

The role of Sulphated Ash (ASTM D874) testing in assessing engine oil performance



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The Sulphated Ash test (ASTM D874) is one of the key analytical methods used in the lubricant industry to determine the level of metallic additives present in engine oils. Sulphated ash content is measured by burning the lubricant under controlled conditions, with the addition of a small amount of sulphuric acid and converting the inorganic or metallic elements into sulphated residues which are then quantified.

This parameter is important in modern engine lubricants because metallic detergent and anti-wear additives present in the additives of a lubricant while essential for engine protection and cleanliness, can contribute to ash accumulation in exhaust after-treatment systems, following the combustion process. Sulphated Ash testing therefore helps lubricant developers balance engine protection with emissions system compatibility.

Engine lubricants with excessively high sulphated ash levels may contribute to the blockage or poisoning of Diesel Particulate Filters (DPFs), Gasoline Particulate Filters (GPFs) and catalytic converters. This can lead to increased exhaust back pressure, reduced fuel efficiency and deterioration of emissions control performance over time.

To achieve the required balance, lubricant formulators carefully select and optimise detergent systems, anti-wear chemistry and additive treat rates. The use of lower SAPS (Sulphated Ash, Phosphorus and Sulphur) technology has become increasingly important

in modern passenger car and heavy-duty lubricants designed for vehicles equipped with advanced emissions systems.

The ASTM D874 test method, developed by the American Society for Testing and Materials, provides a standardised procedure for determining Sulphated Ash content in lubricating oils and additives. The test is part of lubricant quality control and specification compliance.

Original Equipment Manufacturers (OEMs) and industry specifications such as the ACEA Oil Sequences define sulphated ash limits to ensure lubricants provide both effective engine protection and compatibility with exhaust after-treatment devices.

The American Petroleum Institute (API 1509), ACEA and OEM specifications establish maximum sulphated ash limits depending on the intended engine application and emissions system requirements. Lower SAPS formulations are particularly important for modern Euro VI and equivalent emissions-compliant engines.

The Technical Association of the European Lubricants Industry (ATIEL) has delegated its product compliance monitoring program to Services to Associations and Industry in the Lubricants sector (SAIL) to evaluate lubricant performance as part of the European Engine Lubricant Quality Management System (EELQMS).

In 2025, SAIL managed thousands of individual tests as part of the compliance monitoring program, including Sulphated Ash compliance. These activities help maintain high-quality standards in the lubricants market and provide consumers with confidence in the products they use.

SAIL's compliance monitoring activities continue to identify instances where Sulphated Ash values fall outside acceptance limits which is essential to ensure that exhaust after-treatment devices operate as intended. Maintaining the correct Sulphated Ash balance is essential to ensuring both engine durability and long-term emissions system performance.

Although limited modifications of the performance additive package are permitted within the ATC Code of Practice, all such formulation modifications must be technically

supported according to the ATC Code of Practice guidelines to demonstrate continued compliance with Sulphated Ash requirements and overall engine oil performance. The substitution of additives or base oils may alter the balance of detergent and anti-wear chemistry, potentially affecting the engine oil performance, the Sulphated Ash and compatibility with exhaust after-treatment systems.

Base oil interchange guidelines and formulation modification guidelines are clearly defined in the respective Codes of Practice.

The EELQMS embraces, among other standards, the respective ATIEL and ATC Codes of Practice. EELQMS is the only system that can be used to support claims against the ACEA Oil Sequences. If in doubt, please consult your reputable technology provider.

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