

FINAL REPORT

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BRUGOLA OEB INDUSTRIALE USA LLC

PLYMOUTH, MICHIGAN

SOURCE TESTING REPORT: EU-HEATTREAT2500

RWDI #2403961

September 6, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by Brugola OEB Industriale USA, Inc. (Brugola) to complete the emission sampling program at their facility located at 45555 Port Street, Plymouth, Michigan. The test program was conducted in order to fulfill Special Condition V.1 of the Michigan Department of Environment, Great Lakes, and Energy Permit to Install (PTI) 5-24 which notes the following:

“Within 180 days after permit issuance, the permittee shall verify VOC emission rates from the quench oil bath portion of EU-HEATTREAT2500 through the determination of a VOC emission factor (in lb VOC / ton of metal) by testing at the owner’s expense, in accordance with Department requirements. Testing shall be performed using an approved EPA Method listed in 40 CFR Part 60, Appendix A....”

The testing consisted of the following:

- VOC Testing for three (3) 60-minute tests for the following sources concurrently:
 - Oil Quench exhaust from the quench conveyor associated with EU-HEATTREAT2500
 - One (1) building exhaust closest to the Oil Quench exhaust from EU-HEATTREAT2500

Testing was completed on July 10, 2024. Below is a summary of the results. The emission factor from this test does not exceed the VOC emission factor of 0.52 lbs/ton metal conservatively assumed in the PTI application.

Executive Table i: Results Summary – EU-HEATTREAT2500

Parameter	VOC Emission Data (ppmv, lb/hr & lb / ton of metal)			
	Test 1	Test 2	Test 3	Average
Oil Quench Exhaust (Conveyor)	57 ppmv 0.12 lb/hr 0.094 lb/ton of metal	60 ppmv 0.10 lb/hr 0.049 lb/ton of metal	60 ppmv 0.11 lb/hr 0.073 lb/ton of metal	59 ppmv 0.11 lb/hr 0.072 lb/ton of metal
Building Ventilation	0.41 ppmv 0.016 lb/hr 0.012 lb/ton of metal	0.46 ppmv 0.013 lb/hr 0.007 lb/ton of metal	0.56 ppmv 0.015 lb/hr 0.010 lb/ton of metal	0.48 ppmv 0.014 lb/hr 0.009 lb/ton of metal
Total Emissions	0.14 lb/hr 0.106 lb/ton of metal	0.11 lb/hr 0.056 lb/ton of metal	0.13 lb/hr 0.083 lb/ton of metal	0.12 lb/hr 0.082 lb/ton of metal



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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by Brugola OEB Industriale USA, Inc. (Brugola) to complete the emission sampling program at their facility located at 45555 Port Street, Plymouth, Michigan. The test program was conducted in order to fulfill Special Condition V.1 of the Michigan Department of Environment, Great Lakes, and Energy Permit to Install (PTI) 5-24 which notes the following:

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The testing consisted of the following:

- VOC Testing for three (3) 60-minute tests for the following sources concurrently:
 - Oil Quench exhaust from the quench conveyor associated with EU-HEATTREAT2500
 - One (1) building exhaust closest to the Oil Quench exhaust from EU-HEATTREAT2500

Testing was completed on July 10, 2024. Below is a summary of the results

1.1 Testing Personnel

Table 1.1.1: Summary of Testing Personnel

Name	Title & Affiliation	Address	Contact Number
Mr. Alfonso Juarez	Plant Manager Brugola OEB Industriale USA LLC	45555 Port Street Plymouth, MI 48187	734.991.6346
Ms. Kim Alfonsi	Vice President Barr Engineering Company	3005 Boardwalk Drive, Suite 100 Ann Arbor, MI 48108	734.775.0953
Mr. Brad Bergeron	Technical Director RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	248.234.3885
Mr. Steve Smith	Project Manager RWDI USA LLC		734.751.9701
Mr. Mason Sakshaug	Supervisor, USA Source RWDI USA LLC		989.323.0355



2 SOURCE AND SAMPLING LOCATIONS

2.1 Process Description

Brugola OEB manufacturers metal fasteners for the automotive industry. EU-HEATTREAT2500 consists of one (1) metal heat treatment line with one (1) pre-washer, one (1) hardener furnace, quench oil bath, one (1) post-washer, one (1) tempering furnace, an emulsion oil/water bath, and two (2) endothermic gas generators. The focus of the VOC emissions from this process are related solely to the Oil Quench process per Special Condition V.1.

2.2 Control Equipment

There are no control devices associated with the program.

2.3 Operating Parameters

The following process information was recorded during testing:

- Production Rate

Eni Simblum 3/A was the quench oil used during the testing, which is the same product detailed in the PTI application. Detailed process information can be found in **Appendix A**.

2.4 Process Sampling Locations

This following table summarizes the sampling locations. Detailed stack information can be found in **Appendix C**.

Table 2.4.1: Summary of Stack Characteristics

Source	Parameter	Diameter	Approximate Duct Diameters from Flow Disturbance	Number of Ports	Flow Points per Traverse	Total Points per Test	Average Stack Temperature
Building Vent Exhaust	VOC / Flow	48"x50"	2 downstream 0.5 upstream	4	4	16	69°F
Conveyor Exhaust	VOC / Flow	12"	9 downstream 1 upstream	2	4	8	104°F



3 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Description of Testing Methodologies

3.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following USEPA Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline or digital manometer. Volumetric flow rates were determined following the equal area method as outlined in US EPA Method 2. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in US EPA Method 3, "Determination of Molecular Weight of Dry Stack Gas". Both Oxygen and Carbon Dioxide were measured using Fyrite chemical analysis. These values were used with stoichiometric calculations to determine molecular weight.

Since all sources were under 200°F, the wet bulb/dry bulb procedure was used to calculate moisture per USEPA Method 4.

3.1.2 Sampling for Volatile Organic Compounds

VOC emission factor verification was determined by simultaneously measuring the oil quench exhaust (conveyor) and building exhaust over the oil quench area of EU-HEATTREAT2500. The measurements were taken continuously following the USEPA Method 25A (total hydrocarbon/methane analyzer). Non-methane organic concentration was determined by subtracting the in-stack concentration of methane (corrected to propane) from the Total Hydrocarbon (as propane) from each of the locations.

The compliance test consisted of a total of three (3), 60-minute tests concurrently on each source.

Regular performance checks on the CEM were carried out by zero and span calibration checks using USEPA Protocol calibration gases. These checks verified the ongoing precision of the monitor with time by introducing pollutant-free (zero) air followed by known calibration gas (span) into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gases were reviewed frequently as an ongoing indication of analyzer performance.



Prior to testing, a 4-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, low, mid and high-level calibration gases directly into the analyzer. The calibration error check was performed to confirm that the analyzer response is within $\pm 5\%$ of the certified calibration gas introduced. At the conclusion of each test run a system-bias check was performed to evaluate the percent drift from pre- and post-test system bias checks. The system bias checks were used to confirm that the analyzer did not drift greater than $\pm 3\%$ throughout a test run.

Zero and upscale calibration checks were conducted both before and after each test run to quantify measurement system calibration drift and sampling system bias. Upscale is either the mid- or high-range gas, whichever most closely approximates the flue gas level. During these checks, the calibration gases were introduced into the sampling system at the probe outlet so that the calibration gases were analyzed in the same manner as the flue gas samples.

A gas sample was continuously extracted from the stack and delivered to each gas analyzer, which measure the pollutant or diluent concentrations in the gas. The analyzers were calibrated on site using EPA Protocol No. 1 certified calibration mixtures. The end of the probe was connected to a heated Teflon sample line, which delivered the sample gases from the stack to the CEM system. The heated sample line maintained the sample gas temperature above 250°F to prevent condensation of stack gas moisture within the line.

3.1.3 Gas Dilution System

Calibration gas was mixed using an Environics 4040 Gas Dilution System. The mass flow controllers are factory calibrated using a primary flow standard traceable to the United States National Institute of Standards and Technology (NIST). Each flow controller utilizes an 11-point calibration table with linear interpolation, to increase accuracy and reduce flow controller nonlinearity. The calibration is done yearly, and the records are included in **Appendix D**. A multi-point EPA Method 205 check was executed in the field prior to testing to ensure accurate gas mixtures. The gas dilution system consists of calibrated orifices or mass flow controllers and dilutes a high-level calibration gas to within $\pm 2\%$ of predicted values. The gas divider is capable of diluting gases at set increments and was evaluated for accuracy in the field in accordance with US EPA Method 205 "*Verification of Gas Dilution Systems for Field Instrument Calibrations*". The gas divider dilutions were measured to evaluate that the responses are within $\pm 2\%$ of predicted values. In addition, a certified mid-level calibration gas within $\pm 10\%$ of one of the tested dilution gases was introduced into an analyzer to ensure the response of the gas calibration is within $\pm 2\%$ of gas divider dilution concentration.



4 RESULTS

Results are summarized in Table 4.1 for the VOC emission assessment and are presented in **Appendix B**. Flowrate data can be found in **Appendix B**. All sampling field notes are provided in **Appendix C**. Calibration data is provided in **Appendix D**. Sample Calculations are provided in **Appendix E**.

Table 4.1: Results Summary – EU-HEATTREAT2500

Parameter	VOC Emission Data (ppmv, lb/hr & lb / ton of metal)			
	Test 1	Test 2	Test 3	Average
Oil Quench Exhaust (Conveyor)	57 ppmv	60 ppmv	60 ppmv	59 ppmv
	0.12 lb/hr	0.10 lb/hr	0.11 lb/hr	0.11 lb/hr
	0.094 lb/ton of metal	0.049 lb/ton of metal	0.073 lb/ton of metal	0.072 lb/ton of metal
Building Ventilation	0.41 ppmv	0.46 ppmv	0.56 ppmv	0.48 ppmv
	0.016 lb/hr	0.013 lb/hr	0.015 lb/hr	0.014 lb/hr
	0.012 lb/ton of metal	0.007 lb/ton of metal	0.010 lb/ton of metal	0.009 lb/ton of metal
Total Emissions	0.14 lb/hr	0.11 lb/hr	0.13 lb/hr	0.12 lb/hr
	0.106 lb/ton of metal	0.056 lb/ton of metal	0.083 lb/ton of metal	0.082 lb/ton of metal

5 PROCESS CONDITIONS

Operating conditions during the sampling were monitored by Brugola personnel. All equipment was operated under normal operating conditions. Process data is provided in **Appendix A**.

Contact was maintained between Brugola/Barr and the sampling team. A member of the RWDI sampling team was in contact with Brugola staff during the entire sampling program.

6 EGLE CORRESPONDENCE

The test plan and all EGLE correspondence is in **Appendix F**.

7 CONCLUSIONS

Testing was successfully completed over July 10th, 2024. All parameters were tested in accordance with referenced methodologies. The emission factor from this test does not exceed the VOC emission factor of 0.52 lbs/ton metal conservatively assumed in the PTI application.

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TABLES



Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
Building Vent Exhaust	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1-4
	3	Oxygen, Carbon Dioxide	U.S. EPA ^[1] Method 3
	3	THC/Methane/NMOC	U.S. EPA ^[1] Method 25A
Conveyor Exhaust	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1-4
	3	Oxygen, Carbon Dioxide	U.S. EPA ^[1] Method 3
	3	THC/Methane/NMOC	U.S. EPA ^[1] Method 25A

Notes:

[1] U.S. EPA - United States Environmental Protection Agency

Table 2: Sampling Summary and Sample Log

Source and Test #	Sampling Date	Start Time	End Time
VOC Testing			
Building Vent Exhaust			
Test #1	10-Jul-24	20:50	21:49
Test #2	10-Jul-24	22:07	23:06
Test #3	10-Jul-24	21:14	0:13
Conveyor Exhaust			
Test #1	10-Jul-24	20:50	21:49
Test #2	10-Jul-24	22:07	23:06
Test #3	10-Jul-24	21:14	0:13

Table 3: Sampling Summary - Flow Characteristics

Building Vent Exhaust		T1	T2	T3	TOTAL AVERAGE
Testing Date		10-Jul-24	10-Jul-24	10-Jul-24	-
Stack Temperature	°F	71	69	68	69
Moisture	%	1.33%	1.26%	1.80%	1.46%
Velocity	ft/s	5.84	4.30	3.99	4.71
Referenced Flow Rate	CFM	5,550	4,159	3,869	4,526
Conveyor Exhaust		T1	T2	T3	TOTAL AVERAGE
Testing Date		10-Jul-24	10-Jul-24	10-Jul-24	-
Stack Temperature	°F	104	104	104	104
Moisture	%	1.85%	1.92%	1.90%	1.89%
Velocity	ft/s	7.33	5.80	6.57	6.57
Referenced Flow Rate	CFM	308	243	275	275

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

TABLE 4: Summary of VOC Emissions - EUHEATTREAT2500

Source: Burgola EUHEATTREAT2500

RWDI Project # 2403961

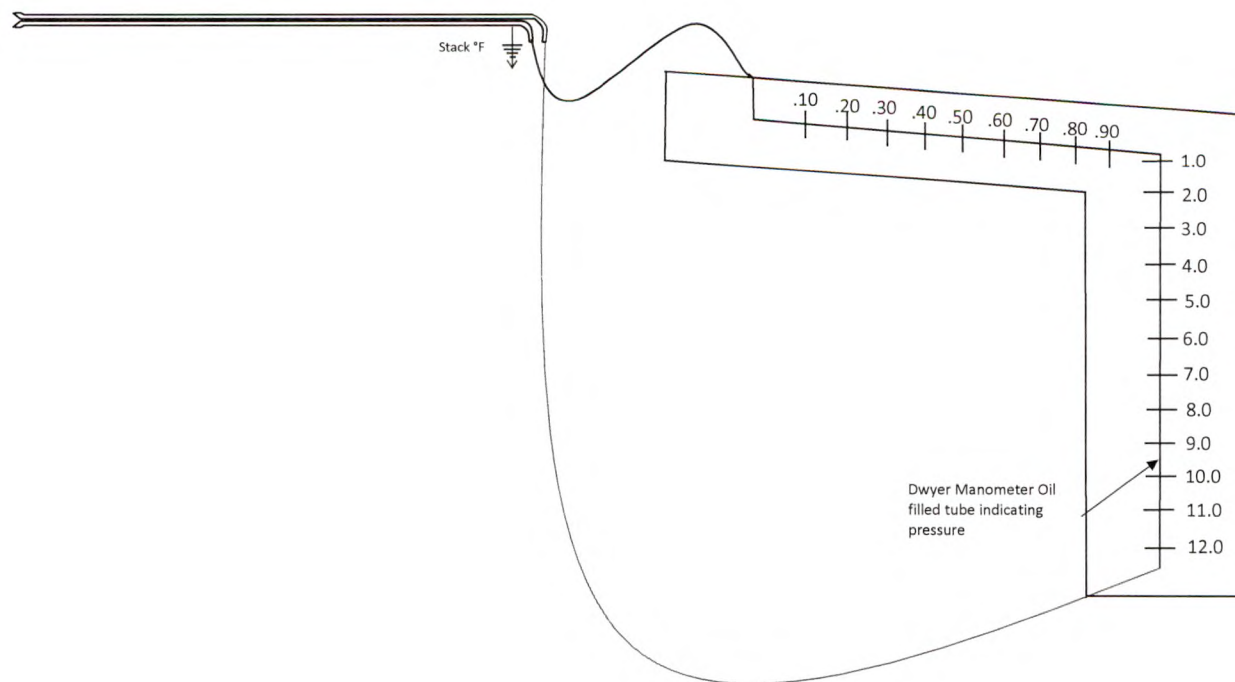
Parameter	Test 1	Test 2	Test 3	Average
Date	10-Jul-24	10-Jul-24	10-Jul-24	--
Start Time:	20:50	22:07	23:14	--
Stop Time:	21:49	23:06	0:13	--
Duration (mins):	60	60	60	--
Average Production Number (kg/hr):	1162	1752	1408	1441
Average Production Number (lb/hr):	2556	3854	3098	3169
Average Production Number (ton/hr):	1.28	1.93	1.55	1.58
Conveyor Emissions				
Outlet VOC Concentration (as Propane) (ppm _d):	57	59	60	59
Outlet VOC Emission Rate (as propane) (lb/hr _d):	0.120	0.095	0.114	0.110
Outlet VOC Emission Factor (as propane) (lb/ton of metal):	0.094	0.049	0.073	0.072
Building Ventilation Emissions				
Outlet VOC Concentration (as Propane) (ppm _d):	0.41	0.46	0.56	0.48
Outlet VOC Emission Rate (as propane) (lb/hr _d):	0.016	0.013	0.015	0.014
Outlet VOC Emission Factor (as propane) (lb/ton of metal):	0.012	0.007	0.010	0.009
Total VOC Emissions				
Outlet VOC Emission Rate (as propane) (lb/hr _d):	0.14	0.11	0.13	0.12
Outlet VOC Emission Factor (as propane) (lb/ton of metal):	0.106	0.056	0.083	0.082

FIGURES





Figure 1: Schematic of USEPA Method 2



USEPA Method 2

Brugola OEB Industriale USA, INC.
EU-HEATTREAT2500

Plymouth, MI

Project #2403961

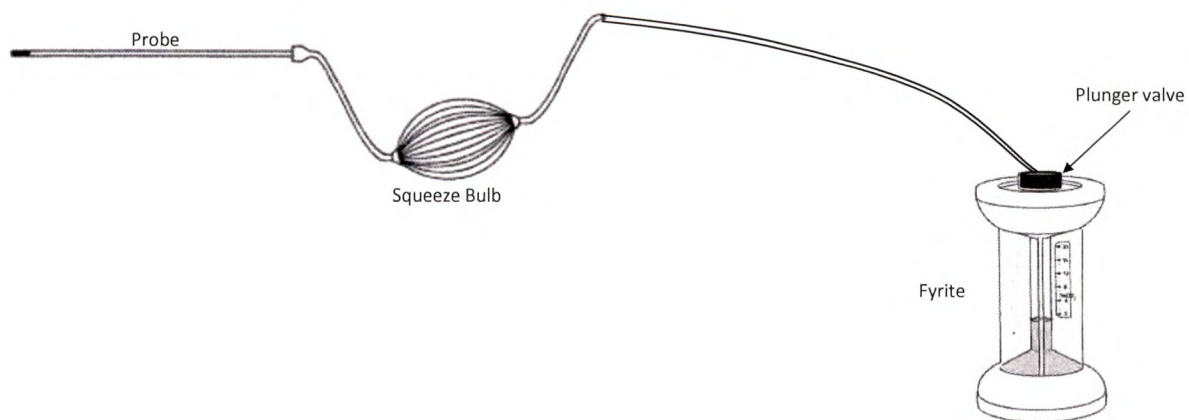
Figure 1: Schematic of USEPA Method 2

Date: July 10, 2024





Figure No. 2: USEPA Method 3 Schematic (Fyrite)



USEPA Method 3

Brugola OEB Industriale USA, Inc.
EU-HEATTREAT2500
Plymouth, MI
Project # 2403961

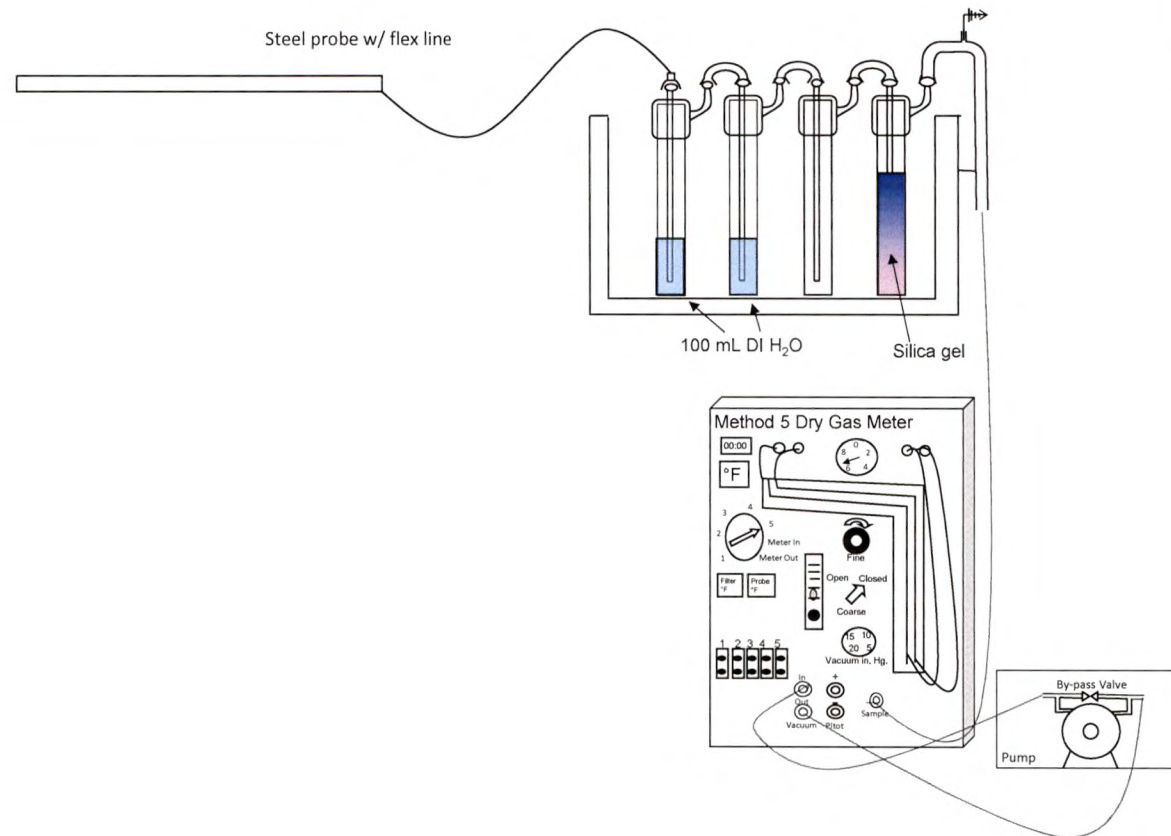
Figure No. 2:
Schematic of USEPA Method 3 (Fyrite)

Date: July 10, 2024





Figure 3: Schematic of USEPA Method 4



USEPA Method 4

Brugola OEB Industriale USA, Inc.

EU-HEATTREAT2500
Plymouth, Mi

Project 2403961

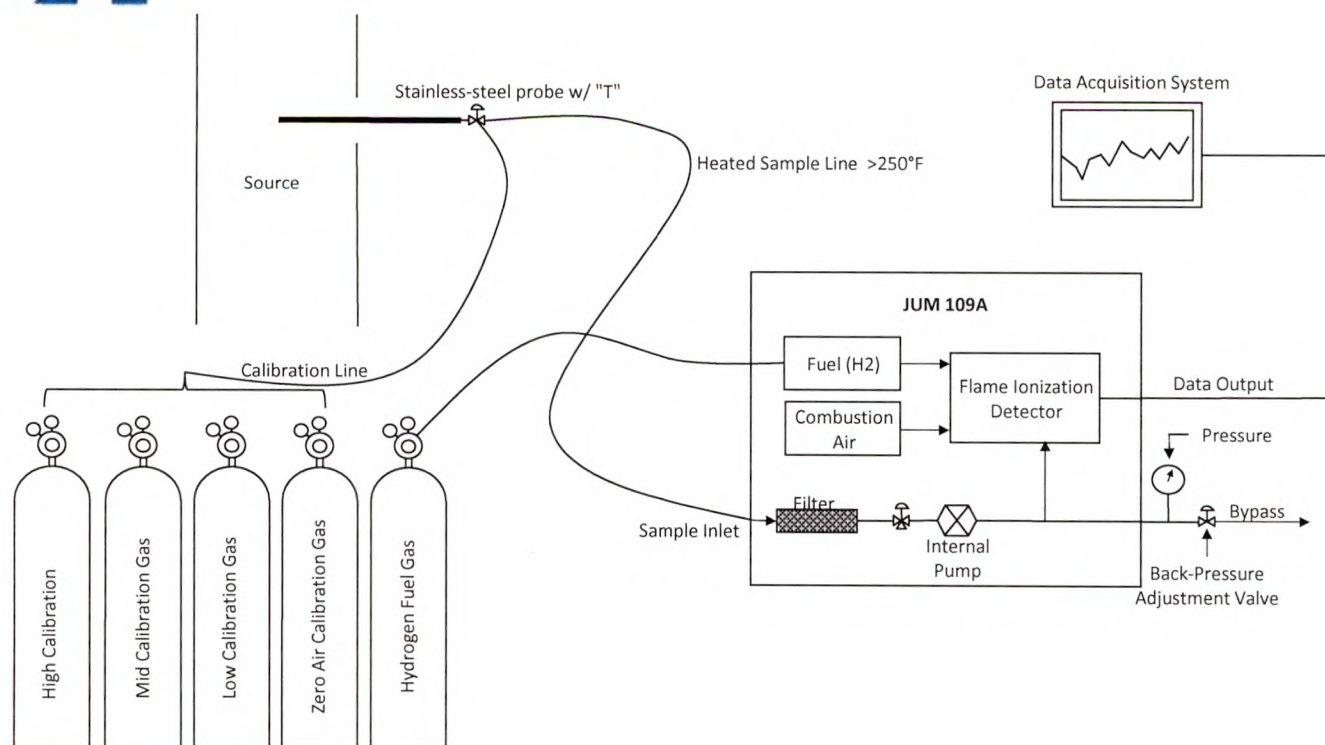
Figure 3: Schematic of USEPA Method 4

Date: July 10, 2024





Figure 4: USEPA Method 25A Schematic



USEPA Method 25A

Brugola OEB Industriale USA, Inc.
EU-HEATTREAT2500

Plymouth, Mi

Project# 2403961

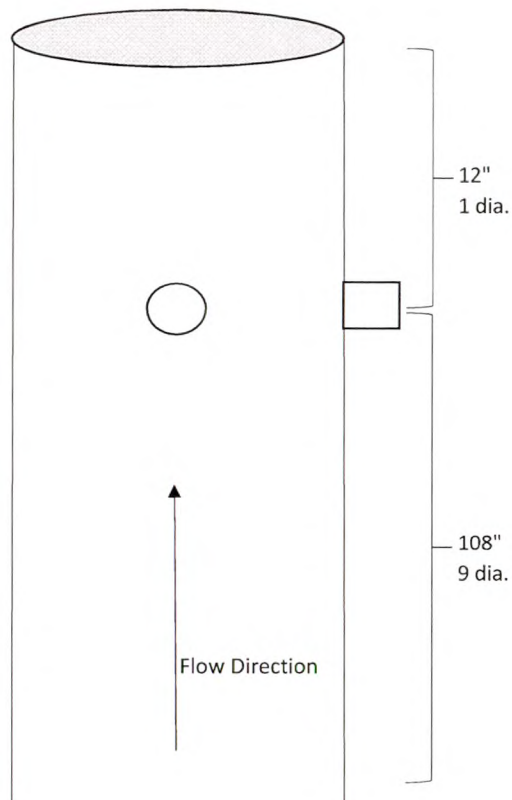
Figure 4: Schematic of USEPA
Method 25A

Date: July 10, 2024



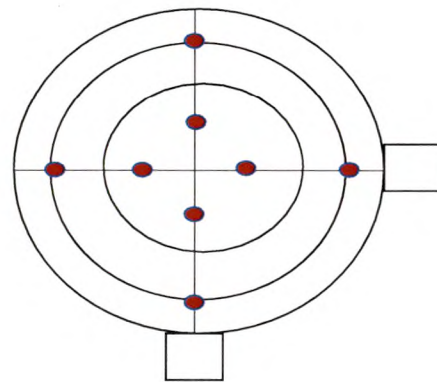


Figure No. 5: Schematic of Conveyor Stack



Diameter: 12

Sampling Points (in.)	
1	0.80
2	3.00
3	9.00
4	11.20



Not to scale

EU-HEATTREAT2500
Brugola OEB Industriale USA, Inc.
Plymouth, MI

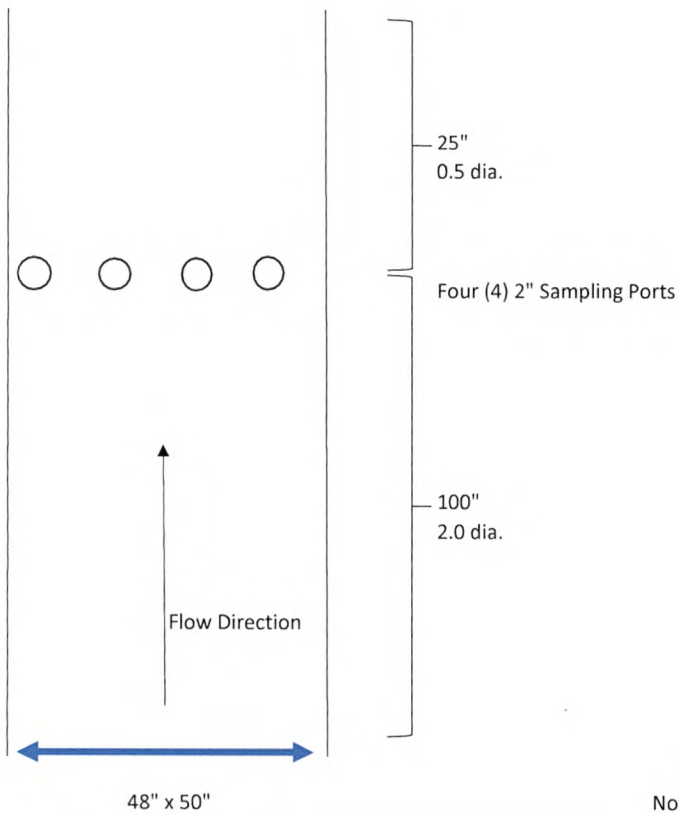
Date:
10-Jul-24

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Diameter: 48" x 50"
Effective Diameter: 49 inches

Figure 6: Building Ventilation Exhaust



Point	Distance from inside Wall (inches)			
	Port 1	Port 2	Port 3	Port 4
1	9.8	9.8	9.8	9.8
2	19.6	19.6	19.6	19.6
3	29.4	29.4	29.4	29.4
4	39.2	39.2	39.2	39.2

Not to scale