



Designation: D6139 – 17

Standard Test Method for Determining the Aerobic Aquatic Biodegradation of Lubricants or Their Components Using the Gledhill Shake Flask¹

This standard is issued under the fixed designation D6139; 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 test method covers the determination of the degree of aerobic aquatic biodegradation of fully formulated lubricants or their components on exposure to an inoculum under controlled laboratory conditions. This test method is an ultimate biodegradation test that measures carbon dioxide (CO₂) evolution.

1.2 This test method is intended to specifically address the difficulties associated with testing water insoluble materials and complex mixtures such as are found in many lubricants.

1.3 This test method is designed to be applicable to all non-volatile lubricants or lubricant components that are not toxic and not inhibitory at the test concentration to the organisms present in the inoculum.

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 the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.* Specific hazards are discussed in Section 10.

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D1293 Test Methods for pH of Water

D4447 Guide for Disposal of Laboratory Chemicals and Samples

D5291 Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants

D5864 Test Method for Determining Aerobic Aquatic Biodegradation of Lubricants or Their Components

E943 Terminology Relating to Biological Effects and Environmental Fate

2.2 ISO Standard:³

4259:1992(E) Petroleum Products—Determination and application of precision data in relation to methods of test

2.3 APHA Standards:⁴

2540B Total Solids Dried at 103–105°C

9215 Heterotrophic Plate Count

3. Terminology

3.1 Definitions:

3.2 Definitions of terms applicable to this test method that are not described herein appear in the ASTM Online Dictionary of Engineering Science and Technology⁵ or Terminology E943.

3.3 *activated sludge, n*—the precipitated solid matter, consisting mainly of bacteria and other aquatic microorganisms, that is produced at a domestic wastewater treatment plant; activated sludge is used primarily in secondary sewage treatment to microbially oxidize dissolved organic matter in the effluent.

3.4 *aerobic, adj*—(1) taking place in the presence of oxygen; (2) living or active in the presence of oxygen.

3.5 *biodegradation, n*—the process of chemical breakdown or transformation of a material caused by organisms or their enzymes.

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 D02.12 on Environmental Standards for Lubricants.

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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.

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

⁴ Methods from *Standard Methods for the Examination of Water and Wastewater*, latest edition. Available from the American Public Health Association (APHA), 800 I Street, NW, Washington, DC 20001.

⁵ *ASTM Online Dictionary of Engineering Science and Technology* (Stock#DEFONLINE) is available on the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org.

*A Summary of Changes section appears at the end of this standard