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Mon-Mo-Po1.07-01 [76]: Study on Analysis Method of Asymmetric Permanent Magnet Assistance Synchronous Reluctance Motor Considering Magnetic Neutral Plane Shift

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1. Introduction

Recently, a new types of high efficiency motors are increasingly receiving attention because of the minimum energy performance standards (MEPS). A permanent magnet assistant synchronous motor (PMA SynRM) has high efficiency since it does not have copper loss of rotor in comparison with induction motor. Therefore, PMA SynRM receive attention as the new type of high efficiency motor. PMA SynRM with the asymmetric rotor can improve the torque by shifting the current phase angle of the magnetic torque and the reluctance torque. In addition, using the asymmetric rotor can reduce cogging torque and torque ripple. Therefore, research on the asymmetric PMA SynRM is actively underway. However research on the analysis method of asymmetric PMA SynRM is insufficient.

2. Body

This paper establishes an analysis method of permanent magnet assistant synchronous motor (PMA SynRM) with asymmetric barrier. In a general motor analysis method, the inductance is calculated using the dq-axis vector diagram. In addition, the characteristics of the motor are analyzed by separating the magnetic torque and the reluctance torque. However, in an asymmetric motor, the magnetic neutral plane (MNP) is shifted because the magnetic permeance is asymmetric. Therefore, it is difficult to analysis the characteristic of the asymmetric motor because it involves errors applying the general analysis method. In this paper, the magnetic property of the asymmetric motor is analyzed and the analysis method of asymmetric motor is proposed. To verify the proposed analysis method, PMA SynRM is designed as a conventional model. Furthermore, the magnetic torque and reluctance torque are separated through the proposed analysis method. The validity of the proposed analysis method is verified through finite element analysis (FEA) and manufacture of the conventional model.

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