



Designation: D8276 – 19

Standard Test Method for Hydrocarbon Types in Middle Distillates, including Biodiesel Blends by Gas Chromatography/Mass Spectrometry¹

This standard is issued under the fixed designation D8276; 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 an analytical scheme using the gas chromatography/mass spectrometry (GC-MS) to determine the hydrocarbon types present in middle distillates 170 °C to 365 °C boiling range, 5 % to 95 % by volume as determined by Test Method [D86](#), including biodiesel blends with up to 20 % by volume of fatty acid methyl ester (FAME). The detailed hydrocarbon composition, total aromatic hydrocarbon and polycyclic aromatic hydrocarbon contents can be determined. The hydrocarbon types include: paraffins, noncondensed cycloparaffins, condensed dicycloparaffins, condensed tricycloparaffins, alkylbenzenes, indans or tetralins, or both, C_nH_{2n-10} (indenes, etc.), naphthalenes, C_nH_{2n-14} (acenaphthenes, etc.), C_nH_{2n-16} (acenaphthylenes, etc.), and tricyclic aromatics. The content of FAME in biodiesel blends can also be determined by GC.

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

1.3 *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 limitations prior to use.*

1.4 *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:²

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 [D02.04.0M](#) on Mass Spectrometry.

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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.

[D86](#) Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure

[D2425](#) Test Method for Hydrocarbon Types in Middle Distillates by Mass Spectrometry

[D4057](#) Practice for Manual Sampling of Petroleum and Petroleum Products

[D4177](#) Practice for Automatic Sampling of Petroleum and Petroleum Products

[D6299](#) Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

[D6300](#) Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products and Lubricants

[D8144](#) Test Method for Separation and Determination of Aromatics, Nonaromatics, and FAME Fractions in Middle Distillates by Solid-Phase Extraction and Gas Chromatography

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 The detailed definitions of the summation of characteristic mass fragments can be found in Test Method [D2425](#).

3.1.2 *dual column GC-MS system, n*—a gas chromatography/mass spectrometry system equipped with a hydrogen flame ionization detector (FID). Samples introduced by the sample introduction system are split into two capillary columns in parallel, in which one column connected to the FID and the other one connected to the mass spectrometer.

3.1.3 *polycyclic aromatic hydrocarbons, n*—sum of the concentrations of naphthalenes, C_nH_{2n-14} (acenaphthenes, etc.), C_nH_{2n-16} (acenaphthylenes, etc.) and tricyclic aromatics.

3.1.4 *total aromatic hydrocarbons, n*—sum of the concentrations of alkylbenzenes, indans, tetralins, C_nH_{2n-10} (indenes, etc.) and polycyclic aromatics.

4. Summary of Test Method

4.1 Samples are separated into saturate, aromatic, and/or FAME fractions by Test Method [D8144](#). Aliquots of internal standards are added to these fractions and all of these fractions are analyzed by the dual column GC-MS system. The contents