



Standard Test Method for Calculated Cetane Index by Four Variable Equation¹

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 (ϵ) 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.² 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.³

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.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.E0.02 on Diesel Fuel Oils.

Current edition approved Aug. 1, 2010. Published September 2010. Originally approved in 1987. Last previous edition approved in 2009 as D4737–09a. DOI: 10.1520/D4737-10.

² 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.

³ 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.

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 used 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:⁴

D86 Test Method for Distillation of Petroleum Products at Atmospheric Pressure

D613 Test Method for Cetane Number of Diesel Fuel Oil

D975 Specification for Diesel Fuel Oils

D1298 Test Method for Density, Relative Density (Specific Gravity), 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

D6751 Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels

D6890 Test Method for Determination of Ignition Delay and Derived Cetane Number (DCN) of Diesel Fuel Oils by Combustion in a Constant Volume Chamber

D7170 Test Method for Determination of Derived Cetane Number (DCN) of Diesel Fuel Oils—Fixed Range Injection Period, Constant Volume Combustion Chamber Method

2.2 CEN Standards:⁵

⁴ 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.

⁵ Available from the National CEN members listed on the CEN website (www.cenorm.be) or from the CEN/TC 19 Secretariat (astm@nen.nl).

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