

## **Abstract**

This dissertation presents the implementation of analytical and numeral methods in computing the winding eddy losses of power transformers. It is appreciated that the computation of any component of stray losses of a transformer is intricate and involves a multitude of variables. The eddy current losses of a single conductor are treated using the rectangular and cylindrical coordinates of the differential form of Maxwell's equations. The governing equations have limited use when the conductor thickness is increased; this is observed when thicknesses exceed 5mm. The analytical method, known as Rabins' method is implemented in Mathematica to evaluate local flux density quantities. The analytical method is compared to the two-dimensional finite element method (FEM) approach. The FEM methodology is found to be robust, flexible and fast to compute flux density components. The leakage flux distribution around the circumference of concentric windings is studied. The windings of a three-phase, three limb transformer that are subject to the non-homogenous distribution of the field due to the presence of the core yokes and adjacent winding influence are modelled. The developed three-dimensional model shows that this effect can introduce an error in the region of 32% to the radial leakage field component. The results of the computational methods are compared to the experimental results of the measured stray losses. The test data of the same design that has been produced eleven times are presented. The stray losses in metal parts are evaluated and subtracted from the net measured stray losses to give measured winding eddy losses. A large error is observed between the calculated and measured winding eddy losses. It is further commented that the benefits of rigorous methods in computing any stray loss component can be suppressed by the variance of measured results of the same transformer design.