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

Contribution ID: **826** Type: **Poster Presentation**

Mon-Mo-Po1.07-04 [79]: The Study on the rotor design for LSPMSM considering the Starting Torque and Magnetic Saturation

Monday, 23 September 2019 09:15 (2 hours)

This paper presents the optimal design method of cage-bars in a single-phase line-start permanent magnet synchronous motor considering the starting torque and magnetic saturation. This method consists of two procedures. First, the basic design of cage-bars is made by analytic method of a single-phase induction motor. In this case, the equivalent magnetic circuit method is used but this method cannot consider nonlinear characteristic as magnetic saturation and leakage flux. Second, for considering the nonlinear characteristics, the optimal design of cage-bars is performed by the response surface method (RSM).

1. Procedure for Design of LSPMSM

The design process of LSPMSM is as follow. First, using the stator with winding and air-gap volume in conventional single-phase induction motor, the outside diameter of rotor can be determined. Next, the basic cage-bars design to maximize the starting torque is performed. After the basic cage-bars design is determined, the shape and the position of permanent magnet are determined. And the barrier is designed to minimize leakage of magnetic flux.

2. Optimal Rotor Design

The basic design of rotor is only considered to the starting torque. Because the LSPMSM adjust the magnetic flux path such as barriers at steady state, the LSPMSM need to consider the optimal design including the magnetic saturation and the leakage flux, which cannot be considered by analytic method. These two components are concerned with efficiency as well as starting torque.

The parameters of the cage-bars design are performed by setting up the limited flux value of possible points of the magnetic saturation and the leakage flux. Using RSM, the design of rotor calculates the optimal value.

3. Experiments

The prototype of optimized model is not manufactured. So, to verify optimized model, the FEM result and experiment result of original model are compared. Through the FEM, it was confirmed that the start time was faster than the existing model.

4. Conclusion

Through the design process, the optimized model has higher starting torque and higher efficiency.

Primary author: KIM, Won-Ho (Gachon University)

Presenter: KIM, Won-Ho (Gachon University)

Session Classification: Mon-Mo-Po1.07 - Motors II