

Title

A Novel Model For Thermal Behavior Prediction Of Oil-Immersed Distribution Transformers With Consideration Of Solar Radiation

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Abstract

Monitoring the insulation status of a transformer requires the availability of accurate information of the oil temperature at any moment. Considering the importance of oil temperature prediction in oil-immersed transformers and its direct relation with the life of transformer, a novel model is presented in this paper using the concept of thermal resistance with consideration of solar radiation for expressing the heat transfer in distribution transformers. The results of the proposed model are compared and validated with experimental results. These results show that in the studied transformer and rated loading, solar radiation can increase the oil temperature by about 3.7 °C. In this paper, the thermal resistance model with solar radiation is used to predict the thermal behavior of the transformer in overloading condition. Finally, the transformer operation with/without consideration of solar radiation effect is studied and its impact on the transformer's loss of life due to the increase in oil temperature is investigated. In order to consider the effect of solar radiation on oil temperature, new equations using the concept of thermal resistance are presented to calculate the shadow surface created on the fin-folded transformers, and a novel equation is proposed for permissible loading of distribution transformers.

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