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.

Designation: D4310 – 22a

Standard Test Method for Determination of Sludging and Corrosion Tendencies of Inhibited Mineral Oils[1]

This standard is issued under the fixed designation D4310; 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 and is used to evaluate the tendency of inhibited mineral oil based steam turbine lubricants and mineral oil based anti-wear hydraulic oils to corrode copper catalyst metal and to form sludge during oxidation in the presence of oxygen, water, and copper and iron metals at an elevated temperature. The test method is also used for testing circulating oils having a specific gravity less than that of water and containing rust and oxidation inhibitors.

NOTE 1—During round robin testing copper and iron in the oil, water and sludge phases were measured. However, the values for the total iron were found to be so low (that is, below 0.8 mg), that statistical analysis was inappropriate. The results of the cooperative test program are available (see Section 16).

1.2 This test method is a modification of Test Method D943 where the oxidation stability of the same kinds of oils is determined by following the acid number of oil. The number of test hours required for the oil to reach an acid number of 2.0 mg KOH/g is the *oxidation lifetime*.

1.3 Procedure A of this test method requires the determination and report of the weight of the sludge and the total amount of copper in the oil, water, and sludge phases. Procedure B requires the sludge determination only. The acid number determination is optional for both procedures.

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

1.5 **WARNING**—Mercury has been designated by many regulatory agencies as a hazardous substance that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Use Caution when handling mercury and mercury-containing products. See the applicable product Safety Data Sheet (SDS) for additional information. The potential exists that selling mercury or mercury-containing products, or both, is prohibited by local or national law. Users must determine legality of sales in their location.

1.6 *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.* For specific warning statements, see Section 7 and X1.1.5.

1.7 *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]

A510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel (Metric) A0510_A0510M

B1 Specification for Hard-Drawn Copper Wire

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

D874 Test Method for Sulfated Ash from Lubricating Oils and Additives

D943 Test Method for Oxidation Characteristics of Inhibited Mineral Oils

D1193 Specification for Reagent Water

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

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

E1 Specification for ASTM Liquid-in-Glass Thermometers

[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 D02.09.0C on Oxidation of Turbine Oils.

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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

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