



Standard Test Method for Engine Oil Volatility by Gas Chromatography¹

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^{ε1} NOTE—Warning statements were made part of the text in November 1999.

1. Scope

1.1 This test method provides for the determination of the amount of engine oil volatilized at 371°C (700°F). This test method is applicable to engine oils containing high molecular weight components that need not elute from a gas chromatographic column.

1.1.1 This test method can also be used to determine the amount of oil volatilized at any temperature between 238 and 371°C, if so desired.

1.2 This test method is limited to samples having an initial boiling point (IBP) greater than 238°C (460°F).

1.3 The values stated in SI units are to be regarded as standard. The values stated in inch-pound units are provided for information only.

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. For specific precautionary statements, see 6.2, 6.3, and 6.4*

2. Referenced Documents

2.1 ASTM Standards:

D 2887 Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography²

D 4626 Practice for Calculation of Gas Chromatographic Response Factors²

2.2 DIN Standard:

DIN 51.581 Noack Evaporative Test³

3. Summary of Test Method

3.1 The sample is mixed with an internal standard and a dilute tetracosane solution, and injected into a gas chromatograph. The column temperature is raised at a reproducible rate and the area under the chromatogram is recorded throughout

the run. The retention time (RT) at 371°C (700°F) is calculated using linear regression, utilizing the *n*-paraffins comprising the internal standard and the tetracosane retention time/boiling point data. The area response (area/g) of the internal standard is related to the area of the sample determined to the 371°C RT to obtain the mass percentage of oil volatilized at 371°C.

4. Significance and Use

4.1 The determination of engine oil volatility at 371°C (700°F) is a requirement in some lubricant specifications.

4.2 This test method is intended to give a more precise measurement of oil volatility than that obtainable using the Noack method.⁴

4.3 This test method can be used on lubricant products not within the scope of Test Method D 2887.

5. Apparatus

5.1 *Chromatograph*, any gas chromatograph can be used that has the following characteristics:

5.1.1 *Oven*, a column oven having high-temperature (400°C/752°F) capability is required.

5.1.2 *Detector*, a flame ionization detector capable of continuous operation at temperatures of 405°C (761°F) is required.

5.1.3 *Column Temperature Programmer*—The chromatograph must be capable of reproducible linear temperature programming over the temperature range required for the test method.

5.1.4 *Sample Inlet System*—The sample inlet system must provide for on-column injection or equivalent such as programmable splitless injection.

5.1.5 *Column*, 12 m by 0.53 mm by 0.15 μm nonpolar, carborane modified polydimethylsiloxane bonded phase column or equivalent that can withstand the high column oven temperature employed, and meets the resolution requirements stipulated in 7.3 must be used.

5.1.6 *Integrator*—Means must be provided for determining the accumulated area under the chromatogram. This can be done by means of a computer or electronic integrator. A timing

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.04.0H on Gas Chromatographic Methods.

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² *Annual Book of ASTM Standards*, Vol 05.02.

³ DIN 51.581, Prüfung von Schmierstoffen: Bestimmung des Verdampfungsverlustes von Schmierölen nach Noack [Testing of Lubricants: Determination of Noack Volatility of Lubricating Oils] (1958).

⁴ The samples used in the ASTM cooperative study for this test method conducted by ASTM Subcommittee D02.04 were also used for a round-robin study of a proposed Standard Test Method for Evaporation Loss of Lubricating Oils by the Noack Method conducted in 1992 by ASTM Subcommittee D02.06. Refer to the minutes of the December 1992 Subcommittee D02.06 meeting for information on the differences between the methods.