

The Development of Technologies of High-Efficiency Electrical Machines Using Large Scale Numerical Analysis

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Abstract

The aim of the project is the development of high-efficiency electrical machines. In order to realize this high-efficiency technology, the large scale numerical analysis of electrical machines is done. This large scale simulation considers and reveals electromagnetic phenomenon in detail. Three-dimensional finite element method is used for this simulation.

An inductor which is connected to a PWM (Pulse Width Modulation) inverter is selected for the example of this subject. The distribution of the magnetic flux density and the eddy current density on coil is revealed in detail in case that the coil is composed by multi conductors. The difference of those densities by the number of conductors, the thickness of the conductor or the aspect of the section of the conductor is revealed by this simulation. In these results of simulations, influence of skin effect and proximity effect is shown. And the guide to design inductors is obtained.

This result makes electrical machines high efficiency and consumption of power and resources saved significantly.

Keywords: Large-Scale Simulation, Three-Dimensional Finite Element Analysis, Inductor, Skin Effect, High-Efficiency Technology