

BASELINE TEST RESULTS

**Permeation Testing of Injection Molded Walk Behind Mower (WBM)
Fuel Tanks using Federal Test Procedures**

for

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Introduction

Recent Federal regulations require control of permeation emissions from the fuel tanks of small off-road gasoline powered engines. The Walk Behind lawn Mower application (WBM) is included in this category.

The US-EPA has defined test procedures at 40 CFR § 1051.515 for compliance with Federal permeation standards.

Fluor-Seal International LLP has for many years supplied fuel tank permeation control treatments to the US automotive industry. This program was performed to measure the effectiveness of their technology to typical tanks used with WBM engines.

Fluoro-Seal purchased regular production Service Part fuel tanks directly from the dealer network of a large US manufacturer of walk behind lawn mower engines. The samples were treated with Fluor-Seal's fluorination process. The tanks were marked with a sticker identifying the treatment level used as "SPAL". The treated tanks were then provided to Automotive Testing Laboratories (ATL). Automotive Testing Laboratories (ATL) performed testing of the tanks in accordance with the EPA Test Procedures. This report describes the tanks tested, the procedures used, and the results to date of the test program.

Test Protocol

Three fuel tanks were provided by Fluoro-Seal for testing in this program. All were treated by Fluoro-Seal to their "SPAL" fluorination level.

US-EPA Federal permeation test procedures defined in 40 CFR § 1051.515 defines detailed testing requirements for permeation testing of WBM tanks. The requirements include stabilization with test fuel, a baseline permeation test, performance of durability tests, restabilization with test fuel, and a final permeation test. The difference between the baseline permeation test and the final permeation test is used to compute a deterioration factor for the design being tested.

This report summarizes testing completed to date – the baseline permeation test.

The three federal tanks were filled with federal test fuel and placed in soak at 28 +/- 5 °C. Instruction was later received to move the tanks to a 40 °C area. Soak at the higher temperature permits acceleration of the stabilization at a 2 : 1 ratio (140 days at 28°C or 70 days at 40°C). At the end of the soak period the tanks were drained and fresh fuel installed. The tanks were stabilized at 28°C and then sealed to begin the baseline permeation test.

Federal permeation test requirements specify that weight loss be measured after at least two weeks, with a precision of at least 3 significant digits. Testing is to continue until a maximum of four weeks has passed or three significant digits of weight loss are obtained. The tanks in this program were weighed for four weeks to insure compliance with all requirements.

The Federal permeation rate is determined by subtracting the final weight from the initial weight, and dividing by the numbers of days in soak and the surface area of the test tank. Results of the baseline Federal permeation tests were:

<u>Tank</u>	<u>Loss (g)</u>	<u>Days</u>	<u>Area (m²)</u>	<u>g/m²/day</u>
1	1.26	28	0.1390	0.324
2	1.82	28	0.1390	0.468
3	1.71	28	0.1390	0.424

In hindsight, all three tanks have 3 significant digits of weight loss, and presumably could have been considered complete earlier in the permeation test run (when the weight loss exceeded 0.99 grams). None of the tanks were complete at two weeks.

The three Federal tanks are now undergoing durability testing. The Federal procedures specify that a “deterioration factor” be determined by performing durability testing after the baseline test run, repeating the permeation test, and measuring the increase in permeation emissions.

A Final Report will be issued detailing the results of the second test series.