DEPARTMENT OF MECHANICAL ENGINEERING
Purdue School of Engineering and Technology

SPRING 2003 SEMINAR SERIES

Date: Thursday, January 30, 2003
Time: 11:30 am - 12:00 pm
Room: SL 165

Reception at 10:45 am (cookie and refreshments served)
Everyone is invited

ME 697 Project

Extension of The IEEE Standard Loading Guide to a Three-Phase, Three-Winding Power Transformer

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Several thermal models have been developed to evaluate to apply of the IEEE C57.91-1995 standard revisions to a three-winding, transmission grade transformer. This IEEE model incorporates the effects of viscosity and resistance changes with temperature that were not accounted for in past models, specifically the ultimate top oil rise model. The model was tested against actual field measured data for a standard two winding transformer for validation. A comparison of this two-winding model with the previous ultimate top oil rise model and actual data revealed a significant improvement in the predictability of the hottest spot temperatures in this style of transformer. This work expands upon the existing IEEE simulation with the development of two models for three-winding transformers, a single oil duct model and a two oil duct model. These models were developed in MATLAB 6.0. The results of the two models, when compared with field-measured data, revealed that the single-duct method provided far more accurate results. To further verify the single-duct approach, two temperature extreme profiles were used as input into the model and the results compared to field-measured data as well as the ultimate top oil rise model with the same inputs. The results for the extreme temperature profiles did produce improved performance over the ultimate top oil rise method for the three-winding transformer chosen. The extreme temperature profiles did reveal some inadequacies and sensitivities in the method. Further research into the application of the method developed here to additional three-winding transformers is required to overcome these problems. Also, research into the exponents in the top-duct-oil rise, top-oil rise, and bulk fluid heat transfer equations as they are applied to three-winding transformers is needed.