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Optimization of High Flux Density Design for Permanent Magnet Motor

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Abstract : This paper presents an optimal magnet shape of a spoke-shaped interior permanent magnet synchronous motor by using ferrite magnets. Generally, the permanent magnet motor used the ferrite magnets has lower output power and efficiency than a rare-earth magnet motor, because the ferrite magnet has lower magnetic energy than the rare-earth magnet. Nevertheless, the ferrite magnet motor is used to many industrial products owing to cost effectiveness. In this paper, the authors propose a high power density design of the ferrite permanent magnet synchronous motor. Furthermore, because the motor design has to be taken a manufacturing process into account, the design is simulated by using the finite element method for analyzing the demagnetization, the magnetizing, and the structure stiffness. Especially, the magnet shape and dimensions are decided for satisfying these properties. Finally, the authors design an optimal motor for applying our system. That final design is manufactured and evaluated from experimentations.

Keywords : demagnetization, design optimization, magnetic analysis, permanent magnet motors
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