



Designation: D4737 – 21

## Standard Test Method for Calculated Cetane Index by Four Variable Equation<sup>1</sup>

This standard is issued under the fixed designation D4737; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 The calculated Cetane Index by Four Variable Equation provides a means for estimating the ASTM cetane number (Test Method [D613](#)) of distillate fuels from density and distillation recovery temperature measurements. The value computed from the equation is termed the Calculated Cetane Index by Four Variable Equation.

1.2 The Calculated Cetane Index by Four Variable Equation is not an optional method for expressing ASTM cetane number. It is a supplementary tool for estimating cetane number when a result by Test Method [D613](#) is not available and if cetane improver is not used. As a supplementary tool, the Calculated Cetane Index by Four Variable equation must be used with due regard for its limitations.

1.3 Procedure A is to be used for Specification [D975](#), Grades No. 1–D S15, No. 1–D S500, No. 1–D S5000, No. 2–D S15, No. 2–D S5000, and No. 4–D. This method for estimating cetane number was developed by Chevron Research Co.<sup>2</sup> Procedure A is based on a data set including a relatively small number of No. 1–D fuels. Test Method D4737 Procedure A may be less applicable to No. 1–D S15, No. 1–D S500, and No. 1–D S5000 than to No. 2–D grade S5000 or to No. 4–D fuels.

1.3.1 Procedure A has been verified as applicable to Grade No. 2–D S15 diesel fuels.<sup>3</sup>

1.4 Procedure B is to be used for Specification [D975](#), Grade No. 2–D S500.

1.5 The test method “Calculated Cetane Index by Four Variable Equation” is particularly applicable to Grade 1–D S5000, Grade No. 1–D S500, Grade No. 2–D S5000 and Grade No. 2–D S500 diesel fuel oils containing straight-run and

cracked stocks, and their blends. It can also be used for heavier fuels with 90 % recovery points less than 382 °C and for fuels containing derivatives from oil sands and oil shale.

NOTE 1—Sxx is the designation for maximum sulfur level specified for the grade. For example, S500 grades are those with a maximum sulfur limit of 500 ppm ( $\mu\text{g/g}$ ).

1.6 Biodiesel blends are excluded from this test method, because they were not part of the datasets use to develop either Procedure A or B.

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

1.8 *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.*

1.9 *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:*<sup>4</sup>

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

[D613](#) Test Method for Cetane Number of Diesel Fuel Oil

[D975](#) Specification for Diesel Fuel

[D1298](#) Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

[D2887](#) Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography

[D4052](#) Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

[D4175](#) Terminology Relating to Petroleum Products, Liquid

<sup>1</sup> 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.E0](#) on Burner, Diesel and Non-Aviation Gas Turbine Fuels.

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<sup>2</sup> Ingham, M. C., et al., “Improved Predictive Equations for Cetane Number,” SAE Paper No 860250, Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

<sup>3</sup> Supporting data (the analysis leading to the use of Procedure A for No. 2–D S15 diesel fuels and to Procedure B) have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1699. Contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org).

<sup>4</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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