BecFluid® 9902

Dielectric cooling and insulating fluid

Retrofilling

One of the main uses of ester fluids since their introduction in 1979 has been to replace fluids based on PCBs in distribution transformers, called Retrofilling.

Esters have been used worldwide on a large scale to retrofill transformers filled with PCB and mineral oil. Retrofilling is carried out to increase the operational life and reliability of the transformer, to reduce the environmental risk and/or to improve the fire security.

BecFluid® 9902 is miscible with mineral oil in all proportions. Nevertheless, the oil concentration should be kept as low as possible to achieve the outstanding properties of BecFluid® 9902.

In this document the practical procedure is described, which should be carefully followed in the Retrofilling of a transformer with BecFluid® 9902

Retrofilling of a transformer filled with PCB

Retrofilling of a transformer filled with PCB must be carried out exclusively by a specialist familiar with the specifications and having a licence to work with PCBs

Retrofilling of a transformer filled with mineral oil

The thermal expansion, heat capacity and electrical properties of BecFluid® 9902 correspond to those of mineral oil. Therefore no change to the design of the transformer is required when it is filled with BecFluid® 9902. BecFluid® 9902 is also a good lubricant; consequently switches, circulation pumps and contacts, which tend to block with silicone oils, do not need to be replaced when the transformer is refilled with BecFluid® 9902.

BecFluid® 9902 is compatible with the transformer construction materials in general use with mineral oils. Its effects on some rubber and gasket materials are different from those of mineral oil. It is advisable to replace these materials when the dimensional stability of the installation is important to the security of the transformer. BecFluid® 9902 is chemically and electrically compatible with mineral oil that may remain in the retro-filled transformer.

However, an excess of residual mineral oil can reduce the fire resistance properties of BecFluid® 9902, which is shown in the diagram above.

Therefore, special attention is needed to minimise the remaining oil. The following description of emptying should be helpful.

Emptying

Allow the oil drain from the transformer through an outlet valve. A gear-pump (0.5 H.P) can help to fasten the process. Allow the equipment to drain for at least 2 hours so that the fluid can flow out of the coils, heat exchangers etc. If the mineral oil is very old, a drain time of more than 2 hours is needed.

When emptying through a drain valve ensure that the valve is at the lowest level of the equipment and as far as possible, tilt the equipment to maximise oil removal.

If tilting is not possible, or if rapid removal is needed, a semi rigid plastic hose (polythene water hose of diameter 2 cm) can be inserted through an air vent or a filling entry at the top of the equipment. The fluid should be pumped into a suitable container ensuring that the hose reaches to the bottom of the transformer to remove the maximum amount of oil from the tank.

Care is needed during the insertion or use of the hose that sensitive coils are not damaged. The hose should be as far as possible from the coils and as close as possible to the tank wall.

Rinsing

An amount of BecFluid® 9902 about 10% of the filled transformer volume should be used to rinse the inner surfaces. The use of a pump will enable spraying of the coils et al and improve the removal of mineral oil. As before, at least 2 hours is needed for the rinse fluid to run out, with tilting if possible. Solvents should not be used to remove the oil because the insulation materials contain dyes and adhesives from manufacture of the transformer and these can be damaged.

Refilling

When refilling the transformer with BecFluid® 9902 it is important to avoid air bubbles. Air entrainment can be minimised if refilling is from a low level and, if using a gear pump, ensure that the flow rate of 13.6 litre/minute is not exceeded. A further possibility is to fill the equipment under vacuum.

The transformer must not be switched on for at least 12 hours after filling to allow any trapped air to escape and the coils to be impregnated with the fluid.

General

During all phases of the Retrofilling procedure it is important that no moisture or solids enter the transformer. When using a pump, the outlet side should be protected with a fine mesh paper filter. A Puralator Micronic Type MF146A or equivalent will limit foreign bodies or other particles entering the equipment. If there is a concern that the oil contains moisture then a molecular sieve drier would be advantageous.