Designation: D8073 – 22

An American National Standard

Standard Test Method for Determination of Water Separation Characteristics of Aviation Turbine Fuel by Small Scale Water Separation Instrument[1]

This standard is issued under the fixed designation D8073; 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.

1. Scope*

1.1 This test method covers a procedure to rate the ability of aviation turbine fuels to release entrained and emulsified water when passed through a water-coalescing filter.

1.2 Results are expressed as a Water Separation Index (WSI).

1.3 The values stated in SI units are to be regarded as standard.

1.3.1 *Exception*—Units in WSI are included.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1655 Specification for Aviation Turbine Fuels

D2550 Method of Test for Water Separation Characteristics of Aviation Turbine Fuels (Withdrawn 1989)[3]

D3602 Test Method for Water Separation Characteristics of Aviation Turbine Fuels (Withdrawn 1994)[3]

D3948 Test Method for Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products, Liquid Fuels, and Lubricants

D7224 Test Method for Determining Water Separation Characteristics of Kerosine-Type Aviation Turbine Fuels Containing Additives by Portable Separometer

3. Terminology

3.1 *Definitions:*

3.1.1 *surfactant, n—in petroleum fuels*, surface active material (or surface active agent) that could disarm (deactivate) filter separator (coalescing) elements so that free water is not removed from the fuel in actual service.

3.1.1.1 *Discussion*—Technically, surfactants affect the interfacial tension between water and fuel, which affects the tendency of water to coalesce into droplets.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *sonicator, n*—a device that applies ultrasonic sound energy to the test specimen.

3.2.1.1 *Discussion*—The sonicator is used to emulsify the water and aviation fuel.

3.2.2 *water separation index (WSI), n*—a numerical rating indicating the ease of separating water from fuel by coalescence.

3.2.2.1 *Discussion*—A high WSI indicates a fuel that separates water easily and is relatively free from surfactants.

4. Summary of Test Method

4.1 A fixed volume of test specimen is poured into the test beaker. The apparatus is purged with the test specimen. A precise amount of water containing a specific dye is added to

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.J0.05 on Fuel Cleanliness.

Current edition approved April 1, 2022. Published May 2022. Originally approved in 2016. Last previous edition approved in 2021 as D8073 – 21. DOI: 10.1520/D8073-22.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

*A Summary of Changes section appears at the end of this standard

the test beaker. The test specimen and dyed water are emulsified using a sonicator. The resulting emulsion is passed at a constant rate directly to the detector, which is sensitive to the dye, to measure a reference value. The emulsion is then passed at the same constant rate to the detector by means of a filter cartridge that is designed to remove entrained water. Readings from the detector are taken. The water separation characteristic, the Water Separation Index (WSI), is calculated from the reference value and the detector readings. Results range from 0.0 WSI to 100.0 WSI. A high value such as 100.0 WSI indicates a test specimen that coalesces water easily and that the test specimen is relatively free of surfactants.

5. Significance and Use

5.1 This test method provides an indication of the presence of surfactants in aviation fuel. Like Test Methods D2550, D3602, D3948, and D7224, this test method can detect carryover traces of refinery treating residues in fuel as produced. In addition, these test methods can detect surface active substances added to or picked up by the fuel during handling from point of production to point of use. Certain additives can affect the WSI. Some of these substances affect the ability of filter separators to separate free water from the fuel.

5.2 The small scale water separation tester has a measurement range from 0.0 WSI to 100.0 WSI.

NOTE 1—WSI values greater than 100.0 WSI can be caused by a reduction in the light transmittance (see A1.1.5) of the test specimen due to material that was removed during the testing process.

5.3 This test method was developed so refiners, fuel terminal operators, pipelines, and independent testing laboratory personnel can rapidly and precisely measure for the presence of surfactants, with a minimum of training, in a wide range of locations.

6. Apparatus

6.1 *General*—The apparatus, as detailed in Annex A1, comprises a test beaker, test beaker holder, sonicator, filter cartridge, specific dye detector, integral computer, automatic solenoid valves, pumps, solvent container, waste container, particulate sieve, and temperature probe.

6.2 *Pipet,* single use, disposable, of suitable size.

6.2.1 The single use disposable pipet is used to adjust the volume of test specimen in the test beaker to 220 mL ± 10 mL.

7. Reagents and Materials

7.1 *Dyed Water*[4]—Proprietary liquid containing water and a controlled amount of specific marker dye.

7.2 *Reference Materials:*

7.2.1 *Dispersing Agent*—Toluene solution containing 1 mg/mL of solid (100 % dry) bis-2-ethylhexyl sodium sulfosuccinate.

7.2.2 *Reference Fluid Base*—A surfactant-free aviation turbine fuel that is used to verify proper operation and is prepared in the manner detailed in Appendix X1 and with a WSI by this test method of 97.5 WSI to 100.0 WSI.

7.2.3 *Reference Fluids*—For checking operational performance consisting of dispersing agent (7.2.1) added to reference fluid base (7.2.2) in concentrations, on a volume basis, ranging from 0 mL/L to 0.8 mL/L, in 0.1 mL/L increments. Reference fluids may be made up in situ in the graduated beaker on an ad-hoc basis, or supplied pre-made up in a suitable container. Typical values are shown in Table 1.

7.3 *Cleaning Materials,* technical grade.

7.3.1 *Isopropyl Alcohol.*

7.4 *Filter Cartridge,* see A1.1.11, individually packed.

8. Sampling and Test Specimen Preparation

8.1 Unless otherwise agreed, samples shall be taken in accordance with Practice D4057 or Practice D4177.

8.2 Collect the sample directly in a suitable container of a minimum volume of 1000 mL.

NOTE 2—The test method is known to be sensitive to trace contamination, for example from sampling containers or transfer glassware. For recommended sampling containers, refer to Practice D4306.

8.2.1 Epoxy-lined containers shall be visually inspected to ensure that the lining has not been damaged and that the containers are not dented.

8.3 Do not pre-filter the sample as the filter media can remove the surfactants that the test method is designed to detect. If the test fuel contains particulate, then allow such materials to settle out before sub sampling.

8.4 Special precautions concerning sampling techniques are discussed in Appendix X2. Wipe the container outlet thoroughly with a clean, lint-free wipe. Take extreme care when pouring the sample directly into the test beaker to avoid contamination from the top of the container.

8.5 If the sample for test is not within the temperature range 18 °C to 29 °C, then allow the sample to stand until it is within this range.

9. Preparation of Apparatus

9.1 *General*—Follow the manufacturer's instructions for the correct set up, verification, calibration, and operation of the apparatus.

9.2 *Location of Apparatus*—Locate the apparatus on a solid surface in a well-ventilated area.

9.3 *Filter Cartridge*—At the beginning of each test, replace the filter cartridge and wipe the sample inlet tube, thermometer probe, and sonicator with a clean, lint-free wipe.

TABLE 1 Reference Fluid Dispersing Agent Concentrations

Concentration (mL/L)	WSI
0	100.0
0.2	97.6
0.4	79.8
0.6	75.4
0.8	68.8

[4] The sole source of supply of the dyed water known to the committee at this time is Stanhope-Seta/D-2 Incorporated, Falmouth, MA. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.