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Standard Test Method for WATER IN INSULATING OILS BY EXTRACTION¹

This Standard is issued under the fixed designation D 1315; 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.

1. Scope

1.1 This method measures by extraction the amount of water contained in mineral oils of petroleum origin such as are used in cables of certain types, transformers, oil circuit breakers, and other electrical apparatus.

NOTE 1—The values stated in U.S. customary units are to be regarded as the standard.

2. Summary of Method

2.1 Moisture is removed from the oil by heat, vacuum, and shaking, and is collected in a moisture-absorbing trap. A filter is added to the train to prevent active hydrocarbons removed from the oil with the moisture from reaching the moisture-absorbing trap. A fitting having a ground-glass joint connection and stopcocks has been incorporated in the design to permit complete removal of the oil and moisture from the sample bottle.

3. Apparatus

3.1 *Water Extractor*, as shown in Fig. 1, constructed of $\frac{3}{8}$ -in. (10-mm) outside diameter heavy-wall chemical- and heat-resistant glass² and mounted on a panel.

3.2 *Filter Tubes*—The filter tubes for holding the activated carbon and P_2O_5 reagents shall be in accordance with the dimensional drawing in Fig. 2. The retainers for holding the activated carbon in the filter tube are also shown in Fig. 2; washers made of No. 60 (250 μ m) brass sieve have been found satisfactory. Chemical-resistant glass² wool shall be used at the top and bottom to retain the P_2O_5 in the filter tube.

3.3 *Vacuum Pump*—A laboratory-type pump capable of developing a vacuum of 0.1 μ m on a closed system and having a free air

capacity of approximately 21 liters/min.

3.4 *Dewar Flask*—A wide-mouth vacuum bottle approximately 2 in. (50 mm) in depth and 3 in. (75 mm) in inside diameter.

3.5 *Heaters*³—Two heating elements capable of providing sufficient heat to the retort and the oil sample bottle.

3.6 *Shaking Device*—Any device capable of providing a pendulum-like action to the retort at a rate of approximately 120 oscillations/min.

NOTE 2—A fractional horsepower a-c motor with reduction gear and cam coupled to the heating mantle on the retort has been found satisfactory.⁴

3.7 *Rotating Drum*—A small rotating drum to aid in conditioning carbon for the filter tubes.⁴ Essential features include a No. 40 (425- μ m sieve) cylinder, approximately $\frac{3}{4}$ in. (20 mm) in diameter by $\frac{3}{8}$ in. (80 mm) long, driven at 1 rpm by an electric clock motor.

4. Reagents

4.1 *Activated Carbon*, specially prepared, passing the No. 20 (850- μ m) and retained on the No. 50 (300- μ m) sieve.⁵

¹ This method is under the jurisdiction of ASTM Committee D-27 on Electrical Insulating Liquids and Gases. Current edition effective Sept. 30, 1963. Originally issued 1954. Replaces D 1315 - 59 T.

² Pyrex glass has been found satisfactory for this purpose.

³ Aluminum-cased Glas-Col heating mantles rated at 110 V, 150 W, constructed to fit snugly the retort and the oil sample bottle, respectively, have been found satisfactory for this purpose.

⁴ Working drawings for a suitable apparatus may be obtained at a nominal cost from ASTM Headquarters, 1916 Race St., Philadelphia, Pa. 19103. Request Adjunct No. 12-413150-10 for the drum and No. 12-413150-20 for the shaking device.

⁵ Columbia Grade I activated carbon, supplied by the National Carbon Co., has been found satisfactory for this purpose.