

INVESTIGATION INTO THE CORRELATION BETWEEN PAPER INSULATION THERMAL AGEING ESTIMATION USING THE ARRHENIUS EQUATION AND OTHER METHODS FOR GENERATOR TRANSFORMERS

Michael Tebogo Metebe

Key words: Arrhenius equation, paper degradation, Furan compound, paper DP (Degree of polymerisation), generator transformers.

Dissertation abstract:

Many generator transformers were installed many years ago during the initial commissioning of Eskom's power stations. Many of these transformers have started showing signs of significant ageing of the paper insulation and hence require regular monitoring. There are two methods that are currently being employed to assess the degree of ageing of the paper insulation in a generator transformer, which are paper sampling and furan level measurement.

This dissertation investigates an alternative method of predicting the degree of ageing of the paper insulation instead of what is used currently. This method uses the Arrhenius equation that relates time and temperature to determine the degree of degradation of organic materials. The reliability of the Arrhenius estimation method is assessed by comparing the predicted DP values with the measured DP values of the same transformer paper insulation.

The results obtained showed that there is reasonable correlation between the DP values estimated from the Arrhenius equation and the DP values estimated from the measured furan levels. The accuracy of the prediction method is reduced when the oil temperature greatly differs from the paper insulation temperature.

The application of the Arrhenius equation to estimate the ageing of paper insulation is a great milestone in the quest to predict the remaining life of a transformer. It is the only method available to do this prediction and using online temperature measurement on transformers makes the method more reliable.