FGCOATINGLINE ENCLOSURE
VOC CAPTURE EVALUATION

Prepared for:

Ventra Fowlerville, LLC
SRN N7413

ICT Project No.: 2300228
September 6, 2024

IMPACT
COMPLIANCE & TESTING

Report Certification

FGCOATINGLINE ENCLOSURE
VOC CAPTURE EVALUATION

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I certify that the testing was conducted in accordance with the test methods and procedures specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

IMPACT COMPLIANCE & TESTING, INC.

Robert L. Harvey, P.E.
Services Director

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1.0 Introduction

Ventra Fowlerville manufactures plastic parts for automobiles. The molded parts are directed to a coating line (emission unit FGCOATINGLINE) that applies solvent based coatings using robotic applicators. The solvent vapor from the coating booths, flash off areas, and natural gas oven is collected from FGCOATINGLINE and directed to a regenerative thermal oxidizer (RTO) for the reduction of volatile organic compound (VOC) emissions.

The emission unit has been issued Permit to Install (PTI) No. 247-04C by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The conditions of PTI 247-04C issued to Ventra Fowlerville specify:

> *The permittee shall not operate FGCOATINGLINE unless the RTO is installed, maintained and operated in a satisfactory manner. Satisfactory operation of the RTO includes a minimum capture efficiency of 90 percent (by weight), a minimum VOC destruction efficiency of 95 percent (by weight),*
>
> *[T]he permittee shall verify VOC capture and destruction efficiencies from FGCOATINGLINE by testing at owner's expense, in accordance with Department requirements*

Ventra Fowlerville has completed the VOC destruction efficiency testing and contracted Impact Compliance & Testing, Inc. (ICT) to perform the VOC capture efficiency testing and verify whether the FGCOATINGLINE enclosure satisfies the criteria for a permanent total enclosure (PTE) as defined in USEPA Method 204.

The testing was performed August 14, 2024 by Max Fierro and Robert Harvey of ICT and managed by Evan Urbanski, EHS Manager for Ventra Fowlerville. Loren Hicks from the Michigan Department of Environment, Great Lakes and Energy (EGLE) Air Quality Division (AQD) was on-site to observe the evaluation.

2.0 Summary of Test Results and Operating Conditions

2.1 Purpose and Objective of the Tests

PTI No. 247-04C required Ventra Fowlerville to determine VOC capture efficiency for FGCOATINGLINE. VOC capture efficiency was evaluated using the criteria of USEPA Method 204 for a permanent total enclosure.

2.2 Summary of Results

The criteria for a permanent total enclosure are specified in Section 4.0 of this report. In general, the enclosure must have a limited amount of natural draft openings (NDO) and meet certain physical criteria. During operation, the enclosure must be operated with a differential pressure (dP) across the NDO such that air is drawn through the NDO's and directed to the emission control device.

Two NDOs were identified for the FGCOATINGLINE enclosure; one at the inlet of the adhesion promoter (A/P) booth and one at the exit of the oven.

Table 2.1 below presents a summary of the FGCOATINGLINE capture efficiency evaluation.

Table 2.1 Summary of FGCOATINGLINE enclosure evaluation

Total Enclosure Criteria	NDO at A/P Booth Inlet	NDO at Oven Outlet
NDO is > 4 diameters from VOC emissions	No[1]	Yes
NDO area <5% of total surface area	Yes	Yes
Airflow direction is into enclosure	Yes	Yes
dP across NDO is > 0.007" wc	Yes	Yes
dP across NDO; one hour average ("wc)[2]	0.008	0.016
dP across NDO; one hour average ("wc)[3]	0.008	0.019

Table Notes

1. The PTE does not fully satisfy spacing requirements. This was addressed in the stack test protocol that was approved by EGLE-AQD. See Section 4.0 for additional information
2. Measured by ICT using inclined manometer.
3. Data recorded by Ventra Fowlerville Dwyer digital dP gauge.

3.0 Process Description

FGCOATINGLINE consists of:

Adhesion promoter down draft water spray booth and associated natural gas natural gas drying oven. Adhesion promoters are applied using three (3) robots with non-electrostatic applicators.

One down draft water wash spray booth used for the application of basecoat materials. Basecoat(s) are applied using eight (8) robots with electrostatic applicators.

One down draft water wash spray booth used for the application of clearcoat materials. Clearcoat(s) are applied using six (6) robots with electrostatic applicators.

One natural gas-fired cure oven.

Parts are transported through the coating booths, flash off areas, and oven continuously using a chain conveyor. The coating application is robotic / computer controlled to minimize coating use and overspray.

Overspray in the coating booths is controlled using a downdraft water wash system. VOC emissions from FGCOATINGLINE are captured using an air collection system and are directed to the RTO for the reduction of VOC emissions. After passing through the RTO, the air is discharged through a vertical exhaust stack.

RTO system fan speed in hertz (Hz), RTO system duct pressure (inches water column measured in the duct prior to the RTO system fan), and RTO temperature in degrees Fahrenheit (°F) were recorded during the test event and are presented in Table 3.1 and Attachment 1.

Data recorded by ICT during the evaluation is provided in Attachment 1 along with production data provided by Ventra Fowlerville.

Table 3.1 RTO operating data during enclosure evaluation

Date & Time	RTO Temperature (°F)	RTO Fan Speed (Hz)	RTO Inlet Duct Pressure (in. wc)
8/14/2024 11:50-12:50 (average)	1,568	71.5	-1.56

4.0 Sampling and Analytical Procedures

4.1 Summary of Sampling Methods

To classify an enclosure as a permanent total enclosure (PTE), USEPA Method 204 requires the design of the enclosure and the NDOs must satisfy specific physical design criteria in Method 204 Sections 5.1 (NDO spacing) and 5.3 (NDO to enclosure area ratio). Additionally, the enclosure must operate such that the average face velocity through all NDOs is at least 200 feet per minute (fpm) and the direction of airflow through all NDOs is into the enclosure. As an alternative to measuring face velocity, it can be demonstrated that the differential pressure (dP) across the enclosure is at least 0.007 inches water column (in. wc).

4.2 Permanent Total Enclosure Physical Measurements

Due to the size of the parts coated by Ventra Fowlerville, the inlet and outlet NDOs are relatively large, the NDO at the:

- A/P booth inlet is 4-ft by 8-ft (32 square feet) and has an equivalent diameter of 6.4 feet.
- Oven exit is 7-ft by 9-ft (63 square feet) and has an equivalent diameter of 8.9 feet.

Physical measurements for FGCOATINGLINE were performed by ICT. The distance from the inlet NDO to the closest VOC emitting point (the first spray robot) is approximately 10 feet and does not fully satisfy the spacing requirement of four NDO equivalent diameters. This was communicated in the stack test protocol that was approved by EGLE-AQD.

The NDOs make up a small portion of the overall surface area of the entire FGCOATINGLINE enclosure. The enclosure is irregularly shaped but was characterized by three different rectangular sections measuring 300 ft, 200 ft, and 50 ft in length with a wall height of 8 ft. This results in a surface area of 8,800 square feet for the walls, not including the floors and ceilings. The total open area of the NDOs (95 square feet) is approximately 1% of the calculated enclosure surface area and well within the PTE requirements.

4.3 Permanent Total Enclosure Operating Criteria

Ventra Fowlerville has installed digital gauges manufactured by Dwyer to monitor the differential pressure across each NDO. During the August 2024 test event, ICT installed an inclined red-oil manometer in parallel with the permanent gauges to verify the differential pressure readings.

Neither NDO is readily accessible during coating line operation. To observe airflow direction:

- Colored Teflon tape streamers were affixed to the NDO at the A/P booth inlet and the streamers (drawing into the booth) observed through the A/P booth window.

- Air current smoke was introduced into the transport tunnel downstream of the oven exit NDO and smoke direction (towards the oven section) was observed through the window in the access door.

Periodically during the test period (at 10-15 minute intervals) observations of the streamers and air current smoke were recorded to verify the direction of airflow into the enclosure.

Table 4.1 addresses each criterion of Method 204.

Attachment 1 provides data sheets from the test event and FGCOATINGLINE production data provided by Ventra Fowlerville.

Attachment 2 provides enclosure drawings, measurements, and calculations.

Attachment 3 provides photographs from the August 2024 evaluation.

4.4 Deviations from Reference Test Methods

The distance from the inlet NDO to the closest VOC emitting point (the first spray robot) is approximately 10 feet and does not fully satisfy the spacing requirement of four NDO equivalent diameters. All other PTE criteria specified in USEPA Method 204 were satisfied.

Table 4.1 Permanent total enclosure criteria compared to FGCOATINGLINE design and operation; Ventra Fowlerville

Method 204 Criteria		FGCOATINGLINE Enclosure Design
5.1	Any NDO shall be at least four equivalent opening diameters from each VOC emitting point	Enclosure has two NDOs that are 6.4 ft and 8.9 ft diameter openings for the inlet and outlet, respectively. The inlet NDO is 10 ft from the nearest VOC source (A/P spray applicator) and does not satisfy this requirement. The outlet NDO is greater than 36 ft from the interior of the oven and satisfies this requirement
5.3	The total area of all NDOs shall not exceed 5 percent of the surface area of the enclosure's walls, floor, and ceiling	The calculated NDO to enclosure area ratio (NEAR) is considerably less than 5%.
5.4	(a) The average facial velocity (FV) of air through all NDOs shall be at least 3,600 m/hr (fpm). Alternatively, a differential pressure across the enclosure of 0.007 in. H_2O corresponds to a to a FV of 3,600 m/hr (200 fpm).	Differential pressure readings from the permanently-installed digital dP gauges (and verified with an inclined manometer) verify an average differential pressure greater than 0.007 in. H_2O.
5.4	(b) The direction of airflow through all NDOs shall be into the enclosure.	Inward air flow for both NDOs was verified using streamers or air current smoke tubes.
5.5	All access doors and windows whose areas are not included in Section 5.3 and are not included in the calculation in Section 5.4 shall be closed during routine operation of the process.	All other openings into the enclosure were closed during the test event