



Fuel Tank Slosh Durability

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. To determine the durability of a fuel tank assembly subjected to the effects of sloshing liquid.

1.2 Applicability. This test applies to all fuel tank assemblies.

1.3 Remarks. Sloshing liquid produces a cyclic load that can deform, wear, or fatigue fuel system components and features, such as fuel pump module flanges or guide rods, level sensor float arms or floats, and tank baffles. The total number of slosh cycles (1 500 000) in this test is intended to represent the expected number of slosh cycles that would occur over the life of a vehicle.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- GMPT 1-005-A, Diesel Fuel
- GMPT 1-006-A, Diesel Fuel
- GMPT 1168-69, Stoddard Solvent

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 Slosh test rig.

3.2.2 Stoddard solvent (GMPT 1168-69) or diesel fuel (GMPT 1-005-A or GMPT 1-006-A) and fluid pumping equipment.

3.2.3 Electronic signal recording device capable of measuring transducer load and equipment capable of measuring and recording or analyzing fuel level resistance at a minimum of 5 Hz.

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3.3 Test Vehicle/Test Piece.

3.3.1 Three (3) fuel tank assemblies.

3.3.2 Insulators, straps, nuts, and bolts to be used for mounting tanks. Alternate method: blocks placed below tank at strap locations and tank assembly fastened to table using tie straps positioned over the top of the tank. Load is to be applied on the top of the tank at vehicle contact points.

3.4 Test Time. The following is an estimate on the amount of time (work hours) needed to perform this procedure. Preparation and other downtime, actual test, and analysis of data are considered in capturing a total calendar time.

Calendar time: 14 d to 21 d

Test time: 334 h to 491 h

Coordination time: 16 h

3.5 Test Required Information. If tie straps are used to install the tank(s) on a test fixture, compress fuel tanks to a point where they do not move during slosh testing (usually 3 mm to 7 mm).

3.6 Personnel/Skills. Test personnel familiar with hydraulic equipment.

4 Procedure

4.1 Preparation.

4.1.1 Pretest Inspection.

4.1.1.1 Verify that components to be tested are in new condition. Photograph the fuel pump module for later reference.

4.1.2 Load Measurement at Frequency and Displacement Combinations.

4.1.2.1 Install a fuel pump module having strain gages on the guide rods (or other means of load measurement) into the fuel tank assembly. The load to be measured is the fore/aft load caused by fuel slosh.

4.1.2.2 Install the fuel tank assembly into the test fixture oriented as installed in the vehicle or utilize the alternate method in 3.3.2. Connect wires from the load measurement device to the electronic signal recording device.

4.1.2.3 Fill fuel tank assembly to 25% of advertised fuel capacity with liquid (Stoddard solvent or diesel fuel).

4.1.2.4 Seal all openings except tank vents.

4.1.2.5 Slosh fuel tank assembly using a sinusoidal wave at the frequencies and actuator displacements designated on Appendix A, Data Sheet A1 to determine which combination of frequency and displacement produces the highest fore/aft load levels. Record the load measurements observed at each combination on Appendix A, Data Sheet A1.

4.1.2.6 Fill fuel tank assembly to 50% and 75% of advertised fuel capacity and repeat steps 4.1.2.1 thru 4.1.2.5 at each fuel level.

4.1.3 Test Matrix. Develop a test matrix using the slosh combinations where the load was the highest at the three (3) fill levels (25%, 50% and 75%). Record this information on Appendix A, Data Sheet A1.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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.

4.3 Instructions.

4.3.1 Slosh the fuel tank for 500 000 cycles at each of the three (3) fuel levels (25%, 50% and 75% of advertised capacity) with the slosh combinations previously determined to be highest load conditions for the respective fuel level.

4.3.2 Measure and either record or analyze fuel level resistance in order to evaluate if a float gets stuck in one (1) position.

4.3.3 Periodically (every 500 000 cycles) check for leaks (a visual check at minimum, however a pressurized leak check is recommended), baffle retention, and fuel pump module integrity. Also inspect electrical

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