Designation: D 6786 – 02

Standard Test Method for Particle Count in Mineral Insulating Oil Using Automatic Optical Particle Counters[1]

This standard is issued under the fixed designation D 6786; 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 particle concentration and particle size distribution in mineral insulating oil. It is suitable for testing oils having a viscosity of 6 to 20 cSt at 40°C. The test method is specific to liquid automatic particle analyzers that use the light extinction principle.

1.2 *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:*

D 923 Practices for Sampling Electrical Insulating Liquids[2]

2.2 *ISO Standards:*

4406:1999 Hydraulic Fluid Power—Fluids—Method for Coding the Level of Contamination by Solid Particles[3]

11171:1999 Hydraulic Fluid Power—Calibration of Automatic Particle Counters for Liquids[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *coincidence*—the presence of more than one particle in the sensing zone of a particle analyzer at the same time, causing mis-sizing and mis-counting of the particle present. The coincidence limit of the counter is determined by the maximum acceptable concentration of particles in the sensing zone and is supplied by the instrument manufacturer.

3.1.2 *concentration limit*—a direct function of coincidence and electronic saturation. The concentration limit of the system is determined by the maximum acceptable concentration of particles in the given sample and is supplied by the instrument manufacturer.

3.1.3 *electronic saturation level*—particle concentration at which the electronic circuitry of the analyzer ceases to function properly due to excessive counting rates.

3.1.4 *light extinction*—the reduction in intensity of a light beam passing through the sensing zone of a particle analyzer, caused by the absorption and/or scattering of the light by particles. Synonyms: light obscuration, light interruption, light blockage.

4. Summary of Test Method

4.1 Samples are taken in particle-clean bottles that are dedicated to particle analysis. The sample bottle is agitated to redistribute particles in the oil, then immediately placed in an automatic particle counter, where the number of particles and their size distribution are determined by the light extinction principle.

4.2 As particles pass through the sensing zone of the instrument, the quantity of light reaching the detector is obscured. This signal is translated to an equivalent projected area diameter based on calibration with a NIST-traceable fluid (ISO Medium Test Dust suspension).

5. Significance and Use

5.1 Particles in insulating oil can have a detrimental effect on the dielectric properties of the fluid, depending on the size, concentration, and nature of the particles. The source of these particles can be external contaminants, oil degradation by-products, or internal materials such as metals, carbon, or cellulose fibers.

5.2 Particle counts provide a general degree of contamination level and may be useful in accessing the condition of specific types of electrical equipment. Particle counts can also be used to determine filtering effectiveness when processing oil.

[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 D27.07 on Physical Tests.

Current edition approved April 10, 2002. Published June 2002.

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

[3] Available from American National Standards Institute, 11 West 42nd Street, New York, NY 10036.