



Designation: D3525 – 20

Standard Test Method for Gasoline Fuel Dilution in Used Gasoline Engine Oils by Wide-Bore Capillary Gas Chromatography¹

This standard is issued under the fixed designation D3525; 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 describes a gas chromatographic technique for determining the amount of gasoline fuel dilution in used lubricating oils arising from their use in gasoline engines.

1.2 This test method is limited to gas chromatographs accommodating wide-bore (0.53 mm) capillary columns and that are equipped with flame ionization detectors (FIDs) and temperature programmable ovens.

1.3 There is no limitation regarding the fuel dilution concentration range that can be determined by this method, however the precision statements apply only to the concentration range of 0.5 % to 20.3 % gasoline. A reporting limit of 0.5 % gasoline fuel dilution has also been included in the method.

1.4 Lubricating fluids recovered from engine crankcases have undergone changes due to heating, volatilization, sheering, oxidation and other reactions, and, as a result, the chromatographic profiles of the gasoline diluents and engine oils often differ significantly from their original patterns. Caution is accordingly advised when comparing quantitative determinations made using new verses used or in-service materials.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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 of regulatory requirements prior to use.*

1.7 *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 Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*²

E355 Practice for Gas Chromatography Terms and Relationships

E594 Practice for Testing Flame Ionization Detectors Used in Gas or Supercritical Fluid Chromatography

E1510 Practice for Installing Fused Silica Open Tubular Capillary Columns in Gas Chromatographs

3. Terminology

3.1 *Definitions:*

3.1.1 For definition of gas chromatography terms, refer to Practice **E355**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *fuel diluent, n—in used oil analysis*, unburned fuel components that enter the engine crankcase causing dilution of the oil.

3.2.1.1 *Discussion*—In this method, the fuel diluent components being determined originate from gasoline.

3.2.2 *fuel dilution, n*—the amount, expressed as a percentage, of gasoline found in engine lubricating oil.

3.2.2.1 *Discussion*—Fuel dilution may be the result of engine wear or improper performance.

3.3 *Abbreviations:*

3.3.1 A common abbreviation of hydrocarbon compounds is to designate the number of carbon atoms in the compound. A prefix is used to indicate the carbon chain form, while a subscripted suffix denotes the number of carbon atoms.

Example:

normal hexadecane $n\text{-C}_{16}$
iso-tetradecane $i\text{-C}_{14}$

4. Summary of Test Method

4.1 A gas chromatographic technique is described for analyzing used engine oils by adding a known amount of

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.B0 on Automotive 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.

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