

The Development of Technologies of High-Efficiency Static Electric Devices 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. In this year, the distribution of the magnetic flux density, the eddy current density and the loss is revealed in detail in case that the inductor with some heat sinks cooling core and coil. The heat sinks reduce the loss of the coil a little. But the eddy current is generated on the heat sinks and total loss of this inductor is increased. Knowledge of this case is obtained and some subjects to downsize the inductor are also obtained.

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

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