PROCESS INDUSTRY PRACTICES

September 2024

Electrical

PIP ELTFT09
Electrical Insulating Oil Analysis

PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

This Practice has been prepared by harmonizing technical requirements from existing standards of major industrial operators, contractors, and standards development organizations. While this Practice is intended to incorporate the majority of requirements, individual applications may have requirements which take precedence over this Practice. Determinations concerning fitness for purpose or application of this Practice to specific project or engineering situations should not be made solely on information contained in this Practice. All Practices are intended to be consistent with applicable laws and regulations. Should this Practice conflict with applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by this Practice.

Use of trade names should not be viewed as an expression of preference. Other brands having the same specifications are equally correct and may be substituted for those named.

This Practice is subject to revision at any time. For more information refer to PIP ADG001, *Specification for Developing Practices*.

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1. Scope

This Practice describes testing procedures used to assess the condition of oil use as an electrical insulation medium in various pieces of electrical equipment such as transformers, switches, circuit breakers, etc. Early detection of problems with electrical insulating oil allows corrective actions to take place before equipment failure or irreversible damage occurs. The condition of the electrical insulating medium is a predictor of the electrical equipment's health.

2. References

Applicable parts of the following Practices, industry codes and standards, and other references shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles are used herein where appropriate.

2.1 Industry Codes and Standards

- American Society for Testing and Materials (ASTM)
  - D 877 - *Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes*
  - D 923 - *Standard Practices for Sampling Electrical Insulating Liquids*
  - D 924 - *Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids*
  - D 971 - *Standard Test Method for Interfacial Tension of Oil Against Water by the Ring Method*
  - D 974 - *Standard Test Method for Acid and Base Number by Color Indicator Titration*
  - D 1500 - *Standard Test Method for ASTM Color of Petroleum Products*
  - D 1524 - *Standard Test Method for Visual Examination of Used Electrical Insulating Liquids in the Field*
  - D 1533 - *Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration*
  - D 1816 - *Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes*
  - D 3284 - *Standard Practice for Combustible Gasses in the Gas Space of Electrical Apparatus Using Portable Meters*
  - D 3612 - *Standard Test Method for Analysis of Gasses Dissolved in Electrical Insulating Oil by Gas Chromatography*
  - D 4243 - *Standard Test Method for Measurement of Average Visometric Degree of Polymerization of New and Aged Electrical Papers and Boards*
  - D 5837 - *Standard Test Method for Furanic Compounds in Electrical Insulating Liquids by High Performance Liquid Chromatography* (HPLC)
- Code of Federal Regulations (CFR)
  - 40 CFR Part 761 - *Polychlorinated Biphenyls*