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Study on Vibration Characteristics of Permanent Magnet Synchronous Motor with Demagnetization of Permanent-magnets

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This paper discusses a motor that was designed to satisfy the size constraints of system by using ferrite magnet and has the same performance as rare-earth magnet motor. In general, the size of the motor is increased in order to meet the same performance of motor using a ferrite magnet, because of its very low energy density compared to the rare-earth magnet. Thus this paper researched the ferrite magnet structure for compensating the low magnetic energy density and satisfying motor size constraint. Especially, in the case of ferrite magnets, since the demagnetization phenomenon is easily occurred at low temperature, the demagnetization analysis is carried out considering the low temperature. In addition, when the permanent magnet's demagnetization is generated, the magnetic flux density of the airgap is different from the initial design. Such deformation of the magnetic flux changes the vibration characteristics of the motor and thereby affects the noise characteristics. Therefore, in this paper, the vibration characteristics of motors according to the demagnetization of permanent magnet are analyzed. Finally, we adopted the magnetic flux concentrated rotor design. Therefore, it analyzed and optimized the structure of motor using finite element method for motor structure that can increase productivity by enabling magnetization well in a mass production system, prevent the problems of demagnetization in the actual use environment of motor, and secure the stiffness of rotor. To verify the study result through an experiment, magnetizer was made to confirm magnetization characteristics and output and efficiency were checked through motor dynamo test.

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