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Mon-Mo-Po1.07-03 [78]: A Study on the effect of Eddy Current Loss and Demagnetization Characteristics by the Direction of Magnet division

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In this paper, the influence of the change of eddy current loss of the IPMSMG (interior permanent magnet synchronous motor generator) for automotive ISG according to magnet lamination direction on the Demagnetization characteristics and vibration was studied. Reduction of the eddy current loss reduces the heat generation in the magnet and affects the demagnetization characteristics and vibration characteristics of the magnet. Therefore, in this paper, we propose a magnet structure that maximizes the reduction of eddy current loss, increases the reliability of the demagnetization, and has the low vibration characteristics that automotive motors should have. In this paper, the operation points of ISG model are divided into three regions: motoring 3000 rpm, power generation area 4000 rpm, and 16500 rpm. Since the demagnetization characteristics and the eddy current loss depend on the lamination type of the magnets inserted into the rotor, the vertical Segmented magnet model and the horizontal Segmented magnet model are analyzed. We compare the demagnetization characteristics according to the magnet division method by applying various drive current ranges where irreversible demagnetization can be occurred. In order to analyze the effect of eddy current loss and demagnetization according to direction of magnet division on vibration, vibration characteristics are analyzed through co-simulation of electromagnetic and mechanical properties. In this study, electromagnetic analysis is performed using ANSYS Electromagnetic Suite 19.0, and the magnet division model is considered through 3D simulation. In order to compare more precise characteristics of the demagnetization, the temperature distribution of the device in the analysis program using the J-H Curve and the thermal coefficient of the permanent magnet is calculated. In addition, we analyze the effect of electromagnetic characteristics due to the magnet division on vibration by using WORKBENCH 19.0 and analyze the magnet heat distribution using CFD thermal analysis program. In order to verify the reliability of the simulation data presented in this paper, we will prove by carrying out an experiment.

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