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Standard Test Method for Water Reaction of Aviation Fuels[1]

This standard is issued under the fixed designation D 1094; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of the presence of water-miscible components in aviation gasoline and turbine fuels, and the effect of these components on volume change and on the fuel-water interface.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* This standard involves the use of hazardous chemicals identified in Section 7. Before using this standard, refer to suppliers' safety labels, Material Safety Data Sheets and other technical literature.

2. Referenced Documents

2.1 *ASTM Standards:*

D 381 Test Method for Existent Gum in Fuels by Jet Evaporation[2]

D 611 Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents[2]

D 1836 Specification for Commercial Hexanes[3]

D 2699 Test Method for Research Octane Number of Spark-Ignition Engine Fuel[4]

D 2700 Test Method for Motor Octane Number of Spark-Ignition Engine Fuel[4]

D 3948 Test Methods for Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer[5]

2.2 *IP Standard:*

IP Standard Test Methods Vol 2, Appendix B, Specification for Petroleum Spirits[6]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *film, n*—thin, translucent layer that does not adhere to the wall of the glass cylinder.

3.1.2 *lace, n*—fibers thicker than hairlike shred or of which more than 10 % are interlocking, or both.

3.1.3 *loose lace or slight scum, or both (Table 2, Rating 3), n*—an assessment that the fuel/buffer solution interface is covered with more than 10 % but less than 50 % of lace or scum that does not extend into either of the two layers.

3.1.4 *scum, n*—layer thicker than film or that adheres to the wall of the glass cylinder, or both.

3.1.5 *shred, n*—hairlike fibers of which less than 10 % are interlocking.

3.1.6 *shred, lace or film or scum at interface (Table 2, Rating 2), n*—an assessment that fuel/buffer solution interface contains more than 50 % clear bubbles or some but less than 10 % shred, lace, film or scum.

3.1.7 *tight lace or heavy scum, or both (Table 2, Rating 4), n*—an assessment that the fuel/buffer solution interface is covered with more than 50 % of lace or scum, or both, that extends into either of the two layers or forms an emulsion, or both.

3.1.8 *water reaction interface conditions rating, n*—a qualitative assessment of the tendency of a mixture of water and aviation turbine fuel to form interface films or precipitates.

3.1.9 *water reaction separation rating, n*— a qualitative assessment of the tendency of insufficiently cleaned glassware to produce emulsions or precipitates, or both, in separated fuel and water layers.

3.1.10 *water reaction volume change, n*—a qualitative indication of the presence in aviation gasoline of water-soluble components.

4. Summary of Test Method

4.1 A sample of the fuel is shaken, using a standardized technique, at room temperature with a phosphate buffer solution in scrupulously cleaned glassware. The cleanliness of the glass cylinder is tested. The change in volume of the aqueous layer and the appearance of the interface are taken as the water reaction of the fuel.

5. Significance and Use

5.1 When applied to aviation gasoline, *water reaction volume* change using the technique reveals the presence of water–soluble components such as alcohols. When applied to

[1] This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.J0.10 on Fuel Cleanliness.

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[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 06.04.

[4] *Annual Book of ASTM Standards*, Vol 05.04.

[5] *Annual Book of ASTM Standards*, Vol 05.02.

[6] Available from the Institute of Petroleum, 61 New Cavendish St., London, W1M 8AR.