

Wide Band Loss Characterisation of Transformers

Master thesis project



Source: ABB

Summary:

The aim of this thesis is to model, analyse and perform experimental analysis of harmonics in power transformers. High frequency harmonics are being created by the increased penetration of non-linear loads (power electronic converters) in the power grid. However, models of transformers do not sufficiently model the harmonic behavior, including impact of different core materials. This thesis will extend the state-of-art by modelling, analysing and measuring the loss behavior of these transformers, specifically the distribution transformers.

Problem definition:

Power transformers inconjuncture with non-linear loads results in increased harmonics, increased heating and losses, culminating in faster ageing of the transformer. Modelling the behavior of different loss mechanisms – hysteresis and eddy current losses in power transformers (both winding/copper and core/no-load core losses). Specifically for distribution transformers, the core losses are always present (irrespective of loading conditions) contributing to lower overall energy efficiency, and hence, it is important to understand, model and measure them.

Method:

In this study, we wish to investigate the loss mechanisms and the impact of non-linear loading conditions on overall losses of distribution power transformers.

- Performing modelling, material dependent magnetic parameters for different cores used in distribution transformers
- Separating the different loss mechanisms especially with harmonic currents and powers is a challenge
- Both circuit level models and also measurements are important to analyse and separate, eventually link to energy efficiency

Courses and supervision:

This is a a challenging, hands-on power electronics project. Background of EE and power electronics courses are considered mandatory.

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