



Designation: D8127 – 17^{ε1}

Standard Test Method for Coupled Particulate and Elemental Analysis using X-ray Fluorescence (XRF) for In-Service Lubricants¹

This standard is issued under the fixed designation D8127; 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.

^{ε1} NOTE—A heading in Table 3 was corrected editorially in April 2018.

1. Scope

1.1 This automatic wear particle analysis² test method for in-service lubricants describes using a combination of pore blockage particle counting and energy dispersive X-ray fluorescence (EDXRF) spectrometry for the quantitative determination of solid particle counts larger than four (4) micrometres, and elemental content of suspended particulate of iron (Fe) and copper (Cu) in such lubricants.

1.2 This test method provides for the determination of the elemental content of suspended particulate of Fe greater than 4 μm in the range of 6 mg/kg to 223 mg/kg. Suspended particulate of copper greater than 4 μm is determined in the range of 3.5 mg/kg to 92.4 mg/kg in the lubricant. Total particle count greater than 4 μm is determined in the range of 11 495 particles/mL greater than 4 μm to 2 169 500 particles/mL greater than 4 μm in the lubricant.

1.3 This test method is applicable to all known in-service lubricants (API Groups I-V) at any stage of degradation.

1.4 This test method uses an empirical inter-element correction methodology.

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

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.*

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 D02.03 on Elemental Analysis.

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² Iron (Fe) and copper (Cu) alloy metals are common elements for machine load bearing surfaces including bearings, gears, pistons, rings, valves, pins, couplings, and cylinders. This in-service lubricant analysis method addresses common challenges associated with extracting, counting, sizing, and elementally analyzing telltale wear debris so that appropriate observations and actions may be recommended.

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:

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D5854 Practice for Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D7669 Guide for Practical Lubricant Condition Data Trend Analysis

D7720 Guide for Statistically Evaluating Measurand Alarm Limits when Using Oil Analysis to Monitor Equipment and Oil for Fitness and Contamination

D7751 Test Method for Determination of Additive Elements in Lubricating Oils by EDXRF Analysis

D7874 Guide for Applying Failure Mode and Effect Analysis (FMEA) to In-Service Lubricant Testing

E1621 Guide for Elemental Analysis by Wavelength Dispersive X-Ray Fluorescence Spectrometry

2.2 ISO Standards:³

ISO 21018:3 Hydraulic fluid power—Monitoring the level of particulate contamination of the fluid—Part 3: Use of the filter blockage technique

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *contaminant particles, n*—particles introduced from an extraneous source into the lubricant of a machine or engine.

3.1.2 *empirical inter-element correction, n*—linear inter-element correction that is constructed from a matrix of calibration samples prepared with varying levels and amounts of

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.