duct inside diameter measured 72 inches. The test ports were located approximately 12.3 feet (2.06 equivalent diameters) downstream and 90 feet (greater than 2.0 equivalent diameters) upstream of the nearest flow disturbances. Velocity measurements were taken at each of 16 points, 8 points in each of the two ports set at 90° to each other.

RTO/Concentrator Outlet:

The RTO outlet duct inside diameter measured 68 inches. The test ports were located approximately 12 feet (2.8 equivalent diameters) downstream and 4 feet (0.7 equivalent diameters) upstream of the nearest flow disturbances. Velocity measurements and particulate samples were taken at each of 16 points, 8 points in each of the two ports set at 90° to each other.

3.1.2 *Velocity Traverse*

Velocity measurements were performed during each VOC destruction and capture efficiency test in accordance with EPA Method 2. An "S" type Pitot Tube with an attached type "K" thermocouple was used to conduct the velocity traverse.

3.1.3 *Gas Composition*

Gas composition for oxygen, carbon dioxide, and nitrogen was determined employing EPA Method 3. An integrated gas sample was collected during each VOC efficiency test. Gas analysis was conducted using an Orsat analyzer.

3.1.4 *Moisture Content*

The exhaust gas moisture content was determined using EPA Method 4 for all tests. Moisture content was determined by drawing the gas sample through four impingers in the sample train. Volumetric analysis was used to measure the condensed moisture in the first three impingers while gravimetric analysis of silica gel was used to measure moisture collected in the fourth impinger.

3.2 **DESTRUCTION EFFICIENCY TESTING**

3.2.1 *Sample Collection*

Testing on the RTO/concentrator inlet and outlet ducts for the destruction efficiency was performed using U.S. EPA Reference Method 25A. A J.U.M. Model 3-500 and 3-300 Flame Ionization Detector (FID) was used to determine the emission concentrations at each location. A sample was transported through a heated Teflon line from the exhaust

stack and inlet duct to the FIDs which analyzed the samples continuously. The output signal from the FIDs were then recorded at one minute averages throughout the test. Copies of this data may be found in Appendix F.

At the beginning of the test series, the analyzers were calibrated and then checked for calibration error by introducing zero, mid-range and high-range calibration gases to the back of the analyzers. Before and after each individual test run, a system bias was performed by introducing a zero and mid-range propane calibration gas to the outlet of the probes. Calibration gases used were U.S. EPA Protocol 1 certified.

3.2.2 Sample Duration and Frequency

The Method 25A train samples were collected in triplicate with each test lasting sixty minutes in duration.

3.2.3 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 25A. Copies of the FID calibrations are included in Appendix E.

3.3 CAPTURE EFFICIENCY TESTING

U.S. EPA Reference Method 204 criteria were used to evaluate the enclosure in order to qualify it as a permanent total enclosure. Measurements were made of all NDO's and the total surface area of each enclosure to demonstrate that the area of the NDO's is less than 5% of the total surface area of the enclosure, per method 204. The distance from the VOC source in each enclosure to the closest NDO was also measured in order to verify that the VOC source is at least four equivalent diameters away from the nearest NDO, per method 204. Appendix D contains this data for each conformal coating booth.

In addition, the direction of air flow into each enclosure NDO was verified using an Omega CFM Master II anemometer during the stack tests. The booth was tested at 10 minute intervals during one of the three 60 minute stack test periods. The minimum requirement of 200 feet per minute of negative draft was maintained throughout the test series. Note that the coating booth total enclosure met the criteria of EPA method 204 for a permanent total enclosure.

4.0 TEST RESULTS

Presented in this section are the results of this test series. Test results are reported in Tables 4.1 and 4.2. Table 4.1 reports the RTO/concentrator inlet results for the DE testing including stack gas temperature, percent carbon dioxide and oxygen, percent moisture, molecular weight of the stack gas dry and wet, velocity in feet per second (fps), and flow rate in actual cubic feet per minute (acfm), standard cubic feet per minute (scfm), and dry standard cubic feet per minute (dscfm).

Table 4.1 also presents the inlet RTO/concentrator VOC results in parts per million as propane and pounds per hour (lb/hr) as propane.

Table 4.1

VOC Results
Aquatic Co.
Three Rivers, MI
09/22/16

RTO Inlet Duct

Test No:	<u>T1</u>	<u>T2</u>	<u>T3</u>	<u>Avg.</u>
Start Time:	06:25 AM	07:50 AM	09:30 AM	
Finish Time:	07:25 AM	08:50 AM	10:30 AM	
Stack Gas Temperature, degrees F:	72.47	74.44	76.63	74.5
% Carbon Dioxide:	0.0	0.0	0.0	0.0
% Oxygen:	21.0	21.0	21.0	21.0
% Moisture:	1.58	1.49	1.45	1.51
Molecular Weight dry, lb/lb-Mole:	28.84	28.84	28.84	28.84
Molecular Weight wet, lb/lb-Mole:	28.67	28.68	28.68	28.68
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	52.19	52.30	52.16	52.22
Stack Gas Flow Rate, ACFM:	88,525	88,711	88,474	88,570
Stack Gas Flow Rate, SCFM:	85,376	85,240	84,694	85,103
Stack Gas Flow Rate, DSCF/HR:	5,041,609	5,038,215	5,007,975	5,029,266
Stack Gas Flow Rate, DSCFM:	84,027	83,970	83,466	83,821
VOC Results:				
PPM as Propane:	303.9	323.2	358.3	328.5
LBS/DSCF	3.47E-05	3.69E-05	4.09E-05	3.75E-05
LBS/HR as Propane:	177.77	188.76	207.92	191.49

Table 4.2

VOC Results
Aquatic Co.
Three Rivers, MI
09/22/16

RTO Exhaust Stack

Test No:	<u>T1</u>	<u>T2</u>	<u>T3</u>	<u>Avg.</u>
Start Time:	06:25 AM	07:50 AM	09:30 AM	
Finish Time:	07:25 AM	08:50 AM	10:30 AM	
Stack Gas Temperature, degrees F:	110.88	114.63	117.57	114.4
% Carbon Dioxide:	1.0	1.0	1.0	1.0
% Oxygen:	20.0	20.0	20.0	20.0
% Moisture:	2.60	2.33	2.51	2.48
Molecular Weight dry, lb/lb-Mole:	28.96	28.96	28.96	28.96
Molecular Weight wet, lb/lb-Mole:	28.68	28.70	28.68	28.69
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	62.37	61.24	60.49	61.37
Stack Gas Flow Rate, ACFM:	94,378	92,668	91,533	92,860
Stack Gas Flow Rate, SCFM:	85,451	83,356	81,916	83,574
Stack Gas Flow Rate, DSCF/HR:	4,993,777	4,884,806	4,791,575	4,890,053
Stack Gas Flow Rate, DSCFM:	83,230	81,413	79,860	81,501
VOC Results:				
PPM as Propane:	14.0	17.0	19.3	16.8
LBS/DSCF:	1.60E-06	1.94E-06	2.20E-06	1.91E-06
LBS/HR (as Propane):	8.20	9.71	10.83	9.58
Destruction Efficiency, %:	95.39	94.86	94.79	95.01

Table 4.2 presents the RTO/concentrator outlet results in the same manner and format as Table 4.1. The outlet VOC results are presented in terms of parts per million as propane (ppm as C₃H₈) and lbs/hr as propane. Table 4.2 also presents the DE results in terms of percent.

Copies of the calculations used to determine these emission rates may be found in Appendix A. Copies of the field data sheets are presented in Appendix B. Copies of the analytical results are presented in Appendix D. Copies of equipment calibrations are presented in Appendix E.