



SURFACE VEHICLE RECOMMENDED PRACTICE

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Test Procedure to Measure the Fuel Permeability of Materials
by the Cup Weight Loss Method

RATIONALE

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1. SCOPE

This test standard covers the procedure for measuring the permeation of fuel or fuel surrogates through test samples of elastomeric, plastic or composite materials, up to about 3 mm thick.

The method involves filling a test cup with the test fluid (fuel or fuel surrogate), sealing test sample over the open end of the cup, and then placing the sealed container into an oven at the desired test temperature and measuring the weight loss over time. Permeation rates are calculated from the rate of weight loss and the exposed area of the test sample.

Standard permeation test temperatures are 40 °C and 60 °C. Standard test fluids are Fuel C, Fuel CE10 and Fuel CM15. Other fluids, such as Fuel CMTBE15, and other volatile liquids may be tested according to this procedure as desired (SAE J1681). The method is not applicable for measuring permeation of higher boiling materials that will not completely evaporate from the exterior surface of the sample at the test temperature.

2. REFERENCES

2.1 Applicable Publication

The following publication forms a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE Publications shall apply.

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1681 Gasoline, Alcohol and Diesel Fuel Surrogates for Materials Testing

SAE J2659 Test Method to Measure Fluid Permeation of Polymeric Materials by Speciation

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 ASTM Publications

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 814-86 Standard Test Method for Rubber Property-Vapor Transmission of Volatile Liquids

ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials

3. USEFULNESS AND LIMITATIONS

The cup method, when used in accordance with the guidelines presented in the procedure sections of this method, can be an easy, effective, and relatively inexpensive screening technique for determining the relative permeability of plastics, elastomers and composites:

- a. The method is useful to establish the permeation rate of a given fluid and material.
- b. The cup method is a useful tool for distinguishing between materials that have a significant difference in their resistance to permeation.
- c. It is most accurate when the test fluid is a pure liquid or a liquid mixture for which changes in composition do not significantly affect the measured permeation rate.

The method does have some limitations:

- a. The permeation rate of individual components of a fuel mixture through the test material cannot be determined; if this is desired, see SAE J2659.
- b. The method should be used with caution when the components of a fuel mixture have widely different permeation rates: the high permeating components can be depleted from the mixture before the test is completed.
- c. For low permeation rates, the weight change is small so that accuracy can be a problem. In addition, the time required to obtain measurable weight changes can be very long.