



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

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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:

D 1129 Terminology Relating to Water²

D 1193 Specification for Reagent Water²

D 1293 Test Methods for pH of Water²

D 4447 Guide for Disposal of Laboratory Chemicals and Samples³

D 5291 Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants⁴

E 943 Terminology Relating to Biological Effects and Environmental Fate³

2.2 ISO Standard:

4259:1992(E) Petroleum Products—Determination and Application of Precision Data in Relation to Methods of Test

2.3 APHA Standard:

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*, 1990⁷ or Terminology E 943.

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.⁸

3.1.8 *log phase*, *n*—the period of growth of microorganisms during which cells divide at a constant rate.⁸

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.

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.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 11.04.

⁴ *Annual Book of ASTM Standards*, Vol 05.03.

⁵ Available from American National Standards Institute, 11 West 42nd St., New York, NY, 10036.

⁶ 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.

⁷ Available from ASTM Headquarters.

⁸ Adapted from *McGraw-Hill Dictionary of Scientific and Technical Terms*, 4th ed., 1989.