World Academy of Science, Engineering and Technology
International Journal of Electrical and Information Engineering
Vol:17, No:04, 2023

Gassing Tendency of Natural Ester Based Transformer oils: Low Alkane Generation in Stray Gassing Behaviour

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Abstract : Mineral oils of naphthenic and paraffinic type have been traditionally been used as insulating liquids in the transformer applications to protect the solid insulation from moisture and ensures effective heat transfer/cooling. The performance of these type of oils have been proven in the field over many decades and the condition monitoring and diagnosis of transformer performance have been successfully monitored through oil properties and dissolved gas analysis methods successfully. Different type of gases representing various types of faults due to components or operating conditions effectively. While large amount of data base has been generated in the industry on dissolved gas analysis for mineral oil based transformer oils and various models for predicting the fault and analysis, oil specifications and standards have also been modified to include stray gassing limits which cover the low temperature faults and becomes an effective preventative maintenance tool that can benefit greatly to know the reasons for the breakdown of electrical insulating materials and related components. Natural esters have seen a rise in popularity in recent years due to their "green" credentials. Some of its benefits include biodegradability, a higher fire point, improvement in load capability of transformer and improved solid insulation life than mineral oils. However, the Stray gases evolution like hydrogen and hydrocarbons like methane (CH4) and ethane (C2H6) show very high values which are much higher than the limits of mineral oil standards. Though the standards for these type esters are yet to be evolved, the higher values of hydrocarbon gases that are available in the market is of concern which might be interpreted as a fault in transformer operation. The current paper focuses on developing a natural ester based transformer oil which shows very levels of stray gassing by standard test methods show much lower values compared to the products available currently and experimental results on various test conditions and the underlying mechanism explained.

Keywords : biodegadability, fire point, dissolved gassing analysis, stray gassing
Conference Title : ICDLA 2023 : International Conference on Dielectric Liquids and Applications
Conference Location : Tokyo, Japan
Conference Dates : April 17-18, 2023