IMPACT COMPLIANCE & TESTING

EMISSION TEST REPORT

Report Title: RESULTS FOR THE VERIFICATION OF VOLATILE ORGANIC COMPOUND CAPTURE EFFICIENCY FOR COATING PROCESSES

Report Date: December 22, 2020

Test Date: December 21, 2020

Facility Information	
Name	Pioneer Metal Finishing Industrial Hwy facility
Street Address	24600 Industrial Hwy.
City, County	Warren, Macomb
SRN	N5747

Facility Permit Information	
Permit to Install:	MI-PTI-2-03M

Testing Contractor	
Company Mailing Address	Impact Compliance & Testing, Inc. 37660 Hills Tech Drive Farmington Hills, MI
Phone	(734) 464-3880
Project No.	2000062

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PIONEER METAL FINISHING
WARREN, MICHIGAN

1.0 INTRODUCTION

Pioneer Metal Finishing (Pioneer Metal) operates a metal parts coating facility located at 24600 Industrial Hwy., Warren, Macomb County, Michigan (Industrial Highway facility, State Registration No. N5747). Coating is transferred metal parts using dip and spray application and dried or cured in coating ovens. The coating lines are equipped with a process air collection system that exhausts captured volatile organic compounds (VOC) to a regenerative thermal oxidizer (RTO) for VOC reduction.

Pioneer Metal received Permit to Install (PTI) No. 2-03M (issued February 6, 2015) from the State of Michigan Department of Environment, Great Lakes, and Energy - Air Quality Division (EGLE-AQD) that specifies capture and control system requirements for its coating lines. The PTI requires Pioneer Metal to demonstrate VOC capture efficiency of its three (3) large dip-spin coating lines using the smoke tube test method. At the same time, the facility is required to verify capture efficiency of the two (2) chain-on-edge coating lines (COE 2 and 3) and a stand-alone batch oven.

A Test Plan for the capture efficiency demonstration was originally submitted to EGLE-AQD in May 2014. The capture efficiency demonstration is required to be performed semi-annually and has been performed every six (6) months starting in June 2014. This report is for the test event performed December 21, 2020 by Impact Compliance & Testing, Inc. (ICT) representatives.

The project was coordinated by Justin Engel, EHS Coordinator for Pioneer Metal. EGLE-AQD was notified on November 9, 2020 of the planned capture efficiency testing event.

Questions regarding this Emission Test Report should be directed to:

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1.1 Report Certification

A Renewable Operating Permit Report Certification Form (EQP 5736) signed by the Pioneer Metal Responsible Official (or the Responsible Official's authorized representative) accompanies this report.

This test report was prepared by ICT based on the field sampling data collected by ICT. I certify that the testing was conducted in accordance with the approved test plan unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Tyler J. Wilson
Senior Project Manager
Impact Compliance & Testing, Inc.

2.0 SUMMARY OF RESULTS

VOC capture efficiency for three (3) large dip-spin coating lines was evaluated using the smoke tube test method; observation of the airflow direction of visual smoke at enclosure openings. Smoke observations were also performed for the ovens associated with chain-on-edge coating line 2 (COE2) and chain-on-edge coating line 3 (COE3), and the stand-alone batch oven.

Capture efficiency for the spray booths associated with COE2 and COE3 was also verified using differential pressure measurements.

The results of the capture efficiency evaluation are presented in Table 2.1 below. All enclosures are connected to the VOC collection system and exhibited inward flow as indicated by the observation of air current smoke. The average measured differential pressure for all chain on edge (COE) coating line enclosures satisfied the permanent total enclosure (PTE) criteria of maintaining a differential pressure (vacuum) of at least 0.007 inches of water as compared to the surrounding environment.

Table 2.1 Summary of capture efficiency test results for each coating line

Emission Unit Coating Process	Smoke Tube Verified Inward Flow (Y/N)	Differential Pressure[1] (inches w.c.)
EU-LINE1-MODEL24	Y	NA
EU-LINE4-COE2 (Primer Booth)	Y	-0.039
EU-LINE4-COE2 (Topcoat Booth)	Y	-0.012
EU-LINE4-COE2 (Oven)	Y	NA
EU-LINE5-COE3	Y	-0.013
EU-LINE6-MODEL10[2]	NA	NA
EU-LINE7-MODEL25	Y	NA
EU-LINE13-MODEL26	Y	NA
EUBATCHOVEN	Y	NA

NA Differential pressure measurements were not required or not obtained.
1. Requirement is to maintain a differential pressure of at least 0.007 inches of w.c. (-0.007).
2. EU-LINE6-MODEL10 is no longer operating.

3.0 SOURCE DESCRIPTION

3.1 Coating Line Processes

Pioneer Metal operates a number of spay and dip coating processes:

- Three (3) large dip-spin coating lines that are identified as EU-LINE1-MODEL24, EU-LINE7-MODEL25, and EU-LINE13-MODEL26 in the PTI.

- One (1) chain-on-edge (COE) coating line, identified as EU-LINE4-COE2 in the PTI, that consist of a continuously moving chain, two spray booths and a curing oven. The booths operate as PTEs; the curing oven operates as a non-fugitive enclosure.

- A Sprimag COE spray coating line, identified as EU-LINE5-COE3 in the PTI. The Sprimag line is an enclosed conveyorized coating line used for coating the interior surface of metal parts. The line is operated as a PTE from the coating section through the attached curing oven.

- A batch oven (identified as EUBATCHOVEN in the PTI) that is a stand-alone enclosed oven. Parts are loaded into the oven in bulk on carts, containers, or pallets and the oven is sealed (door secured closed) while in operation.

- Two (2) Tumble Spray coating lines. In these lines the parts are tumbled within a sealed drum while the coating is spray applied with an HVLP applicator. During operation the tumble spray cover is in the closed position and the opening is sealed by the vacuum caused by the evacuation fan. There are no natural draft openings while the unit is in operation.

3.2 Type of Raw Materials Used

The coatings applied by the processes are either for corrosion resistance, adhesion, or surface priming. The high-performance coatings are primarily solvent based, though some waterborne formulations are used. These coatings are received from the manufacturer and diluted (reduced) with organic solvents or water prior to their application.

3.3 Emission Control System Description

Solvent laden air from the individual processes is combined in a mixing plenum near the center of the facility and exhausted to the RTO emissions control system.

The RTO system consists of a variable frequency drive (VFD) fan, three (3) energy recovery columns packed with ceramic heat exchange media and a high-temperature combustion chamber containing natural gas-fired burners. The VFD fan maintains an appropriate vacuum within the process air collection system and directs the collected air to the RTO unit where it is oxidized (combusted) at high temperatures.

The RTO effluent gas is released to atmosphere via a rectangular vertical exhaust stack.

3.4 Process Operating Conditions During the Compliance Testing

During the capture efficiency evaluation on December 21, 2020, the coating processes operated normally. Tumble Spray No. 1 and the Model 10 were not evaluated for VOC capture efficiency because these processes are no longer operating. Tumble Spray Nos. 2 and 3 operated normally throughout the test event. Tumble Spray No. 4 has been removed from the facility completely. All other lines applied solvent-based coating at typical application rates.

The RTO inlet fan was operated normally to maintain an appropriate vacuum within the main air collection header. The fan operated at 60.0 Hertz (Hz) as indicated by the VFD output display, which resulted in a captured gas volumetric flowrate of 17,059 actual cubic feet per minute (acfm) based on airflow measurements performed at the inlet to the RTO fan.

The RTO combustion chamber temperature was set at 1,500°F and ranged between 1,495°F and 1,540°F during the testing as observed by the test crew on December 21, 2020 (based on intermittent observations, not continuous monitoring records).

A summary of the VOC capture and emission control system operating parameters during the test events are presented in Table 3.1 below.

Attachment 1 provides RTO operating records and flowrate measurements for the capture efficiency evaluation period.

Table 3.1 VOC capture and emission control system operating parameters

Operating parameter		
Average fan speed	60.0	Hz
Average RTO inlet vacuum	-1.4	in wc
Avg RTO inlet flowrate, actual	17,059	acfm
Avg RTO inlet flowrate, standard	15,037	scfm
Chamber temperature setpoint	1,500	°F
Chamber temp (min.)	1,495	°F
Chamber temp (max.)	1,540	°F

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A description of the sampling and analytical procedures is provided in the previous Test Plan dated May 21, 2014, which was submitted to and approved by EGLE-AQD. Following

approval of the procedures specified in the Test Plan, a Test Notification was sent to the EGLE-AQD for this test event and capture efficiency testing was performed on December 21, 2020. The capture efficiency demonstration is required to be performed semi-annually and will be repeated in June 2021.

This section provides a summary of the capture efficiency verification procedures.

4.1 Smoke Tube Air Current Observations for Non-Fugitive Enclosures

Ventilation or air current smoke tubes were used to observe the direction of air flow for the air collection systems associated with the three (3) large dip-spin lines (Model 24, 25 and 26), two (2) chain on edge ovens (COE2 and COE3), and a stand-alone batch oven.

The smoke tube was placed in front of each natural draft opening, an adequate amount of smoke was generated manually using the squeeze bulb, and the direction of airflow (into or out of the natural draft opening) was noted. All the natural draft openings for each process were tested and recorded on a data sheet.

Attachment 2 provides field data sheets that were used to identify natural draft openings and record the direction of airflow.

4.2 Differential Pressure Measurements for Permanent Total Enclosures

Enclosure differential pressure measurements for the chain-on-edge coating booths (COE2) and Sprimag Booth/Oven (COE3) was performed using a Heise® PTE-1 Handheld Pressure Calibrator.

Prior to use, the pressure measurement instrument performs a self-zero and calibration procedure. To measure enclosure differential pressure, the low-pressure side of the differential pressure measurement cell was connected by flexible tubing to a port installed on the enclosure wall (or inserted into the enclosure if a measurement port doesn't exist) and the high-pressure side of the measurement cell was open to the surrounding environment. Five (5) individual differential pressure (inches water column) readings were recorded using the 'hold' function on the instrument. The average recorded differential pressure was calculated for each enclosure.

Attachment 3 provides field data sheets that were used to record differential pressure readings.

4.3 Captured Gas Flowrate to the RTO

The captured gas volumetric flowrate was measured at the inlet to the RTO near the beginning and end of the capture efficiency evaluation period on December 21, 2020. The sampling location for the combined coating line exhaust (RTO inlet) is in the 30-inch diameter duct exterior to the facility wall.

Velocity traverse locations for the sampling points were determined in accordance with USEPA Method 1. The exhaust gas velocity pressure and temperature were measured at each sampling location in accordance with USEPA Method 2. An S-type Pitot tube connected to a red-oil manometer was used to determine velocity pressure and a K-type thermocouple mounted to the Pitot tube was used for temperature measurements. The Pitot tube and connective tubing were leak-checked to verify the integrity of the measurement system onsite, prior to the test event.

A summary of the volumetric airflow measurement methods is summarized below:

Method 1	Velocity and sampling locations were selected based on physical duct measurements in accordance with USEPA Method 1.
Method 2	Gas velocity pressure were determined using a Type-S Pitot tube connected to a red oil incline manometer. Exhaust gas temperature will be measured using a K-type thermocouple connected to the Pitot tube.
Method 4	RTO inlet gas moisture was determined by wet bulb/dry bulb temperature measurements.

The velocity measurement field data sheets and flowrate calculations are provided in Attachment 1 with the RTO operating data.

5.0 TEST RESULTS AND DISCUSSION

5.1 Evaluation of Test Results

The results of the capture efficiency evaluation are presented in Table 2.1. All enclosures are connected to the VOC collection system and exhibited inward flow as indicated by the observation of air current smoke, except for the North booth opening of the Model 26, which is currently inoperable and hasn't been used for several years.

The average measured differential pressure for all enclosures classified as permanent total enclosures exceeded -0.007 inches of water (the PTE criteria).

The captured gas (RTO inlet) flowrate measured on December 21, 2020 was comparable to that measured on June 18, 2020 (15,037 scfm compared to 15,930 scfm).

5.2 Variations from Normal Sampling Procedures or Operating Conditions

The testing was performed in accordance with the Test Notification dated November 9, 2020 and the previously submitted Test Plan. During the testing program the coating lines were operated at normal operating conditions, at or near maximum capacity and satisfied the parameters specified in the EGLE-AQD Test Plan Approval Letter.

EU-LINE6-MODEL10 was not evaluated for VOC capture efficiency because it is no longer operating. Pioneer Metal-Industrial Highway representatives have no plans to operate EU-LINE6-MODEL10 in the future.