



Standard Test Method for Estimating Apparent Vapor Pressures and Molecular Weights of Lubricating Oils¹

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1. Scope

1.1 This test method covers a calculation procedure for converting data obtained by Test Method D972 to apparent vapor pressures and molecular weights. It has been demonstrated to be applicable to petroleum-based and synthetic ester lubricating oils,² at temperatures of 395 to 535K (250 to 500°F). However, its applicability to lubricating greases has not been established.

NOTE 1—Most lubricants boil over a fairly wide temperature range, a fact recognized in discussion of their vapor pressures. For example, the apparent vapor pressure over the range 0 to 0.1 % evaporated may be as much as 100 times that over the range 4.9 to 5.0 % evaporated.

1.2 The values stated in SI units are to be regarded as the standard. In cases in which materials, products, or equipment are available in inch-pound units only, SI units are omitted.

1.3 **WARNING**—Mercury has been designated by many regulatory agencies as a hazardous material that can cause central nervous system, kidney and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website—<http://www.epa.gov/mercury/faq.htm>—for additional information. Users should be aware that selling mercury or mercury containing products into your state or country may be prohibited by law.

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 or regulatory limitations prior to use.* For specific warning statements, see 6.2, 7.1, 8.2, and Annex A2.

¹ This test method is under the jurisdiction of Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.L0.07 on Engineering Sciences of High Performance Fluids and Solids.

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² Coburn, J. F., "Lubricant Vapor Pressure Derived from Evaporation Loss," *Transactions*, American Society of Lubricating Engineers, ASLTE, Vol 12, 1969, pp. 129–134.

2. Referenced Documents

2.1 ASTM Standards:³

- A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester
- D972 Test Method for Evaporation Loss of Lubricating Greases and Oils
- D2503 Test Method for Relative Molecular Mass (Molecular Weight) of Hydrocarbons by Thermoelectric Measurement of Vapor Pressure
- D2595 Test Method for Evaporation Loss of Lubricating Greases Over Wide-Temperature Range
- D2883 Test Method for Reaction Threshold Temperature of Liquid and Solid Materials
- E659 Test Method for Autoignition Temperature of Liquid Chemicals

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *apparent vapor pressure* (p), n —the time-averaged value of the vapor pressure from the start to the end of the evaporation test.

3.1.1.1 *Discussion*—While this may include some effects of differences in nonideality of the vapor, heat of vaporization, surface tension, and viscosity between the m -terphenyl and the lubricating oil, these factors have been demonstrated to be negligible. Unless stated, this average shall cover the range 0 to 5 ± 1 %.

3.1.2 *cell constant* (k), n —the ratio of the amount of m -terphenyl or lubricating oil carried off per unit volume of gas to that predicted by Dalton's law.

$$k = 22.41 PW / VpM \quad (1)$$

where:

³ 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.