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Standard Guide for Filter Debris Analysis (FDA) Using Manual or Automated Processes¹

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INTRODUCTION

Typically, main lubrication systems incorporate in-system filters to maintain an appropriate lubricant cleanliness level during operation. Since the lubrication filter element removes and retains a major portion of the solid contamination in the lubrication system, evaluation of the debris captured within the filter element aids in the determination of machine condition and root cause analysis (RCA).

The past decade has seen more widespread use of filter debris analysis (FDA) as a condition-monitoring tool to detect and analyze abnormal contaminant ingress into the lube system and predict lube system component wear. This is in part due to the increased use of finer filtration in machinery which results in a decrease of wear debris available for detection by traditional sampled oil analysis. The U. S. military and other militaries around the world as well as Original Equipment Manufacturers have adopted FDA techniques. Commercial in-service oil laboratories are also utilizing a wide range of FDA techniques, from manual to automated. It is necessary to provide a guide to improve analysis and comparison of data.

1. Scope

1.1 This guide pertains to removal and analysis techniques to extract debris captured by in-service lubricant and hydraulic filters and to analyze the debris removed.

1.2 This guide suggests techniques to remove, collect and analyze debris from filters in support of machinery health condition monitoring.

1.3 Debris removal techniques range from manual to automated.

1.4 Analysis techniques vary from visual, particle counting, microscopic, x-ray fluorescence (XRF), atomic emission spectroscopy (AES), and scanning electron microscopy energy dispersive x-rays (SEMEDX).

1.5 This guide is suitable for use with the following filter types: screw on, metal mesh, and removable diagnostic layer filters.

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.

1.7 *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

D5185 Test Method for Multielement Determination of Used and Unused Lubricating Oils and Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)

D6595 Test Method for Determination of Wear Metals and Contaminants in Used Lubricating Oils or Used Hydraulic Fluids by Rotating Disc Electrode Atomic Emission Spectrometry

D7669 Guide for Practical Lubricant Condition Data Trend Analysis

¹ This guide is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.96.06 on Practices and Techniques for Prediction and Determination of Microscopic Wear and Wear-related Properties.

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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.