

Simple Model for Heat Transfer in Magnetic Nanofluid-Enhanced Oil-Filled Transformers

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Abstract. This article introduces a simplified model for analyzing heat transfer in oil-filled transformers enhanced with magnetic nanofluids. The model integrates natural convection with thermomagnetic effects to predict the cooling performance of transformer oil channels and fins. The study employs a combination of theoretical formulations and Finite Element Method (FEM) simulations to evaluate the impact of magnetic field on heat transfer characteristics. The results indicate a notable contribution of thermomagnetic convection to the overall cooling efficiency, providing insights into the design and optimization of transformer cooling systems.

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