

BIO-DEGRADABLE LIQUID INSULATION FOR POWER TRANSFORMERS: COMPARISON OF CASTOR AND MINERAL OILS

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Due to poor biodegradability, transformer mineral oil insulation is now slowly being replaced by natural esters and synthetic oil. However, perfect replacement of mineral oil has not been introduced yet because of the poor properties of such alternative oils *i.e.* high conductivity, high pour point *etc.* This paper presents a comparison of chemical and electrical properties of alternative oils namely coconut and castor oil. Performance comparison with mineral oil has also been presented to check their suitability of using as transformer liquid insulation. In chemical properties acidity, viscosity and pour point were considered whereas complex capacitance, dielectric losses, breakdown voltage and corona effects were compared in the electrical properties. For complex capacitance and dielectric loss measurements, Frequency Dielectric Spectroscopy test was conducted at 12V from 1mHz to 1kHz using Insulation Diagnostic Analyzer (IDA200). It was found that all the chemical properties except viscosity of castor oil was in an acceptable range. Specially, among these natural oils, castor oil has the minimum pour point. Regarding the electrical properties, conductivity of castor oil is very much lower than coconut oil and it is almost equal to mineral oil. From the corona effect test, it was found that castor oil has the best lightning surge withstand capability and the loss tangent values also proved that castor oil has the minimum dielectric losses at power frequency. As the conclusion, from the chemical and electrical properties it was found that castor oil has the potential to use as an alternative liquid insulation for transformers. Further studies are recommended to improve some of the physical properties such as viscosity.

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