Designation: D2668 – 07 (Reapproved 2013)

Standard Test Method for 2,6-*di-tert*-Butyl- *p*-Cresol and 2,6-*di-tert*-Butyl Phenol in Electrical Insulating Oil by Infrared Absorption[1]

This standard is issued under the fixed designation D2668; 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 determination of the weight percent of 2,6-ditertiary-butyl paracresol (DBPC) and 2,6-ditertiary-butyl phenol (DBP) in new or used electrical insulating oil in concentrations up to 0.5 % by measuring its absorbance at the specified wavelengths in the infrared spectrum.

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

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D923 Practices for Sampling Electrical Insulating Liquids

D2144 Practices for Examination of Electrical Insulating Oils by Infrared Absorption

D3487 Specification for Mineral Insulating Oil Used in Electrical Apparatus

3. Significance and Use

3.1 The quantitative determination of 2,6-ditertiary-butyl paracresol and 2,6-ditertiary-butyl phenol in a new electrical insulating oil measures the amount of this material that has been added to the oil as protection against oxidation. In a used oil it measures the amount remaining after oxidation has reduced its concentration. The test is also suitable for manufacturing control and specification acceptance.

3.2 When an infrared spectrum is obtained of an electrical insulating oil inhibited with either of these compounds there is an increase in absorbance of the spectrum at several wavelengths (or wavenumbers). 2,6 ditertiary-butyl paracresol produces pronounced increases in absorbance at 2.72 μm (3650 cm^{-1}), and 11.63 μm (860 cm^{-1}). 2,6 ditertiary-butyl phenol produces pronounced increases in absorbance at 2.72 μm (3650 cm^{-1}) and 13.42 μm (745 cm^{-1}).

3.3 When making this test on other than a highly oxidized oil or when using a double-beam spectrophotometer, it has been found convenient to obtain the spectrum between 2.5 μm (4000 cm^{-1}) and 2.9 μm (3450 cm^{-1}) because the instrument is compensated for the presence of moisture and the band is not influenced by intermolecular forces (associations). However, when testing a highly oxidized oil or when using a single-beam instrument better results may be obtained if the scan is made between 10.90 μm (918 cm^{-1}) and 14.00 μm (714 cm^{-1}).

3.4 Increased absorption at 11.63 μm (860 cm^{-1}) or 13.42 μm (745 cm^{-1}) or both, will identify the inhibitor as 2,6-ditertiary-butyl paracresol or 2,6-ditertiary-butyl phenol respectively (Note 1).

NOTE 1—The absorbance at 745 cm^{-1} for 2,6-ditertiary-butyl phenol and at 860 cm^{-1} for 2,6-ditertiary-butyl paracresol for equal concentrations will be in the approximate ratio of 2.6 to 1.

4. Apparatus

4.1 With equipment description referring to compliance, the equipment shall be in accordance with Section 6 of Practices D2144. Accordingly, the use of Fourier-transform rapid scan infrared (FTIR) spectrophotometers is permitted by reference to that test method.

5. Sampling

5.1 Obtain the sample in accordance with Practices D923.

6. Calibration and Standardization

6.1 When the manufacturer of the oil is known and the base oil is available, use it to prepare the standards. For oils of unknown origin, use base oils which meet the requirements of Specification D3487. Some base oils may provide a better match than others and therefore it is desirable to have several available.

[1] This test method is under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.03 on Analytical Tests.

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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.

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