



Designation: D2878 – 21

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

This standard is issued under the fixed designation D2878; 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 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 K to 535 K (250 °F 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 substance that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Use caution when handling mercury and mercury-containing products. See the applicable product Safety Data Sheet (SDS) for additional information. The potential exists that selling mercury or mercury-containing products, or both, is prohibited by local or national law. Users must determine legality of sales in their location.

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, health, and environmental 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, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.L0.07 on Engineering Sciences of High Performance Fluids and Solids (Formerly D02.1100).

Current edition approved Dec. 1, 2021. Published February 2022. Originally approved in 1970. Last previous edition approved in 2016 as D2878 – 10 (2016). DOI: 10.1520/D2878-21.

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

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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 (Withdrawn 2016)⁴

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

E659 Test Method for Autoignition Temperature of Chemicals

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

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

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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

*A Summary of Changes section appears at the end of this standard