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Design of a Non Rare Earth Spoke Type Permanent Magnet Motor for Considering Magnetization after Assembly

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Recently, due to the rising issue of environmental pollution, secure process of rare earth material with high efficiency is increasing world wide. However, the price of the rare earth material has increased significantly by restriction of rare earth production in China, where more than 90% of rare earth material is produced. Therefore, non rare earth material, for replacing of rare earth material has been interested and interests on a Spoke type permanent magnet motor has been increased. However, it is not easy to magnetize due to the structural problem of the Spoke type permanent magnet motor. In this paper, multiple magnetization method was proposed for considering magnetization after assembly of a Spoke type permanent magnet motor by using non rare earth material. First, 10 poles 12 slots combination was designed for considering simple production, low cost, torque and vibration. And requirements of the model were set up by considering number of turns, width of permanent magnet, air-gap flux density, stack length. Finally, the multiple magnetization method was selected for optimizing this model. The 3 times partial multi-magnetization was selected for considering mass production, magnetic reduction of permanent magnet and magnetization ratio of the permanent magnet. Magnetization after the assembly method was selected due to the problem of repulsive power and suction power of the permanent magnet. The magnetization yoke was designed for testing magnetization yoke design. The magnetization requirements of non-rare earth permanent magnet was determined based on the result of simulation. Therefore, the proposed 3 times partial magnetization method was verified. Finally, the design was analyzed and investigated by applying to the Spoke type permanent magnet motor.

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