



Internal Stress Cracking in Polyethylene Tanks

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 is used to determine the ability of a polyethylene tank to resist chemically induced stress.

1.2 Applicability. This test is intended for polyethylene tanks that are under pressure (e.g., fuel tank, diesel exhaust fluid tank).

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3086

GMW14106

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 Air line or other equipment capable of introducing pressure into tank.

3.2.2 Pressure gage.

3.2.3 Fixture capable of restraining a production tank.

3.2.4 Environmental chamber large enough to contain the tank and the fixture, as well as maintain the defined temperature within the specified range.

3.3 Test Vehicle/Test Piece. Test shall be performed on "as molded" production tanks with a minimum of 48 hours of aging at 23 ± 2 °C

3.4 Test Time. Test hours shall be specified within the applicable component performance specification, i.e. GMW3086.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Personnel performing testing should have appropriate, documented, training and skill sets as deemed appropriate by the user of this standard.

4 Procedure

4.1 Preparation. All connections/openings shall be sealed well enough to withstand the required pressures throughout the test without leaking.

4.2 Conditions.

4.2.1 Environmental Conditions.

4.2.1.1 Test Temperature. Environmental chamber shall be stabilized at a test temperature of 50 ± 2 °C.

4.2.1.2 Test Fluid. The test fluid shall consist of a solution of 10% alkanol polyglycol ether, non-ionic wetting agent (i.e., Igepal, Laventin W from BASF, etc.) by weight in deionized water.

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.

4.2.2.1 The duration of the test is specific to the tank type per GMW3086.

4.3 Instructions.

4.3.1 Restrain the tank in a fixture in vehicle position, with representative production tank straps. For a strapless design, production intent fasteners must be used with restraint fixture to achieve in-vehicle positioning.

4.3.2 Place the tank and restraining fixture into the heated chamber.

4.3.3 Fill the tank completely with the specified test fluid.

4.3.4 Allow the test fluid to reach the specified temperature.

4.3.5 Pressurize the tank to (30 -0/+5) kPa. This pressure must be maintained throughout the test.

4.3.6 Monitor the pressure for the number of hours identified by GMW3086 for fuel tanks.

4.3.7 At end of test visually examine all interior and exterior surfaces and joints for evidence of stress whitening or cracking.

4.3.8 Microtome all areas of concern, including areas of stress whitening and suspected crack initiation sites.

5 Data

5.1 Calculations.

5.2 Interpretation of Results.

5.2.1 Results shall be reported and included regarding any evidence of:

- Visible leaks during or after the test at 30 kPa,
- Bursting of the tank,
- Delamination,
- Cracks that initiate or terminate at either surface layer. This is exclusive of molding defects within a tank layer.

5.2.2 Review results with GM Engineering for approval.

5.3 Test Documentation. Documentation of setup must include the test fluid utilized and the total test time. Results will be included in GMW14106 compliance reports. Documentation of the results must include:

- Visual inspection including confirmation of leaking, if applicable,
- Pressure measurement at end of test,
- Microtomes, per 4.3.8, if applicable,
- Photographs, including but not limited to:
 - a. Complete tank in restraining fixture,
 - b. Macro view of suspect areas on both the interior and exterior of the tank,
 - c. Enhanced/magnified view of suspect areas, with areas of concern clearly identified.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices.