# OVEN SOLVENT LOADING TEST REPORT (EU-THREEWET)

## Flint Assembly - General Motors, LLC

Permit number Mi-ROP-B1606-2020

SRN: B1606

Testing Date: August 15, 2023

**Submitted September 29, 2023**

to

**Robert Byrnes &**
**EGLE AQD Technical Programs Staff**
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# APPENDICIES

## Executive Summary

General Motors, LLC Flint Assembly (GM) retained BASF to conduct Oven Solvent Loading (OSL) for the GM Flint Assembly on August 15, 2023, at the BASF Corporation Laboratory at 26701 Telegraph Rd, Southfield, MI 48033. GM is proposing ambient Basecoat Primer Heated Flash-off temperature within the three-wet paint coating process. The OSL test results will be used to calculate volatile organic compounds (VOCs) emissions from the three wet (EU-THREEWET) painting process. The resulting capture efficiency is 79.7% for the clearcoat booth, and 20.3% for the clearcoat oven. Capture efficiency from prior 2016 OSL testing was 79.0% for the clearcoat booth, and 20.9% for the clearcoat oven.

# Introduction

General Motors, LLC Flint Assembly (GM) is proposing ambient Basecoat Primer Heated Flash-off temperature within the three-wet paint coating process. GM retained BASF to conduct Oven Solvent Loading (OSL) for the GM Flint Assembly facility located at G-3100 Van Slyke Road, Flint, MI 48551. The applicable permit number is Renewable Operating Permit, Permit No. MI-ROP-B1606-2020. The OSL test was conducted on August 15, 2023, at the BASF Corporation Laboratory located at 26701 Telegraph Rd, Southfield MI 48033.

## Source and Test Program Contacts

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# Summary of Results

The results from the OSL testing (Approved Test Plan, Appendix A) were used to calculate capture efficiency for the proposed ambient Basecoat Primer Heated Flash-off temperature. The resulting capture efficiency is 79.7% for the clearcoat booth, and 20.3% for the clearcoat oven.

The Flint OSL Final Test Report can be found in Appendix B, and handwritten laboratory worksheets in Appendix C. The enclosed Test Report includes the panel weights and records of film build data. Additional testing equipment information, including the equipment calibration and quality assurance checks and certification of scale accuracy are in Appendix D. There were no rejected, voided, or repeated runs/tests.

# Appendix A

OSL Test Plan Details

GPPC
Global Paint & Polymers Center

# MATERIAL TEST REQUEST 09PT8584

**Resp. Engineer:** Brittany Venglarcik, +1 248-496-9593

**Issue Date:** May 19, 2023

**Required Date:** August 29, 2023

**Suppliers Issued to:** BASF - Chris Carlstein , 248-948-2564

**Plants:** GMNA-Flint

**Material(s) Under Test:** 998 - 6329* - BASF - E211 / E54 [Basecoat]
998 - 4515 - BASF - E10CG081/N52CG081 (2K4) [Clearcoat]
998 - 6328 - BASF - U338 Line [Primer]

**Test Purpose Summary:**
Conduct oven solvent loading test for Flint plant using 3Wet Semi-compressed technology.

**Test Purpose/Description:**
Perform weight loss measurements in triplicate and defined in attached to simulate Flint processing.

Use paint materials at target film builds
Medium gray primer - 0.9 mils
2 basecoat colors
- Summit White - 1.0 mils
- Sharkskin Metallic - 0.6 mils
Clearcoat - 2.0 mils

Use testing protocol ASTM D6266 for waterborne coatings and ASTM D5087 for solventborne coatings.

See attached matrix for OSL details.

**Test Results:**
N/A

**Panel Testing Description:**
* See attached sheet(s) for specific panel preparation, bake and testing information.

**Additional Notes:**
* Film builds are to be nominal unless otherwise specified.
* Film builds are to be nominal unless otherwise specified.
* Provide report detailing all test results along with panels for review to responsible engineer.
* Document ALL assumptions used for this MTR.
* Document equipment and application parameters used for this MTR.

## New Flint Primer / Topcoat Line

| | BCP Ext Spray | Observation | Air Seal | BCP Htd Flash | Cool down | Vestibule | BC Int / Ext Spray | BC Int / Ext Spray | Observation | Air Seal | BC Heated Flash | Cool down | Vestibule | Int CC Spray | Ext CC Spray | Observation | Ambient Flash | Oven |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length (ft) | 37.5 | 25 | 5 | 80 | 30 | 5 | 75 | 55 | 25 | 5 | 65 | 15 | 5 | 50 | 55 | 25 | 117 | N/A |

Line Rate 14.72 Ft/min

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time in Zone (Minute) | 2.5 | 1.70 | 0.34 | 5.43 | 2.04 | 0.34 | 5.10 | 3.74 | 1.70 | 0.34 | 4.42 | 1.02 | 0.34 | 3.40 | 3.74 | 1.70 | 7.95 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Primer** | 4.54 | 5.4 | 13.2 | 4.4 | 1.0 | 17.1 | 25 | Time (mins |
| | ambient | 140 F | ambient | 140 F | | ambient | 265 | Temp (F) |
| | $W_0/W_1$ | $W_2$ | $W_3$ | $W_4$ | | $W_5$ | $W_6$ | $W_7$ |

Testing Ambient
PR flash (100° F)

| | | | | | | |
|---|---|---|---|---|---|---|
| **Basecoat** | 10.9 | 4.4 | 1.0 | 17.1 | 25 | Time (mins |
| | ambient | 140 F | | ambinet | 265 | Temp (F) |
| | $W_0/W_1$ | $W_2$ | | $W_3$ | $W_4$ | $W_5$ |

| | | | | |
|---|---|---|---|---|
| **Clearcoat** | 16.8 | 25 | Time (mins |
| | ambient | 265 | Temp (F) |
| | $W_0/W_1$ | $W_2$ | $W_3$ |

## Oven Solvent Loading for Flint Assembly – (Move to ambient PR flash, May 2023)

### Primer Surfacer (Generic Gray WA#225A)

$W_0$ = weight of bare panel/foil

Apply primer surfacer
$W_1$ = Weight of panel + primer surfacer (immediately after spraying as practical)

Flash for **4.54** minutes @ ambient temp.

$W_2$ = Weight of primed panel/foil after ambient flash

Flash for **5.43** minutes @ **100˚F**.

$W_3$= Weight of primed panel/foil after **100˚F.**

Flash for **13.2** minutes @ ambient temp.

$W_4$ = Weight of primed panel/foil after ambient flash

Flash for **4.4** minutes at **140°F**. Remove panel from oven and cool down for **1** minute.

$W_5$ = Weight of primed panel/foil after heated flash and cool down.

Flash for **17.1** minutes @ ambient temp

$W_6$ = Weight of pane/foil after ambient flash

*Determine the amount of water in the film by spraying extra panels and analyze using Karl Fisher or GC*

**Bake for 25 minutes at 265°F**

Let panel cool

$W_7$ = Weight of cooled, cured primed panel/foil

**Waterborne Basecoat (Summit White - WA#8624 & Sharkskin Metallic - WA#130H)**

$W_0$ = weight of bare panel/foil

Apply basecoat

$W_1$ = Weight of panel/foil + basecoat (immediately after spraying as practical)

Flash for **10.9** minutes @ ambient temp.

$W_2$ = Weight of basecoated panel/foil after ambient flash

Flash for **4.4** minutes @ **140°F**. Remove from oven and cool **1** additional minute.

$W_3$ = Weight of basecoated panel/foil after heated flash

Flash for **17.1** minutes at ambient

$W_4$ = Weight of basecoated panel/foil after ambient flash

*Determine the amount of water in the film by spraying extra panels and analyze using Karl Fisher or GC*

**Bake for 25 minutes at 265°F**

Let panel cool

$W_5$ = Weight of cooled, cured basecoated panel/foil

**Solventborne Clearcoat - E10CG081 / N52CG081**

$W_0$ = weight of bare panel/foil

Apply clearcoat

$W_1$ = Weight of panel/foil + clearcoat (immediately after spraying as practical)

Flash for **16.8** minutes at ambient conditions

$W_2$= Weight of clearcoated panel/foil after flash

**Bake for 25 minutes at 265°F**

Let panel cool

$W_3$ = Weight of cooled, cured clearcoated panel/foil