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Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)[1]

This standard is issued under the fixed designation D 1500; 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. This is also a standard of the Institute of Petroleum issued under the fixed designation IP 196. The final number indicates the year of last revision.

This test method was adopted as a joint ASTM-IP standard in 1966.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the visual determination of the color of a wide variety of petroleum products such as lubricating oils, heating oils, diesel fuel oils, and petroleum waxes.

NOTE 1—Test Method D 156 is applicable to refined products that have an ASTM color lighter than 0.5. IP Method 17 includes a procedure for measuring the color of undyed, refined products such as gasoline, white spirit, and kerosine by comparison with a series of IP Standard glasses. It also includes a procedure by which petroleum products, except black oils and bitumens, may be measured for tint and depth of color in terms of Lovibond units by a series of red, yellow, and blue glasses.

1.2 This test method reports results specific to the test method and recorded as "ASTM Color."

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 and health practices and determine the applicability of regulatory limitations prior to use.* For a specific hazard statement, see Note 2.

2. Referenced Documents

2.1 *ASTM Standards:*

D 155 Test Method for Color of Lubricating Oil and Petrolatum by Means of ASTM Union Colorimeter[2]

D 156 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)[3]

D 938 Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum[3]

D 2500 Test Method for Cloud Point of Petroleum Oils[4]

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products[5]

2.2 *IP Standard:*

IP 17 Color by the Lovibond Tintometer[6]

3. Summary of Test Method

3.1 Using a standard light source, a liquid sample is placed in the test container and compared with colored glass disks ranging in value from 0.5 to 8.0. When an exact match is not found and the sample color falls between two standard colors, the higher of the two colors is reported.

4. Significance and Use

4.1 Determination of the color of petroleum products is used mainly for manufacturing control purposes and is an important quality characteristic since color is readily observed by the user of the product. In some cases the color may serve as an indication of the degree of refinement of the material. When the color range of a particular product is known, a variation outside the established range may indicate possible contamination with another product. However, color is not always a reliable guide to product quality and should not be used indiscriminantly in product specifications.

5. Apparatus

5.1 *Colorimeter*, consisting of light source, glass color standards, sample container housing with cover, and viewing piece as listed in Annex A1.

5.2 *Sample Container*—For referee work, use the glass sample jar as shown in Fig. 1. For routine tests, it is permissible to use a cylindrical, clear glass jar with a flat bottom of 30 to 32.4 mm internal diameter and 115 to 125 mm in external height and a wall thickness no greater than 1.6 mm as specified

[1] This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.05 on Properties of Fuels, Petroleum Coke, and Oil Shale. In the IP, this test method is under the jurisdiction of the Standardization Committee.

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[2] *1958 Book of ASTM Standards*, Part 7; see also the compilation of "ASTM Standards on Petroleum Products and Lubricants," October 1959, p. 91.

[3] *Annual Book of ASTM Standards*, Vol 05.01.

[4] *Annual Book of ASTM Standards*, Vol 05.02.

[5] *Annual Book of ASTM Standards*, Vol 05.03.

[6] "Methods for Analysis and Testing," available from Institute of Petroleum, 61 New Cavendish St., London, England W1M 8AR.

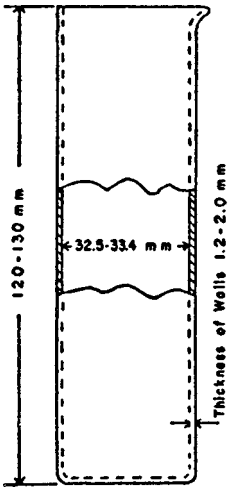

FIG. 1 Standard Glass Sample Jar

in Test Method D 2500, or an ordinary 125-mL oil sample bottle if it meets these requirements.

6. Sampling

6.1 Samples shall be taken in accordance with the instructions in Practice D 4057.

7. Diluent

7.1 Solvent kerosine (**Warning**—See Note 2) having a color lighter than + 21 Saybolt color by Test Method D 156 or 1.5 by Method B of IP 17. This material is used for diluting dark samples for the test. As an alternative, other solvents, such as white oil or solvent neutral 100 of satisfactory purity that meet the color requirements specified above, are also acceptable.

NOTE 2—**Warning:** Combustible. Vapor harmful.

NOTE 3—Solvent kerosine complies with this requirement if it is lighter in color than potassium dichromate ($K_2Cr_2O_7$) solution formed by dissolving 4.8 mg of pure anhydrous $K_2Cr_2O_7$ in 1 L of distilled water.

8. Preparation of Sample

8.1 *Liquid Petroleum Products such as Lubricating Oils*—Fill the sample container to a depth of 50 mm or more and observe the color. When the sample is not clear, heat it 6°C (10°F) above its cloud point (see Test Method D 2500) and observe the color at that temperature. When the sample is darker than 8 color, mix 15 volumes of sample into 85 volumes of the solvent kerosine and observe the color of the mixture.

8.2 *Petroleum Waxes, Including Petrolatum*—Heat the sample to a temperature 11 to 17°C (20 to 30°F) above its congealing point as determined in accordance with Test Method D 938 and test at that temperature. When the sample is darker than 8 color, mix 15 volumes of melted sample with 85 volumes of solvent kerosine brought to the same temperature and test the mixture at that temperature.

9. Procedure

9.1 Place a sample container or containers, filled to a depth of at least 50 mm with distilled or deionized water in the compartment or compartments, of the colorimeter through which the standard glasses will be observed. Place the sample in its container in the other compartment. (When using a three field comparator this will be the middle compartment.) Cover the containers to exclude all exterior light.

9.2 Switch on the light source and compare the color of the sample with that of the standard glasses. When using a three field comparator the sample must be bracketed by darker and lighter discs or by an exact match and a darker disc. Determine for two field comparators which glass matches the color of the sample; or if an exact match is not possible, then use that glass which possesses the next darker color.

10. Report

10.1 Report as the color of the sample, the designation of the glass producing a matching color, for example; "7.5 ASTM Color."

10.2 If the color of the sample is intermediate between those of two standard glasses, record the designation of the darker glass preceded by the letter "L," for example: "L7.5 ASTM Color." Never report the color as being darker than a given standard except those darker than 8, for example: "D8 ASTM Color."

10.3 If the sample has been diluted with kerosine, report the color of the mixture followed by the abbreviation "Dil," for example: "L7.5 Dil ASTM Color."

11. Precision and Bias [7]

11.1 *Precision*

11.1.1 The precision of this test method as obtained by statistical examination of interlaboratory test results is as follows:

11.1.1.1 *Repeatability*—The difference between successive test results obtained by the same operator with the same apparatus under constant operating conditions on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following value only in one case in twenty: 0.5 color units.

11.1.1.2 *Reproducibility*—The difference between two single and independent test results obtained by different operators working in different laboratories on identical test material would, in the long run, in the normal and correct operation of the test method exceed the following value only in one case in twenty: 1 color unit.

11.2 *Bias*—The procedure in this test method has no bias because the value of ASTM Color is subjective and can only be defined in terms of this test method.

12. Keywords

12.1 ASTM color; color; petroleum products

[7] Precision and bias data are available from ASTM Headquarters. Request RR:D02-1234.