Contribution ID: **746** Contribution code: **THU-PO3-719-04** Type: **Poster**

Experimental and Comparative Study of Noise Vibrations and Harshness of Permanent Magnet Machines according to Rotor Eccentricity with Two Different Fractional Pole/Slot Combinations

Thursday 18 November 2021 10:00 (20 minutes)

Recently, permanent magnet synchronous motors(PMSM) are widely used in industrial fields due to various advantages such as high speed operation, high efficiency, and compact design. However, PMSM has the disadvantage of noise and vibration caused by high magnetic energy during the interaction between the stator and the rotor magnet. These drawbacks have a significant impact on machine performance. Moreover, vibration and noise cause eccentricity, bearing defects and PMSM misalignment. Therefore, it is important to identify the vibration sources of electromagnetic that cause vibration and noise. Therefore, torque pulsation must be taken into account at the design stage.

Therefore, in order to analyze the influence of each source, we propose a PMSM design with the same characteristic performance as the fractional pole/slot combination, and derive the dominant model of the pole/slot combination for each electromagnetic vibration source through finite element analysis, and the result of electromagnetic characteristic analysis. The pole slot combinations of the derived model are 8 poles/9 slots and 8poles/12slots. The main components of the 9-slot and 12-slot models are torque pulsation and electromagnetic force, respectively. Therefore, experiments with FEM and electromechanical coupling analysis were performed to analyze the effect of each vibration source, and then the results were compared with two different partial pole/slot combinations.

Therefore, in this study, we derived the dominant model for each electromagnetic vibration source, the pole/slot combination, to analyze the influence of each source. The derived pole-slot combinations are 8pole/9slot and 8pole/12slot. As torque ripple and cogging torque in the 9slot model, the torque pulsation is lower than that of the 12slot model. However, the electromagnetic force of the 12slot model is lower than that of the 9slot model. Detailed analysis and measurement results are discussed in the full paper.

Primary author: BANG, Tae-Kyoung (Republic of Korea /Chungnam National University)

Co-authors: Prof. CHOI, Jang Young (Chungnam National University); CHO, Han-Wook (Chungnam National University); WOO, Jong-Hyeon (chungnam national university); LEE, Jeong-In (CHUNGNAM NATIONAL UNIVERSITY); SHIN, Kyung-Hun (Chonnam National University)

Presenter: BANG, Tae-Kyoung (Republic of Korea /Chungnam National University)

Session Classification: THU-PO3-719 Design and Analysis II