



Designation: D6224 – 23

Standard Practice for In-Service Monitoring of Lubricating Oil for Auxiliary Power Plant Equipment¹

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INTRODUCTION

A more systematic approach to monitoring auxiliary power plant equipment can help to minimize the high cost of oil changes and unplanned shutdowns. These avoided costs must be balanced against the cost of sampling and laboratory testing.

This practice is designed to help the user evaluate the condition of the lubricant through its life cycle by carrying out a meaningful program of sampling and testing of oils in use. This practice is performed in order to collect data and monitor trends which suggest any signs of lubricant deterioration and to ensure a safe, reliable, and cost-effective operation of the monitored plant equipment.

1. Scope*

1.1 This practice covers the requirements for the effective monitoring of mineral oil and phosphate ester fluid lubricating oils in service auxiliary (non-turbine) equipment used for power generation. Auxiliary equipment covered includes gears, hydraulic systems, diesel engines, pumps, compressors, and electrohydraulic control (EHC) systems. It includes sampling and testing schedules and recommended action steps, as well as information on how oils degrade.

NOTE 1—Other types of synthetic lubricants are sometimes used but are not addressed in this practice because they represent only a small fraction of the fluids in use. Users of these fluids should consult the manufacturer to determine recommended monitoring practices.

1.2 This practice does not cover the monitoring of lubricating oil for steam and gas turbines. Rather, it is intended to complement Practice **D4378**.

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

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.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standard-*

ization 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

D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

D95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation

D257 Test Methods for DC Resistance or Conductance of Insulating Materials

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

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

D665 Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water

D892 Test Method for Foaming Characteristics of Lubricating Oils

D893 Test Method for Insolubles in Used Lubricating Oils

D943 Test Method for Oxidation Characteristics of Inhibited Mineral Oils

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

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.C0.01** on Turbine Oil Monitoring, Problems and Systems.

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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

- D1169** Test Method for Specific Resistance (Resistivity) of Electrical Insulating Liquids
- D1298** Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
- D1401** Test Method for Water Separability of Petroleum Oils and Synthetic Fluids
- D1500** Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
- D1533** Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration
- D2272** Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel
- D2273** Test Method for Trace Sediment in Lubricating Oils (Withdrawn 2022)³
- D2422** Classification of Industrial Fluid Lubricants by Viscosity System
- D2668** Test Method for 2,6-*di-tert*-Butyl- *p*-Cresol and 2,6-*di-tert*-Butyl Phenol in Electrical Insulating Oil by Infrared Absorption
- D2896** Test Method for Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration
- D2982** Test Methods for Detecting Glycol-Base Antifreeze in Used Lubricating Oils
- D3427** Test Method for Air Release Properties of Hydrocarbon Based Oils
- D3524** Test Method for Diesel Fuel Diluent in Used Diesel Engine Oils by Gas Chromatography
- D4052** Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter
- D4057** Practice for Manual Sampling of Petroleum and Petroleum Products
- D4175** Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
- D4378** Practice for In-Service Monitoring of Mineral Turbine Oils for Steam, Gas, and Combined Cycle Turbines
- D4739** Test Method for Base Number Determination by Potentiometric Hydrochloric Acid Titration
- D5185** Test Method for Multielement Determination of Used and Unused Lubricating Oils and Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
- D6304** Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration
- D6810** Test Method for Measurement of Hindered Phenolic Antioxidant Content in Non-Zinc Turbine Oils by Linear Sweep Voltammetry
- D6971** Test Method for Measurement of Hindered Phenolic and Aromatic Amine Antioxidant Content in Non-zinc Turbine Oils by Linear Sweep Voltammetry
- D7155** Practice for Evaluating Compatibility of Mixtures of Turbine Lubricating Oils
- D7414** Test Method for Condition Monitoring of Oxidation in In-Service Petroleum and Hydrocarbon Based Lubricants by Trend Analysis Using Fourier Transform Infrared (FT-IR) Spectrometry
- D7546** Test Method for Determination of Moisture in New and In-Service Lubricating Oils and Additives by Relative Humidity Sensor
- D7464** Practice for Manual Sampling of Liquid Fuels, Associated Materials and Fuel System Components for Microbiological Testing
- D7647** Test Method for Automatic Particle Counting of Lubricating and Hydraulic Fluids Using Dilution Techniques to Eliminate the Contribution of Water and Interfering Soft Particles by Light Extinction
- D7669** Guide for Practical Lubricant Condition Data Trend Analysis
- D7687** Test Method for Measurement of Cellular Adenosine Triphosphate in Fuel and Fuel-associated Water With Sample Concentration by Filtration
- D7720** Guide for Statistically Evaluating Measurand Alarm Limits when Using Oil Analysis to Monitor Equipment and Oil for Fitness and Contamination
- D7843** Test Method for Measurement of Lubricant Generated Insoluble Color Bodies in In-Service Turbine Oils using Membrane Patch Colorimetry
- D7978** Test Method for Determination of the Viable Aerobic Microbial Content of Fuels and Associated Water—Thixotropic Gel Culture Method
- D8506** Guide for Microbial Contamination and Biodeterioration in Turbine Oils and Turbine Oil Systems
- E1064** Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration
- F311** Practice for Processing Aerospace Liquid Samples for Particulate Contamination Analysis Using Membrane Filters
- F312** Test Methods for Microscopical Sizing and Counting Particles from Aerospace Fluids on Membrane Filters
- 2.2 *ISO Standard*:⁴
- ISO 3448:1992** Industrial liquid lubricants—ISO viscosity classification
- ISO 4406:1999** Hydraulic fluid power—Fluids—Method for coding the level of contamination by solid particles
- 2.3 *SAE Standards*:⁵
- J300** Engine Oil Viscosity Classification
- J306** Automotive Gear Lubricant Viscosity Classification

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this practice, refer to Terminology **D4175**.

4. Significance and Use

4.1 This practice is intended to help users, particularly power plant operators, maintain effective control over their mineral lubricating oils and lubrication monitoring program. This practice may be used to perform oil changes based on oil

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁵ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.