



AEROSPACE RECOMMENDED PRACTICE

ARP7355™

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Assessment of Elastomer Volume Swelling Behavior in Aero-Derived Gas Turbine Engine Lubricants - Short Duration Test

RATIONALE

Synthetic lubricating fluids for aircraft turbine engines must be compatible with materials of construction, such as elastomers used in the engines. Elastomers are used in seals, O-rings, gaskets, and related applications. This method is designed to determine the lubricating fluids' elastomer material compatibility relative to volume swell of elastomeric materials. The E-34 Propulsion Lubricants committee has interest in transitioning U.S. Military federal test methods that are used in AS5780 into SAE International standards. This Aerospace Recommended Practice (ARP) helps to accomplish that vision.

1. SCOPE

This method is used for determining the volume swelling effect of aero-derived gas turbine engine lubricants on elastomeric materials. It provides insight into the expected performance of a candidate lubricants impact upon elastomer swell and provides data to determine if the candidate lubricant meets specification requirements. This ARP is based upon Federal Standard 791, Method 3604.

1.1 Approach

The volume swell percentage change of elastomer test specimens is measured using water displacement analysis after immersion in a candidate lubricant. Three test specimens are immersed in the candidate lubricant at elevated temperatures for a specified time. A laboratory oven is used to maintain the temperature of the lubricant during the test. At the completion of the test, the average percent volume change of the elastomer test specimens is determined based on difference between initial and final displacement weights.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS3217/4 Test Slabs, Fluoroelastomer (FKM), 65 - 75

AS5780 Specification for Aero and Aero-Derived Gas Turbine Engine Lubricants

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2.2 Other Publications

U.S. Navy Federal Standard 791, Method 3604, "Swelling of Synthetic Rubber by Aircraft Turbine Lubricants"

3. WARNING

This document may involve hazardous materials, operations, and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

4. APPARATUS

4.1 Oven capable of maintaining $204\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ ($400\text{ }^{\circ}\text{F} \pm 1.8\text{ }^{\circ}\text{F}$).

4.2 Glassware - 400 mL borosilicate beakers.

4.3 Suspension device - Glass or stainless steel (for holding elastomer test specimens completely immersed in 400 mL beaker so that they do not touch each other or the sides of the beaker).

4.4 Hooks - Stainless steel wire (for suspending elastomer test specimens from suspension device and from balance).

4.5 Balance - Capable of determining mass to 0.1 mg accuracy.

4.6 No. 60 emery cloth.

5. REAGENTS AND/OR MATERIALS

5.1 Elastomer Test Specimens

5.1.1 Elastomer material type shall be AMS3217/4 standard fluorocarbon (FKM) rubber stock in the form of molded test plaque in a hardness range of 65 to 75 Shore A.

5.1.2 Suitable plaques are available from Akron Rubber Development Laboratory, Inc. (<http://www.ardl.com/test-plaques>). Test plaques are supplied in a sealed UV bag contained in a storage container. The plaques are approximately 152 x 152 x 2 mm (6 x 6 x 0.080 inches).

5.1.3 Test plaques are to be stored in original container in a dark place and kept at a temperature of less than $25\text{ }^{\circ}\text{C}$ ($77\text{ }^{\circ}\text{F}$). They must be within 1 year of fabrication before use. If stored for more than 1 year before use, test plaques may be recertified to extend shelf life.

NOTE: Other elastomer material types may be evaluated using this method such as AMS3217/1 acrylonitrile butadiene (NBR-H) or AMS 3217/5 fluorosilicone (FVMQ).

5.1.4 Three elastomer test specimen replicates are required for each test.

5.2 Lubricants

5.2.1 Candidate or benchmark lubricants to be evaluated (approximately 350 mL)

5.3 Solvents

5.3.1 Suitable cleaning solvent: reagent grade petroleum ether (boiling range 40/60 or 30/60), heptane, or hexane.

5.3.2 Naphtha, technical grade.

5.3.3 Toluene, technical grade (methylbenzene).

5.3.4 Ethyl alcohol (ethanol).