

Neural Network–Based Prediction of Mechanical Properties of Thermally Upgraded Kraft Insulating Paper under Thermal Aging in Power Transformers

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Abstract

New techniques such as artificial neural networks, fuzzy inference systems and ANFIS (adaptive neuro-fuzzy inference system) have been used in recent years to develop predictive models to estimate the necessary parameters. The aim of this research is to predict the mechanical properties along with the behaviors of thermally upgraded kraft (TUK) insulating paper used in power transformers under thermal aging. This is conducted by applying an artificial ANFIS (adaptive neuro-fuzzy inference system). The aging of the paper insulation is monitored directly by the tensile strength and the degree of polymerization of the solid insulation and indirectly by chemical markers using methanol compound content in oil (CH₃OH). The acquired results are assessed and compared with the experimental data. The model presents almost the same behavior. In particular, it has the capability to accurately simulate the nonlinear property behavior of insulation under thermal aging with an acceptable margin of error. Since the life expectancy of power transformers is directly related to that of the insulating paper. The approach developed makes it possible to assess and classify the state of the insulation. The prediction results presented in this work demonstrate the effectiveness of the method used.

Keywords

Prediction, mechanical properties, methanol, ANFIS, Power Transformers.