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Research on demagnetization-resistant structure of synchronous motor performance using Nd-permanent magnets reduced heavy rare earth metals

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In order to reduce the heavy rare earth element, permanent magnet are continuously developing. Especially, maintain of high coercive force is a very important technology in motors that mainly use high currents. In addition, since the price of heavy rare earth element is high, the use of the rare earth element is minimized so that the price competitiveness of the motor is obtained. In this paper, we have developed the permanent magnet type synchronous motor for Idle Starter & Generator. To increase the output density of the motor, a study was made on a structure capable of generating the maximum magnetic flux per unit volume. In this process, various structures and permanent magnets were applied to compare the characteristics of simulation through FEM. In the case of motors using permanent magnets, it is essential to verify the demagnetization of the permanent magnet by the inverse magnetic field. In particular, in a system requiring high-speed operation, the field control must be performed due to the limitation of the voltage that can be supplied. At this time, demagnetization of permanent magnets can be easily generated. Therefore, in this paper, we analyze various situations in which permanent magnets can be demagnetized by simulation and verify them by test. Finally, we present the results of the study on the demagnetization-resistant structure to minimize the demagnetization of permanent magnets even if the magnet is applied by minimizing the D_y among the heavy rare earth elements.

Submitters Country

Republic of Korea

Primary author: KANG, Dong-woo (Keimyung University)

Presenter: KANG, Dong-woo (Keimyung University)

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