



Standard Test Method for Insolubles in Used Lubricating Oils¹

This standard is issued under the fixed designation D893; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers the determination of pentane and toluene insolubles in used lubricating oils.

1.2 *Procedure A* covers the determination of insolubles without the use of coagulant in the pentane. It provides an indication of the materials that can readily be separated from the oil-solvent mixtures by centrifuging.

1.3 *Procedure B* covers the determination of insolubles in oils containing detergents and employs a coagulant for both the pentane and toluene insolubles. In addition to the materials separated by using Procedure A, this coagulation procedure separates some finely divided materials that may be suspended in the oil.

NOTE 1—Results obtained by Procedures A and B should not be compared since they usually give different values. The same procedure should be employed when comparing values obtained periodically on an oil in use or when comparing results determined by two or more laboratories.

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 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.* For specific warning statements, see Section 7 and 9.1.1.

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

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 D02.06 on Analysis of 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.

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

3. Terminology

3.1 Definitions:

3.1.1 *coagulate*, *v*—to cause to become viscous or thickened into a coherent mass.

3.1.2 *coagulated pentane insolubles, n—in used oil analysis*, separated matter that results when a coagulant is added to a solution of used oil in pentane.

3.1.2.1 *Discussion*—The addition of a coagulant will aid in separating finely divided materials that may have been held in suspension because of the dispersant characteristics of the oil.

3.1.3 *coagulated toluene insolubles, n—in used oil analysis*, coagulated and separated matter not soluble in pentane or toluene.

3.1.4 *pentane insolubles, n—in used oil analysis*, separated matter resulting when a used oil is mixed with pentane.

3.1.4.1 *Discussion*—In this test method, the separation is effected by centrifugation.

3.1.5 *toluene insolubles, n—in used oil analysis*, the portion of pentane insolubles not soluble in toluene.

3.1.6 *used oil, n*—any oil that has been in a piece of equipment (for example, an engine, gearbox, transformer, or turbine), whether operated or not.

3.1.6.1 *Discussion*—In this test method, the oil can be any oil that has been used for lubrication.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *insoluble resins, n—in used oil analysis*, separated matter soluble in toluene but not pentane.

3.2.1.1 *Discussion*—Insoluble resins can be calculated for either Procedure A or B by subtracting the toluene insolubles from the pentane insolubles.

4. Summary of Test Method

4.1 *Procedure A*—A representative sample of used lubricating oil is mixed with pentane and centrifuged. The oil solution is decanted and the precipitate washed twice with pentane, dried, and weighed to give the pentane insolubles. For toluene insolubles, a separate sample of the oil is mixed with pentane and then centrifuged. The precipitate is washed twice with