



Standard Test Method for Determining Aerobic Aquatic Biodegradation of Lubricants or Their Components¹

This standard is issued under the fixed designation D5864; 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 laboratory conditions.

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 lubricants that are not volatile and are not inhibitory at the test concentration to the organisms present in the inoculum.

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 and health practices and 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

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 Standard:⁴

2540B Total Solids Dried at 103–105°C

9215 Heterotrophic Plate Count

3. Terminology

3.1 Definitions:

3.1.1 Definitions of terms applicable to this test method that are not described herein appear in the *Compilation of ASTM Standard Definitions*, 1990² or Terminology E943.

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

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

3.1.4 *biomass*, *n*—any material, excluding fossil fuels, which is or was a living organism or component of a living organism.

3.1.5 *blank*, *n*—a flask containing the test medium and the inoculum with no additional carbon source added.

3.1.6 *inoculum*, *n*—spores, bacteria, single celled organisms, or other live materials, that are introduced into a test medium.

3.1.7 *lag phase*, *n*—the period of physiological activity and diminished cell division following the addition of microorganisms to a new culture medium.⁵

3.1.8 *log phase*, *n*—the period of growth of microorganisms during which cells divide at a constant rate.⁵

3.1.9 *mixed liquor*, *n*—the contents of an aeration tank including the activated sludge mixed with primary effluent or the raw wastewater and return sludge.

3.1.10 *pre-adaptation*, *n*—the incubation of an inoculum in the presence of the test substance which is done prior to the initiation of the test and under conditions similar to the test conditions.

3.1.10.1 *Discussion*—The aim of pre-adaptation is to improve the precision of the test method by decreasing variability in the rate of biodegradation produced by the inoculum. Pre-adaptation may mimic the natural processes which cause

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.12 on Environmental Standards for Lubricants.

Current edition approved Nov. 1, 2005. Published December 2005. Originally approved in 1995. Last previous edition approved in 2000 as D5864–00. DOI: 10.1520/D5864-05.

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.

⁴ From *Standard Methods for the Examination of Water and Wastewater*, latest edition. Available from the American Public Health Association, 1015 18th St., N.W., Washington, DC 20036.

⁵ Adapted from *McGraw-Hill Dictionary of Scientific and Technical Terms*, 4th ed., 1989.