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Mon-Mo-Po1.06-10 [72]: A study on the design of BLDC Slot-less PM motor using Response Surface Method

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[Introduction]

Permanent magnet (PM) motors, which have various advantages such as the wide operation range and high power density, are widely developed in various industrial fields such as automobile, aerospace, home appliance, defense industry and so on. The study and development of the slot-less PM motor is actively underway as the servo and driving motor, because it does not have teeth and their corresponding slots so that it has a variety of electromagnetic and structural advantages compared to the slotted motor : No cogging torque, Smooth motor running even at low speed, Less vibrations and audible noise, and Compact design and so on. This paper presents the study of the design and analysis of BLDC slot-less PM motor with the magnetic and electric loading using Response Surface Method(RSM).

[Body & Conclusion]

In the defense industry, the slot-less PM motor is widely developed and studied for the driving motor of guided weapon. The guided weapon is necessary a high output density and efficiency motor to improve its mobility and effectively strike a fast moving target. Especially, it should have the low rotor inertia in order to have the rapid response for forward and reverse rotation. In this paper, the electromagnetic characteristics of the BLDC slot-less PM motor are analyzed by Finite Elements Analysis (FEA). And the optimal design of BLDC slot-less PM motor is conducted with RSM and 3-Dimensional FEA (3-D FEA) to meet the requirements of a driving motor of guided weapon: the high torque constant and low rotor inertia. In conclusion, BLDC slot-less PM motor is designed with the optimal design using RSM and FEA. The achievement of the objective functions of the design for the driving motor of guided weapon is verified by FEA and the experimental tests with the prototype. Therefore, this paper provides the effective design method and process of BLDC slot-less PM motor.

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