Development of a Coil Arrangement Method in the Design of Multiphase and Multipole Motor

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The design of multiphase and multipole motor is very complicated because of huge number of slots and complex parameters in the design. To overcome these difficulties, we developed the CAM (Coil arrangement method) to determine the slot numbers and winding scheme in this thesis. A difference between electrical angle and phase winding has been calculated and the smallest difference is adopted in phase per slot. This method is very systematic and particular. Moreover, this method can discriminate fitness of designed winding. This method is applied to all combination (phase/pole/slot).

The proposed procedure of CAM winding method is as follows. Firstly, the electrical angel for each slot is calculated. Secondly, the permissible range of coil span (pitch), which represents an integer number of skipping slots of a coil bundle, is calculated. Thirdly, the phase angle and inverse phase angle of each phase is assigned. Fourthly, the difference of electric angle and phase angle per slot is calculated. Lastly, each slot connects to the phase which has the smallest phase difference calculated. We is applied to motor of various structure and analysed using FEM for the verification of this method.

This work is supported by ADD (Agency for Defense Development).

REFERENCES

A Study on the Design of an Inset Permanent Magnet Type Flux-Reversal Machine

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Flux reversal machines (FRMs) are doubly salient machines with permanent magnets on the stator. The permanent magnet flux linkage in the stator phase concentrated coils reverses polarity with the rotor traveling [1]. Its simple structure makes it cost effective and suitable for mass production. It has a low self and mutual inductances, hence a low electrical time constant and high fault tolerance. However, there is notable permanent magnet flux leakage (fringing) and cogging torque caused by its structure. This flux leakage deteriorates the torque constant of the FRM. The cogging torque also produces a pulsating torque ripple resulting in vibration and acoustic noise that is detrimental to the machine performance.

In this paper, we propose the new inset permanent magnet type FRM to reduce the flux leakage and cogging torque. Fig. 1 shows the constructed inset type FRM. This new type FRM has the permanent magnets parallel to the stator magnet flux lines and thus is much more difficult to demagnetize. As a bonus the flux fringing and cogging torque are notably small. The all experimental results are shown to confirm the validity of the proposed FRM in the full paper.

REFERENCES