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An American National Standard

Standard Test Method for Filter Plugging Tendency of Distillate Fuel Oils[1]

This standard is issued under the fixed designation D 2068; 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 describes a procedure for determining the filter plugging tendency (FPT) of distillate fuel oils where the end use demands an exceptional degree of cleanliness. This test method is applicable to fuels within the viscosity range of 1.50 to 6.00 mm^2/s (cSt) at 40°C.

NOTE 1—ASTM Specification fuels falling within the scope of this test method are Specification D 396 Grade Numbers 1 and 2, Specification D 975 Grades 1-D, low sulfur 1-D, 2-D, and low sulfur 2-D, Specification D 2880 Grades 1-GT and 2-GT and Specification D 3699 kerosine.

1.2 This test method is not applicable to fuels that are not clear and bright because water interferes with the measurement of filter plugging.

1.3 Relative tendency of fuels to plug filters may vary depending on filter porosity and structure, and may not always correlate with results from this test method.

1.4 Annex A1 describes a standard procedure for preparing a test fluid for use in calibrating the apparatus used in this test method.

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 396 Specification for Fuel Oils[2]

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)[2]

D 975 Specification for Diesel Fuel Oils[2]

D 1500 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)[2]

D 2880 Specification for Gas Turbine Fuel Oils[2]

D 3699 Specifications for Kerosine[3]

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products[3]

D 4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)[3]

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 For this test method, fuel filter plugging tendency (FPT) can be described in either of the following two ways:

3.1.1.1 *filter plugging*—the pressure drop across a 1.6 µm pore size glass fiber filter when 300 mL of fuel is passed at a rate of 20 mL/min.

3.1.1.2 *filter plugging*—the volume of fuel passed when a pressure of 105 kPa (15 psi) is reached. This method of report is used when less than 300 mL passes at that pressure drop.

4. Summary of Test Method

4.1 A sample of the fuel to be tested is passed at a constant rate of flow (20 mL/min) through a glass fiber filter medium. The pressure drop across the filter is monitored during the passage of a fixed volume of test fuel. If a prescribed maximum pressure drop is reached before the total volume of fuel is filtered, the actual volume of fuel filtered at the time of maximum pressure drop is recorded.

4.2 Calibration of the apparatus is required at intervals, and a procedure for the preparation of a fluid for calibration is described in Annex A1.

5. Significance and Use

5.1 This test method is intended for use in evaluating distillate fuel cleanliness in those applications that demand a high throughput per installed filter.

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

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

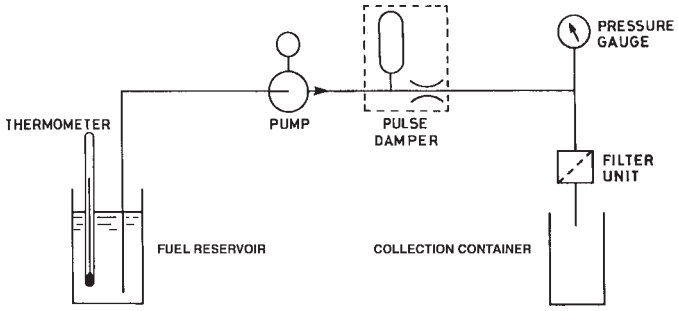

FIG. 1 Flow Diagram of Filtration Test Apparatus

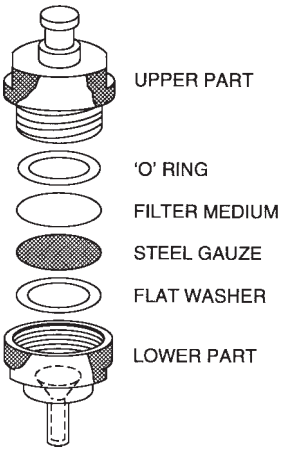

FIG. 2 Assembly of Filter Unit

5.2 A change in filtration performance after storage or pretreatment can be indicative of changes in fuel condition.

5.3 Causes of poor filterability might include fuel degradation products, contaminants picked up during storage or transfer, or interaction of the fuel with the filter media. Any of these could correlate with orifice or filter system plugging, or both.

6. Apparatus

6.1 The apparatus[4,5] is shown as a diagram in Fig. 1 and is comprised of the following parts:

6.1.1 *Pump*, capable of delivering fuel at a constant rate of 20 ± 1 mL/min, and incorporating a pulse damping mechanism to produce smooth flow.

6.1.2 *Pressure Gage*—Gage or equivalent pressure recording device calibrated and graduated 0 to 210 kPa (2 kPa graduations, minimum).

6.1.3 *Filter Unit*—Stainless steel body, 13–mm diameter, shown as a diagram in Fig. 2.[5,6]

6.1.4 *Filter Medium*—Glass fiber filter, nominal pore size 1.6 µm, 13-mm diameter.[7]

6.1.5 *Fuel Reservoir and Collection Containers*—Graduated glass beakers or cylinders, 400 mL capacity.

6.2 *Thermometer*, general purpose type, range 0 to 60°C.

6.3 *Measuring Cylinder*, nominal capacity 500 mL.

6.4 *Forceps*, spade ended.

6.5 *Stopwatch*, manual or electronic, nominal accuracy 0.2 s.

7. Sampling

7.1 The laboratory fuel sample from which an aliquot is being drawn for the purposes of this test must be representative of the lot of fuel, whether the fuel is in a storage tank, a tank car, a pipeline, or other container. The laboratory sample should therefore have been obtained by following the practices of Practices D 4057, D 4177, or similar standard. The maximum sample size is dictated by the quantity that can be mixed thoroughly (see 9.2).

7.2 Draw a representative 1 to 2 L aliquot from the thoroughly mixed laboratory sample into an epoxy-lined can or dark glass bottle that has been previously rinsed three times with the product to be sampled.

NOTE 2—Because the situations under which samples are taken vary from laboratory to laboratory and from situation to situation, no firm recommendations for sampling can be given. It is the responsibility of the user of this test method to ensure the representativeness of the aliquot used in this test method.

8. Preparation of Apparatus

8.1 *Calibration*—Calibration is required when a new batch of filter media is used, when there is doubt concerning the validity of a test result, or when the apparatus has not been used for three months. A procedure for the preparation of standard solutions for the apparatus calibration is given in Annex A1 to this test method.

8.2 *Apparatus Assembly*—Assemble the apparatus as shown in Fig. 1 without the filter unit connected. To ensure that the pump and pipework are clean and to calibrate the pump, fill the fuel reservoir with fuel that has been previously filtered through a glass fiber filter medium. Measure the delivery rate of the pump by timing the removal of 200 mL of fuel from the reservoir. If the time is not 600 ± 30 s, adjust and repeat.

8.3 *Filter Unit Assembly*—Assemble the filter unit as shown in Fig. 2 using a new glass fiber filter medium handled with the forceps, taking care not to damage the filter medium. The medium is placed into the holder with the face marked with a grid pattern uppermost.

NOTE 3—It is most important that the filter unit components are assembled as above, and in the exact configuration shown in Fig. 2, because any leakage would yield erroneous results.

9. Procedure

9.1 Measure the temperature of the fuel in the container and, if necessary, adjust to 15 to 25°C.

9.2 Shake the fuel container vigorously for 120 ± 5 s, and then allow to stand on a vibration-free surface for 300 s.

[4] The sole source of supply of an assembled unit known to the committee at this time is Unitor Industry, 28-30 Thursby Rd., Croft Business Park, Bromborough, Wirral, Merseyside L62 3PW, United Kingdom.

[5] 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.

[6] The sole source of supply of the apparatus known to the committee at this time is Millipore Cat. No. XX3001200, available from Millipore (U.K.) Ltd. or Millipore Corp.

[7] Whatman Grade GF/A, or its equivalent, has been found satisfactory for this purpose.