Designation: D2157 – 18

Standard Test Method for Effect of Air Supply on Smoke Density in Flue Gases from Burning Distillate Fuels[1]

This standard is issued under the fixed designation D2157; 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 the evaluation of the performance of distillate fuels from the standpoint of clean, efficient burning. It is intended primarily for use with home heating equipment burning No. 1 or No. 2 fuel oils. It can be used either in the laboratory or in the field to compare fuels using a given heating unit or to compare the performance of heating units using a given fuel.

NOTE 1—This test method applies only to pressure atomizing and rotary-type burners.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.2.1 Arbitrary and relative units are also used.

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]

D2156 Test Method for Smoke Density in Flue Gases from Burning Distillate Fuels

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *efficiency, n*—the percentage of gross heat of combustion of the fuel which is retained by the equipment and which does not pass out in the flue gases.

3.1.2 *excess combustion air, n*—the percentage of air entering the equipment over and above that needed for stoichiometric conversion of the fuel to the ultimate combustion products, essentially CO_2 and water, for a normal fuel.

3.1.2.1 *Discussion*—This may be calculated from the percentage CO_2 in the flue gas and the carbon-hydrogen ratio of the fuel.

3.1.3 *flue-gas carbon dioxide (CO_2), n*—the percentage concentration of carbon dioxide in the flue gas, measured by conventional Orsat analysis, or the equivalent.

3.1.4 *net stack temperature, n*—the difference between the stack temperature and the ambient temperature of the air near the inlet to the burner.

3.1.5 *smoke density, n*—the concentration of smoke in the flue gas, measured as a Smoke Spot Number as described in Test Method D2156.

4. Summary of Test Method

4.1 The flue-gas smoke density is measured for various amounts of combustion air while the burner is operating at equilibrium conditions. Results are expressed as a plot of smoke density as a function of flue-gas carbon dioxide (CO_2) content, or alternatively, as a function of percentage excess combustion air.

5. Significance and Use

5.1 This test method relates efficiency of operation of domestic heating equipment to clean burning. Reducing combustion air in a burner gives more efficient operation. The extent to which combustion air can be reduced is limited by the onset of unacceptable smoke production. By delineating the relation between smoke density and air supply, this test method (together with net stack temperature data) defines the maximum efficiency for a given installation at any acceptable smoke level.

[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.E0 on Burner, Diesel, Non-Aviation Gas Turbine, and Marine Fuels.

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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**