



Fuel Resistance Testing of Organic Coatings on Metal Substrates

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This procedure describes a method of testing the corrosive effects of various test fuels and vapors on metal substrates with protective coatings for components that are in continuous contact with fuel.

1.2 Applicability. Typical applications are painted zinc nickel plated steel used on fuel components such as fuel tanks and fuel filler pipes. The test fuels include flex fuels and Bio-Diesel.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D610 ASTM D714

2.2 GM Standards/Specifications.

GMW15282

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Water Tanks. Each water tank shall be capable of holding a minimum vertical water level of 130 mm, with a lid providing pressure relief.

3.2.2 Heating Equipment. Associated equipment and controls shall be capable of maintaining the water in one tank at a uniform temperature of $60\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$, and the water in another tank at a uniform temperature of $90\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.

3.2.3 Sample Containers. Leak proof containers, such as 1 L high density polyethylene bottles from Fisher Scientific or equivalent, shall be suitable for holding 500 mL of test fuel and samples.

3.2.4 Measuring Devices. The measuring devices shall be capable of measuring 500 mL of test fuel.

3.2.5 Scale. The scale shall be suitable for weighing a capped 1 L bottle containing 500 mL of test fuel and a material sample.

3.3 Test Vehicle/Test Piece. The coatings being tested shall be applied to panels of the substrate material which have been cut to approximately 35 mm by 178 mm before coating.

3.4 Test Time.

Calendar time: 182 d

Test time: 4368 h

Inspections are conducted every 2 weeks.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Test technician familiar with test facilities and equipment.

4 Procedure

4.1 Preparation.

4.1.1 Scribe an "X" with 13 mm long scribes on the top and bottom of each panel, going through all coatings to the substrate per GMW15282. See Appendix A, Figure A1.

4.1.2 On a detergent-washed and air-dried test panel, form an Olsen Cup at both ends of the panel (see Figure A1) to a depth of 7.5 mm with the fuel exposed surface on the tension side. The inside diameter of the lower die shall be 25 mm, and the ball diameter and interchangeable upper die diameter shall be as shown in Table 1 for the metal thickness specified.

Table 1: Olsen Cup Parameters

Metal Thickness ^{Note 1} (mm)	Ball Diameter (mm)	Upper Die Diameter (mm)	Cup Depth ^{Note 2} (mm)
0.75 to 1.50	22.2	25.0	7.5
1.52 to 2.30	22.2	28.6	7.5

Note 1: The minimum base metal thickness does not include the coating film thickness.

Note 2: Cup Depth is defined as the actual ball travel during time of formation of the cup (from under surface of flat panel to under surface of cup).

4.1.3 General Motors Global Propulsion Systems (GPS) fuels (Table 2) can be obtained by contacting GM Global Propulsion Systems Materials Engineering. Use the most up-to-date suffix level for each fuel, per the GM Global Propulsion Systems Materials Engineer. Fuels must be purchased from GM-approved suppliers.

Table 2: Test Fuels

Test Fuel Number ^{Note 1}	Test Fuel Name
GMPT-6-005	TF1
GMPT-6-006	TF2
GMPT 6-019	Oxidized Gasoline
GMPT-6-004	Fuel C
GMPT-6-030	M15
GMPT-6-020	Corrosive 2-Phase E10
GMPT-6-022	Corrosive E22
GMPT-6-023	E85 Low pH
GMPT-6-037	E100 Conductivity
GMPT-5-020	Bio-Diesel

Note 1: Use the most up-to-date suffix level for each fuel, per the GM Global Propulsion Systems Materials Engineer.

4.2 Conditions.

4.2.1 Environmental Conditions.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.