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An American National Standard

H-24-15

Standard Test Method for Thermal Stability of Aviation Turbine Fuels¹

This standard is issued under the fixed designation D 1660; 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 test method has been adopted for use by government agencies to replace Method 3464 of Federal Test Method Standard No. 791b.

1. Scope

1.1 This test method² covers a procedure for rating the tendencies of aviation turbine fuels and similar gas turbine fuel oils to deposit decomposition products in the fuel system components.

1.2 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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. For specific hazard statements, see Notes 1 and 3 and Annex A1.*

2. Referenced Documents

2.1 ASTM Standards:

D 1655 Specification for Aviation Fuels³

D 4306 Practice for Sampling Aviation Fuel for Tests Affected by Trace Contamination⁴

2.2 ASTM Adjuncts:

ASTM-CFR Fuel Coker Record Form⁵ Color Standard for Tube Deposit Rating (5 Aluminum Strips)⁶

3. Definition

3.1 *thermal stability*—represents the oxidative degradation of jet fuels by application of thermal stresses resulting in a fuel deposit formation which may differ based on temperature(s) applied.

4. Summary of Test Method

4.1 This test method for measuring the high-temperature stability of aviation turbine fuels uses the ASTM-CRC Fuel Coker which subjects the test fuel to temperatures and conditions similar to those occurring in some aviation turbine engines. Fuel is pumped at predetermined rates through a preheater section which simulates the hot fuel line sections of the engine as typified by an engine fuel-oil cooler.

It then passes through a heated filter section which represents the nozzle area or small fuel passages in the hot section of the engine where fuel degradation products may become trapped. A precision sintered stainless steel filter in the heated filter section traps fuel degradation products formed during the test. The extent of the build-up is noted as an increased pressure drop across the test filter, and, in combination with the deposit condition of the preheater, is used as an assessment of the thermal stability of the fuel.

5. Significance and Use

5.1 This test method is indicative of fuel performance during gas turbine operation and is used to assess fuel thermal stability at specific temperatures.

6. Apparatus

6.1 *ASTM-CRC Fuel Coker*—Either of the two specified models of the ASTM-CRC Fuel Coker, Manual Unit (Model 01FC) or Semi-Automatic Unit (Model 02FC), as described in detail in Annex A2, may be used.⁷

6.2 *Accessories and Materials*—The flushing solvents, metal polish, and cleaning equipment specified in Section 7 for use in cleaning and flushing operations shall conform to the specifications listed in Annex A3 on Accessories and Materials. Other optional tools and accessories are also described in Annex A3. These include certain essential accessories which are not furnished with the Fuel Coker.

7. Preparations for Test

7.1 *Fuel Pre-Filtering*—The nature of the thermal stability test requires that all fuel be essentially clean and free of moisture as determined visually. Accordingly, the test fuel and solvent flushing fluids shall be filtered (**Warning**—See Note 1) by a single pass through a close-textured filter before loading the fuel reservoir.⁸

NOTE 1: Warning—A potential hazard involving static electricity can exist if all parts of the filter system are not grounded. It is therefore strongly recommended that a stainless steel funnel be used, and that it be adequately grounded.

7.2 *Test Fuel Reservoir*—The fuel reservoir must be cleaned before it is filled with filtered fuel.

NOTE 2—Test method results are known to be sensitive to trace contamination from sampling containers. For recommended containers refer to Practice D 4306.

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.J on Aviation Fuels.

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² This test method was developed on the basis of cooperative work carried out by the Coordinating Research Council from 1955 to 1958, and published in CRC Report "Investigation of Thermal Stability of Aviation Turbine Fuels with CFR Fuel Coker," (CRC Project CFA-2-54), July, 1957 and "Fuel Thermal Stability Exchange Program," (CRC Project CA-2-58), September, 1958.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 05.03.

⁵ Available from ASTM Headquarters; order Adjunct No. 12-416600-01.

⁶ Available from ASTM Headquarters; order Adjunct No. 12-416600-00

⁷ The automatic unit (Model 03FC) may also be used and is described in Part 17 of the 1969 *Annual Book of ASTM Standards (Second Edition)*. Its description herein has been deleted to simplify the test method. Models 03FC and 01FC are no longer manufactured.

⁸ A single sheet of No. 12 Whatman filter paper is specified for this purpose.