Designation: D 2296 – 01

Standard Specification for Continuity of Quality of Electrical Insulating Polybutene Oil for Capacitors [1]

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1. Scope

1.1 This specification provides the limits within which the properties of electrical insulating polybutene oil for capacitors shall conform in order to ensure an unvarying continuity in the quality and grade of polybutene oil supplied.

1.2 It is expected that additional laboratory or service tests of the purchaser's own choosing may be applied to polybutene oil from each source of supply before approval for use.

2. Referenced Documents

2.1 *ASTM Standards:*

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup [2]

D 97 Test Method for Pour Point of Petroleum Products [2]

D 117 Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Oils of Petroleum Origin [3]

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity) [2]

D 664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration [2]

D 877 Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes [3]

D 878 Test Method for Inorganic Chlorides and Sulfates in Insulating Oils [3]

D 923 Practice for Sampling Electrical Insulating Liquids [3]

D 924 Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids [3]

D 974 Test Method for Acid and Base Number by Color-Indicator Titration [2]

D 1169 Test Method for Specific Resistance (Resistivity) of Electrical Insulating Liquids [3]

D 1275 Test Method for Corrosive Sulfur in Electrical Insulating Oils [3]

D 1298 Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method [2]

D 1500 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale) [2]

D 1533 Test Methods for Water in Insulating Liquids (Karl Fischer Reaction Method) [3]

D 1816 Test Method for Dielectric Breakdown Voltage of Insulating Oils of Petroleum Origin Using VDE Electrodes [3]

D 1934 Test Method for Oxidative Aging of Electrical Insulating Petroleum Oils by Open-Beaker Method [3]

D 2161 Practice for Conversion of Kinematic Viscosity to Saybolt Universal Viscosity or to Saybolt Furol Viscosity [2]

D 2522 Test Method for Chlorine Content of Polybutenes Used for Electrical Insulation [3]

D 2864 Terminology Relating to Electrical Insulating Liquids and Gases [3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions applicable to the properties listed in Table 1, reference should be made to Guide D 117. For standard definitions refer to Terminology D 2864.

4. Materials and Manufacture

4.1 No change shall be made in the type of polybutene oil without prior agreement with the purchaser. The polybutene oil shall not contain additives.

5. Detail Requirements and Test Methods

5.1 Electrically insulating polybutene oil shall conform to the requirements prescribed in Table 1 and shall be tested in accordance with the test methods listed therein.

6. Sampling

6.1 Electrically insulating polybutene oil shall be sampled in accordance with Practice D 923.

7. Shipping

7.1 All polybutene oil containers, including attendant pipes and pumps, shall be clean and dry. No change shall be made in the approved type of containers without prior agreement with the purchaser.

[1] This specification is under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.02 on Gases and Synthetic Liquids.

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

[3] *Annual Book of ASTM Standards*, Vol 10.03.

TABLE 1 Detail Requirements for Electrically Insulating Polybutene Oil

Property	Requirements	ASTM Test Methods
Physical:		
Relative Density (Specific gravity), min, 15.6/15.6°C(60/60°F)	0.890	D 1298
Pour point, max	10°C (50°F)	D 97
Flash point, min	218°C (425°F)	D 92
Viscosity:		D 445 and D2161
Kinematic, cSt at 100°C (212°F)	600 to 771	
Color, max	1	D 1500
Water content as shipped, max, ppm	40	D 1533
Chemical:		
Chlorine, max, ppm	40	D 2522
Inorganic chlorides and sulfates	NDA [A]	D 878
Neutralization number, max, mg KOH/g	0.04	D 974 or D664
Sulfur, corrosive	noncorrosive	D 1275
Electrical:		
Dielectric breakdown, min, kV	35	D 877[B], or D 1816[C]
Power factor, [D] 60 Hz, max at 100°C (212°F)	0.0003	D 924
Resistivity, [D] min, $10^{12}\Omega\cdot$ cm at 100°C (212°F)	50	D 1169
Aging Tests (*after heating 96 h at 115°C*(*239°F*))*:*		D 1934, Procedure A
Color, max	1.5	D 1500
Neutralization number, max, mg KOH/g	0.04	D 974 or D664
Power factor, [D] 60 Hz, max at 100°C (212°F)	0.0005	D 924
Resistivity, [D] min $10^{12}\Omega\cdot$cm at 100°C (212°F)	10	D 1169

[A] No distinguishable amount.
[B] If a dielectric breakdown test is required, the modification of Test Method D 877 should be agreed upon between the purchaser and the supplier.
[C] A value for the Dielectric breakdown by D 1816 has not been agreed upon but is being generated.
[D] By mutual agreement between the purchaser and the supplier, only one of the two tests, power factor or resistivity, may be required.

8. Keywords

8.1 capacitors; dielectric; dielectric fluid; insulating oil; oil; polybutene oil