

Application of Vegetable Oil-Based Fluids as Transformer Oil

Ursula Biermann and Jürgen O. Metzger, University of Oldenburg, Institute of Pure and Applied Chemistry, P.O. Box 2503, D-26111 Oldenburg, Germany

The insulating system of nearly all power transformers which are presently used in the power transmission and distribution system is a combination of mineral oil and the transformer board. While the transformer board, which is made from cellulose, is an environmentally friendly and biodegradable material the insulating liquids mostly based on petroleum mineral oil show some serious disadvantages:

- low environmental compatibility
- low fire point; high burning risk
- low water absorption
- usage of a depleting feedstock

Native oils are an ideal alternative to the commonly used insulating fluids on the base of mineral oil and the relative expensive synthetic liquids such as Midel. The plant oils have the potential to reduce the environmental risk because they are completely biodegradable. They are cheaper than synthetic transformer oils and in the long run they may be even cheaper than mineral oils with respect to the actual development of prices of crude oil. Furthermore their application as transformer oil contributes to the protection of the global reserves of raw material.

First insulating liquids on the base of renewable raw materials, especially soybean-based electrical transformer oils, are commercially available in the USA as "Vegetable Oil-Based Insulating Dielectric Fluid" and widely-used in small transformers.

Our project includes the verification of high oleic sun flower and rapeseed oil for their application as transformer fluids. Comprehensive studies on the one hand of the electric and dielectric properties and on the other of the chemical changes on the molecular level of the oil/transformer board-system in connection with the most important factors such as temperature and water content have to be carried out.