



# Standard Test Method for Cleanliness and Compatibility of Residual Fuels by Spot Test<sup>1</sup>

This standard is issued under the fixed designation D 4740; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method describes separate procedures for determining the cleanliness of residual fuel oil and the compatibility of a residual fuel oil with a blend stock. It is applicable to residual fuel oils with viscosities up to 50 cSt (1 cSt = 1 mm<sup>2</sup>/s) at 100°C.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

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.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products<sup>2</sup>

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products<sup>2</sup>

E 1 Specification for ASTM Thermometers<sup>3</sup>

### 2.2 ASTM Adjuncts:

Reference Spot Sheet (D 4740)<sup>4</sup>

## 3. Terminology

### 3.1 Descriptions of Terms Specific to This Standard:

3.1.1 *blend stock, n*—a finished residual fuel oil or fuel oil component, including petroleum streams ranging from kerosene to residuals and asphalt.

3.1.2 *compatibility, n*—of residual fuel, the absence of suspended solids when equal volumes of a sample and a blend stock are mixed together.

3.1.3 *cleanliness, n*—of residual fuel, the absence of suspended solids in a finished sample.

## 4. Summary of Test Method

4.1 *Cleanliness Procedure*—A drop of the preheated and thoroughly mixed sample is put on a test paper and placed in an oven at 100°C. After 1 h, the test paper is removed from the oven and the resultant spot is examined for evidence of suspended solids and rated for cleanliness using the D 4740 Adjunct Reference Spots.

4.2 *Compatibility Procedure*—A blend composed of equal volumes of the sample fuel oil and the blend stock is tested in the same way as described in 4.1 and rated for compatibility against D 4740 Adjunct Reference Spots.

## 5. Significance and Use

5.1 The two procedures in this test method are used alone or in combination to identify fuels or blends that could result in excessive centrifuge loading, strainer plugging, tank sludge formation, or similar operating problems.

5.2 A spot rating of Number 3 or higher on a finished fuel oil by the cleanliness procedure indicates that the fuel contains excessive suspended solids and is likely to cause operating problems.

5.3 Although a fuel may test clean when subjected to the cleanliness procedure, suspended solids may precipitate when the fuel is mixed with a blend stock. Evidence of such incompatibility is indicated by a spot rating of Number 3 or higher in the compatibility procedure.

## 6. Apparatus

6.1 *Test Paper*—Chromatographic paper cut or divided into appropriately sized squares, strips, or circles. Store the paper, without folding, rolling, or bending, in a tightly closed container.<sup>5</sup>

6.2 *Test Paper Support*—Fig. 1 shows a suitable support for multiple samples spotted on the same test paper which shall be supported in a horizontal position so nothing touches test areas of the paper.

6.3 *Oven*—Any convection oven capable of maintaining an air temperature of 100 ± 2 degrees celsius.

6.4 *Reference Spot Sheet*—Adjunct for D 4740.<sup>4</sup>

6.5 *Conical Flask*, 100-mL capacity.

6.6 *Heating Bath or Hot Plate*, capable of heating sample to a temperature between 90 and 95°C.

<sup>1</sup> 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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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 05.02.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.03.

<sup>4</sup> Available from ASTM Headquarters. Order Adjunct No. ADJD4740.

<sup>5</sup> Whatman paper No. 2 has been found satisfactory.