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Introduction to Silicone Transformer Fluid

Silicone Transformer Fluid (oil) was introduced in the mid 70's, and has become widely accepted for transformers where the location or environment presents a risk that demands a fire safe and/or environmentally friendly alternative to traditional transformer oils.

These fluids are also used in transformers designed to operate at temperatures above the typical 55/65°C rise transformers. The physical product, known generically as 'silicone transformer fluid', has not changed in its 25-year of history, although the specification of silicone fluid transformers and information regarding the handling has.

There are both IEC 836 and ASTM D 4652 specifications for silicone fluid, useful for transformer makers requiring fluid or when fluid is needed for repair or top-off of existing units. These standards cover both the physical and electrical properties of fluid suitable for dielectric applications. Although the properties of the Pure Silicone Fluid 50cSt are very similar to the STO-50, the PSF-50cSt does not meet the required electrical properties for use in electrical transformers.

The ASTM standard also sets a maximum level of volatile material that can be lost within the first 24 hours at 150°C. This test, ASTM D 4559, measures both the volatile content and its resistance to decomposition, important in high temperature applications. It also indicates a fluid's long-term performance.

These fluids won't pass this test if they are inadequately stripped during the manufacturing process or if the remaining polymerization catalyst is not neutralized or stripped.

Silicone fluid filled transformers may be specified generically as transformers designed for meeting the above specifications. In the case where the National Electrical Code must be met then the unit has to be built to Factory Mutual Approval or the UL or Underwriters Laboratory Classification requirements. Both of these standards now require physical changes to the transformer construction including a heavier tank and protection beyond normal ANSI standards.

If silicone is not specified and the broader 'less flammable' is requested, the specifier may receive a unit with a high molecular weight hydrocarbon, ester or vegetable oil-based fluid. Whilst these two have fire points above 300°C they have substantially different fire properties if ignited.\

Benefits of Silicone Transformer Oil over Petroleum-based oils

STO-50 provides major benefits when considering safety issues. These include:

- High flash point and fire point – can be placed close to a building or installed indoors within National Code guidelines
- Self extinguishing – provides safest operating environment where fire potential is a concern
- Low rate of heat release, smoke evolution and toxicity – minimal damage from fire, as it self extinguishes and low heat evolution during a fire.
- Not petroleum based, non-bio accumulating and non-water soluble – thus may not be subject to petroleum requirements for clean up.
- Recy461 Straw Roactable – easily recycled meaning there are no concerns with disposal
- Non-hazardous material with excellent environmental product life cycle – regulatory friendly, does not biodegrade 'especially in your transformer'.... contains no corrosive or acid causing materials.

Silicone transformer fluids allow for transformer systems that are fire safe, environmentally friendly and offer lower operating costs when compared to their counterparts.