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Wed-Mo-Po3.12-06 [101]: A Study on Robust Design of Irreversible Demagnetization of IPMSM Rotor Core Using Dy-Free Permanent Magnet

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Since only one tenth of the ore is deposited as rare earth elements, these elements are not common. However, these elements are constantly needed to be used to supplement the thermal demagnetization strength of the motor.
However, there are many cost variables and risks for continuous use of these elements, since these elements are mainly buried in only certain countries.
Recently, a lot of magnets excluding heavy rare earths have been studied by using the hot forming technique, but the coercive force of these magnets does not reach the coercive force of existing magnets. In order to apply these magnets to motors, robust design for non-reversible demagnetization must be accompanied with. In this paper, we study the shape of the rotor with the maximized coercivity so that the motor made by using the permanent magnet without heavy rare earths can operate similarly to the motor made by using the permanent magnet at the actual motor operating temperature (150 ℃). By using the same specification of the existing 22Kw hybrid vehicle traction motor, the rotor parameters affecting the rotor demagnetization were changed to analyze the demagnetization and performance characteristics. We adopted the IPMSM structure which is small and efficient in consideration of the motor space constraint. As a result, we can propose various irreversible demagnetization design methods. The effect of the presence of demagnetization at the extreme temperature condition (200 ℃) and the performance of the demagnetization were analyzed by applying the demagnetization analysis conditions. In addition, the prototype was fabricated and tested to verify the validity of the study.

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