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Standard Test Method for Determination of Total Sediment in Residual Fuels¹

This standard is issued under the fixed designation D 4870; 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 the determination of total sediment up to 0.40 % m/m for distillate fuel oils containing residual components and to 0.50 % m/m in residual fuel oils having a maximum viscosity of 55 cSt (mm^2/s) at 100°C. Some fuels can exceed the maximum filtration time specified in this test method due to factors other than the presence of significant quantities of insoluble organic or inorganic material. This test method can be used for the assessment of total sediment after regimes of fuel pretreatment designed to accelerate the aging process.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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.* For specific warning statements, see 7.2, 7.3, Annex A1, and X1.6.1.

2. Referenced Documents

2.1 ASTM Standards:²

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

E 1 Specification for ASTM Liquid-in-Glass Thermometers

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *total sediment*—the sum of the insoluble organic and inorganic material that is separated from the bulk of the

residual fuel oil by filtration through a Whatman GF/A filter medium, and that is also insoluble in a predominantly paraffinic solvent.

4. Summary of Test Method

4.1 A weighed quantity (10 g) of the oil sample is filtered through the prescribed apparatus at 100°C. After solvent washing and drying the total sediment on the filter medium is weighed. The test is to be carried out in duplicate.

5. Significance and Use

5.1 Appreciable amounts of sediment in a residual fuel oil can cause fouling of facilities for handling, and give problems in burner mechanisms. Sediment can accumulate in storage tanks, on filter screens, or on burner parts, resulting in obstruction of the flow of oil from the tank to the burner.

6. Apparatus

6.1 *Filtration Apparatus*, constructed of brass, with copper steam coils attached, suitably supported above a vacuum flask appropriately protected against the effects of implosion. See Figs. 1 and 2.

6.2 *Temperature Measuring Device*, capable of measuring the temperature in the range from 95 to 105°C with an accuracy of 0.5°C.

6.3 *Oven*, electric, capable of maintaining a temperature of $110 \pm 1^\circ\text{C}$. The oven should be capable of safely evaporating the solvent without risk of fire.

6.4 *Stirring Rod*, glass or polytetrafluoroethylene (PTFE) approximately 150 mm in length and 3 mm in diameter.

6.5 *Beaker*, glass, 30 mL capacity, either squat form with lip or conical.

6.6 *Weighing Bottles*, with ground glass stoppers, numbered, 80 mm diameter by 40 mm.

6.7 *Hotplate*, electric.

6.8 *Steam Generator*, to provide steam at $100 \pm 1^\circ\text{C}$.

6.9 *Vacuum Source*, capable of providing the specified vacuum.

6.10 *Vacuum Gauge*, capable of measuring the specified vacuum.

6.11 *Filter Medium*, Whatman glass fiber filter medium, Grade GF/A, 47 mm diameter.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.14 on Stability and Cleanliness of Liquid Fuels.

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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.

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

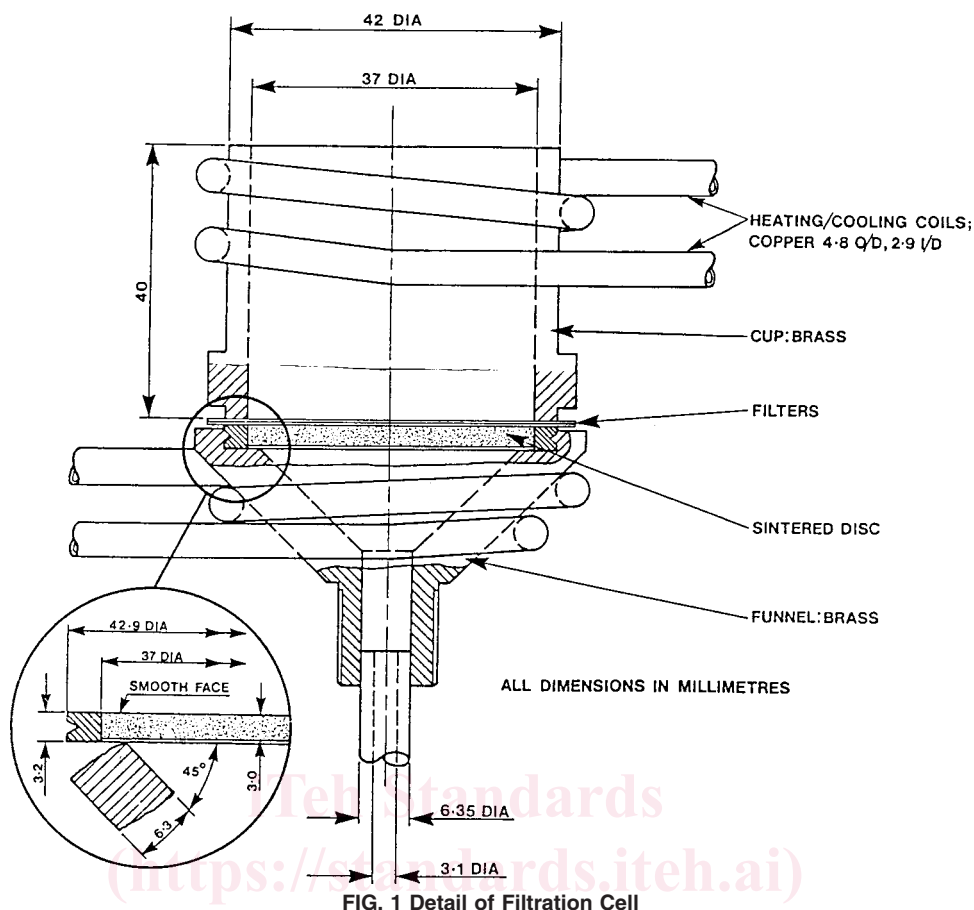


FIG. 1 Detail of Filtration Cell

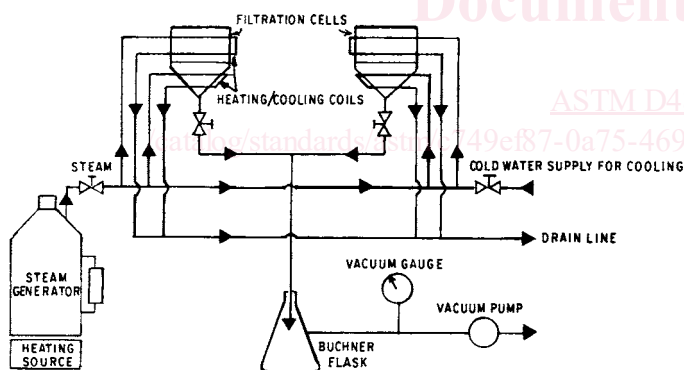


FIG. 2 Arrangement of Filtration Apparatus

6.12 *High Speed Mixer*, any convenient type, minimum speed 400 rpm.

6.13 *Desiccator*.

6.14 *Cooling Vessel*, a desiccator or other type of tightly covered vessel for cooling the filter media before weighing. The use of a drying agent is not recommended.

6.15 *Syringe or Graduated Wash Bottle*, minimum capacity 25 mL, graduated in 0.5 mL increments.

6.16 *Forceps*, spade-ended.

7. Reagents and Materials

7.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that

all reagents shall conform to the specifications of the committee on Analytical Reagents of the American Chemical Society, where such specifications are available.³ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 *Normal Heptane*, minimum 99.75 % purity. (**Warning**—Flammable, vapor harmful if inhaled. See A1.1.)

7.3 *Toluene*, at least reagent grade purity. (**Warning**—Flammable, vapor harmful. See A1.2.)

7.4 *Wash Solvent*, consisting of 85 volume % *n*-heptane (7.2) and 15 volume % toluene (see 7.3).

8. Sampling

8.1 Sample in accordance with Practice D 4057 or Practice D 4177.

9. Procedure

9.1 *Sample Preparation*—Mix the whole sample, as received, thoroughly using a high speed mixer when practicable, for 30 s. In all cases a sample taken on a glass or PTFE rod

³ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For Suggestions on the testing of reagents not listed by the American Chemical Society, see *Annual Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.