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Mon-Mo-Po1.07-08 [83]: Study on the Design Process of the Spoke Type Permanent Magnet Synchronous Motor Considering Magnetization Performance

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An important index in determining the performance of a permanent magnet synchronous motor (PMSM) is the maximization of using the permanent magnet (PM) inserted in its rotor. Thus, a process that verifies the demagnetization of PM is generally included in a design process of PMSM. However, the magnetization, which is also one of the important indexes in the design process, has not been much considered. It is due to the fact that most of the mass produced motors are categorized as surface permanent magnet synchronous motors (SPMSMs) and interior permanent magnet synchronous motors (IPMSMs) and the whole magnetization of these motors can be performed using properly designed magnetization yokes without any major trouble.
The spoke type PMSM is a shape that maximizes the surface area of PM vertically inserted in a rotor core. Also, studies on SPMSM have been actively performed because of increasing more power density than that of IPMSM. However, it plays disadvantage to the magnetization performance in a rotor structure for improving motor performances. Consequently, the whole magnetization could not possibly be performed depending on models of the spoke type PMSM and it requires a new process that has not been considered in the conventional design process of PMSM. Thus, a new design process of the spoke type PMSM that considers the magnetization performance is proposed in this study. First, types of magnetization methods and its advantages and disadvantages were analyzed. Then, a cause that decreases the magnetization performance in the magnetization method based on yokes for the mass production of PMSM was analyzed. In addition, the major factors that affect the magnetization performance in the spoke type PMSM structure were investigated, and a new design process considering the magnetization of the spoke type PMSM was proposed. Finally, a model of the spoke type PMSM was designed, fabricated, and evaluated using the proposed design process.

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