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Mon-Mo-Po1.09-06 [102]: Design and Analysis of Coaxial Magnetic Gears Considering the Electromagnetic Performance and Mechanical Stress

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The magnetic gear can prevent the noise, vibration, and damage due to the noncontact drive.
Many papers have been published with regard to the design of magnetic gears. However, most design methods in the study only considered magnetic properties. The structure of the magnetic gear has two voids, and permanent magnets are located on the inner and outer rotor. And, a fixed-pole is located between the inner and outer permanent magnets to modulate the magnetic flux.
In this study, design and fabrication are performed considering only the electromagnetic performance of the magnetic gear. However, there are significant differences between the FEA results and experimental results in terms of the efficiency characteristics. In order to analyze the errors of the analysis and measurement results, the stress analysis was performed from the results of electromagnetic force characteristics analysis of the manufactured magnetic gears. As a result, it can be confirmed that the stress distribution of the fixed core is out of the yield stress. For this reason, it can be seen that the deformation of the fixed iron core occurs and the loss due to friction is greatly increased.
In this paper proposes a method for the design and analysis of coaxial magnetic gears considering the mechanical stress as well as the electromagnetic performance. Considering the magnetic and mechanical properties of magnetic gears, the design area to increase permanent magnet usage to within 10% compared to the existing model and satisfy the maximum pull-out torque of the same level was derived. Then, the optimum design model in which the yield stress does not occur is presented through the stress analysis of each model. The production of the magnetic gear, electromagnetic and mechanical analysis, and the design method will be explained in detail in the final paper.

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