MT 26
International Conference
on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **1407** Type: **Poster Presentation**

Mon-Mo-Po1.06-09 [71]: A study on IE5 class synchronous reluctance motor design using Co-analysis

Monday 23 September 2019 09:15 (2 hours)

In order to cope with environmental pollution caused by the recent increase in electric power consumption, 'Minimum Energy Performance Standards(MEPS)' is being implemented in developed countries. MEPS is a policy to regulate the efficiency of the motor, which is a large part of the industrial power consumption, and it is a policy to prohibit the use of low efficiency induction motors. Research has been conducted to improve the efficiency of induction motor in order to cope with this policy. However, since it is adjacent to the saturation state, researches to replace it with a synchronous reluctance motor have been actively carried out. A synchronous reluctance motor is an electric motor using reluctance torque generated by using a rotor difference of inductance and is considered to be a suitable motor to replace an induction motor due to its simple structure and manufacturing convenience. This research was conducted to achieve IE5 level of IE4 class SynRM. The output characteristics of SynRM are determined according to the rotor difference of inductance and arc type barrier is applied to maximize the difference of inductance. In addition, the shape of the arc type barrier was mathematically identified and the rotor design parameters were reduced. Whereas induction motors can be directly driven, SynRM is required to be driven by a controller composed of inverters. In order to achieve IE5 efficiency, we analyzed the efficiency distribution of existing IE4 class motors through Co-analysis and studied IE5 class SynRM design by deriving improvement model. Additional studies have also investigated the output characteristics for Pma-SynRM by inserting permanent magnets inside the rotor. Finally, to confirm the validity of this study, we conducted the fabrication and testing and confirmed that the analysis results and the test results converged.

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Session Classification: Mon-Mo-Po1.06 - Motors I