



Designation: D5846 – 07 (Reapproved 2017)

# Standard Test Method for Universal Oxidation Test for Hydraulic and Turbine Oils Using the Universal Oxidation Test Apparatus<sup>1</sup>

This standard is issued under the fixed designation D5846; 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 covers a procedure for evaluating the oxidation stability of petroleum base hydraulic oils and oils for steam and gas turbines.

1.2 This test method was developed to evaluate the oxidation stability of petroleum base hydraulic oils and oils for steam and gas turbines.

1.2.1 Rust and oxidation inhibited hydraulic, anti-wear hydraulic and turbine oils of ISO 32–68 viscosity were used to develop the precision statement. This test method has been used to evaluate the oxidation stability of fluids made with synthetic basestock and in-service oils; however, these fluids have not been used in cooperative testing to develop precision data.

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

1.3.1 *Exception*—The values given in parentheses are for information only.

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.* Identified hazardous chemicals are listed in 7.3, 7.6, and 7.8. Before using this test method, refer to suppliers' safety labels, Material Safety Data Sheets, and other technical literature.

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.*

<sup>1</sup> 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 D02.09.0D on Oxidation of Lubricants.

Current edition approved Oct. 1, 2017. Published November 2017. Originally approved in 1995. Last previous edition approved in 2012 as D5846–07(2012). DOI: 10.1520/D5846-07R17.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

A510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

B1 Specification for Hard-Drawn Copper Wire

D664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration

D943 Test Method for Oxidation Characteristics of Inhibited Mineral Oils

D974 Test Method for Acid and Base Number by Color-Indicator Titration

D3339 Test Method for Acid Number of Petroleum Products by Semi-Micro Color Indicator Titration

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4740 Test Method for Cleanliness and Compatibility of Residual Fuels by Spot Test

D4871 Guide for Universal Oxidation/Thermal Stability Test Apparatus

D5770 Test Method for Semiquantitative Micro Determination of Acid Number of Lubricating Oils During Oxidation Testing

### 2.2 Energy Institute Standard:<sup>3</sup>

IP 2546 Practice for Sampling of Petroleum Products; alternate to Practice D4057

### 2.3 British Standard:<sup>4</sup>

BS 1829 Specification for Carbon Steel Wire; alternate to Specification A510

### 2.4 ASTM Adjuncts:

Reference Spot Sheet<sup>5</sup>

## 3. Terminology

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

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

<sup>3</sup> Available from Energy Institute, 61 New Cavendish St., London, WIG 7AR, U.K., <http://www.energyinst.org.uk>.

<sup>4</sup> Available from British Standards Institute (BSI), 389 Chiswick High Rd., London W4 4AL, U.K., <http://www.bsi-global.com>.

<sup>5</sup> Available from ASTM International Headquarters. Order Adjunct No. ADJD4740. Original adjunct produced in 2000.



FIG. 1 Apparatus, Showing Gas Flow Control System, Temperature Control System, and Heating Block

3.1.1 *inhibited mineral oil, n*—a petroleum oil containing additives to retard oxidation.

3.1.2 *oxidation life, n*—of an oil, the time in hours required for degradation of the oil under test.

3.1.3 *universal oxidation test, n*—the apparatus and procedures described in Guide D4871.

#### 4. Summary of Test Method

4.1 An oil sample is contacted with air at 135 °C in the presence of copper and iron metals. The acid number and spot forming tendency of the oil are measured daily. The test is terminated when the oxidation life of the oil has been reached.

4.2 The oil is considered to be degraded when either its acid number (measured by Test Methods D974 or D664) has increased by 0.5 mg KOH/g over that of new oil; or when the oil begins to form insoluble solids so that when a drop of oil is placed onto a filter paper it shows a clearly defined dark spot surrounded by a ring of clear oil.

#### 5. Significance and Use

5.1 Degradation of hydraulic fluids and turbine oils, because of oxidation or thermal breakdown, can result in the formation of acids or insoluble solids and render the oil unfit for further use.

5.2 This test method can be used to estimate the relative oxidation stability of petroleum-base oils. It should be recognized that correlation between results of this test and the oxidation stability in use can vary markedly with service conditions and with various oils.

#### 6. Apparatus

6.1 *Heating Block*, as shown on the right in Fig. 1, and as further described in Guide D4871, to provide a controlled constant temperature for conducting the test.

6.1.1 Test cells are maintained at a constant elevated temperature by means of a heated aluminum block which surrounds each test cell.

6.1.2 The test cells shall fit into the block to a depth of 225 mm ± 5 mm. When centered, the side clearance of the 38