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: D7416 – 09 (Reapproved 2020)

Standard Practice for Analysis of In-Service Lubricants Using a Particular Five-Part (Dielectric Permittivity, Time-Resolved Dielectric Permittivity with Switching Magnetic Fields, Laser Particle Counter, Microscopic Debris Analysis, and Orbital Viscometer) Integrated Tester[1]

This standard is issued under the fixed designation D7416; 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 practice covers procedures for analysis of in-service lubricant samples using a particular five-part (dielectric permittivity, time-resolved dielectric permittivity with switching magnetic fields, laser particle counter, microscopic debris analysis, and orbital viscometer) integrated tester to assess machine wear, lubrication system contamination, and lubricant dielectric permittivity and viscosity. Analyzed results trigger recommended follow-on actions which might include conducting more precise standard measurements at a laboratory. Wear status, contamination status, and lubricant dielectric permittivity and viscosity status are derived quantitatively from multiple parameters measured.

1.2 This practice is suitable for testing incoming and in-service lubricating oils in viscosity grades 32 mm^2/s at 40 °C to 680 mm^2/s at 40 °C having petroleum or synthetic base stock. This practice is intended to be used for testing in-service lubricant samples collected from pumps, electric motors, compressors, turbines, engines, transmissions, gearboxes, crushers, pulverizers, presses, hydraulics and similar machinery applications. This practice addresses operation and standardization to ensure repeatable results.

1.3 This practice is not intended for use with crude oils.

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 *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.*

1.6 *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]

D341 Practice for Viscosity-Temperature Equations and Charts for Liquid Petroleum or Hydrocarbon Products

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D924 Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids

D1298 Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

E617 Specification for Laboratory Weights and Precision Mass Standards

E1951 Guide for Calibrating Reticles and Light Microscope Magnifications

D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products, Liquid Fuels, and Lubricants

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.96.07 on Integrated Testers, Instrumentation Techniques for In-Service Lubricants.

Current edition approved May 1, 2020. Published June 2020. Originally approved in 2008. Last previous edition approved in 2015 as D7416 – 09 (2015). DOI: 10.1520/D7416-09R20.

[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.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States