DQ07

Design of Magnet for a Synchronous Motor with a Self-magnetizing Apparatus

Byung-Taek[1]*, Dae-Kyong Kim[2], Se-Hyung Rhu[2], and Byung-Il Kwon[3]

[1]Department of Electrical Engineering, Kunsan National University, Kunsan, 573-707, South Korea
[2]Korea Electronics Technology Institute, Gwangju, Korea
[3]Department of Electronic, Electrical, Control and Instrumentation Engineering, Hanyang University, Korea

*Corresponding author: Byung-Taek Kim, e-mail: btkim@kunsan.ac.kr

The written-pole motor (WPM) is a very unique motor which has a self-magnetizing apparatus [1]. Fig. 1 shows the structure and circuit of WPM. As shown in Fig. 1, a WPM has magnet and cage conductors in a rotor, therefore it has self-starting ability like the line-start permanent magnet motor. The difference between both motors is that magnet of WPM is demagnetized in start-up by stator's field and re-magnetized by the magnetizing apparatus called an exciter pole in Fig. 1. In this study, a 0.2hp single-phase WPM for home appliance is dealt with. Especially this paper aims to determine magnet property, which is crucial in WPM design. A bonded-type magnet is considered for the magnet layer. In WPM, the magnet should be demagnetized in start-up and not be demagnetized in synchronous operation. Therefore, using the constraints, the coercive force and the knee point can be determined for a given magnet with a residual induction. In other words, the magnetic field impressed on the magnet is calculated for the maximum load condition in synchronous mode and then the magnetic field is during start-up condition. For both conditions, the fields in the magnet calculated by FEA are shown in Fig 2. The J-H characteristics determined by the proposed procedure are shown in Fig. 3.

This work is the outcome of a Manpower Development Program for Energy & Resources supported by the Ministry of Knowledge and Economy (MKE)

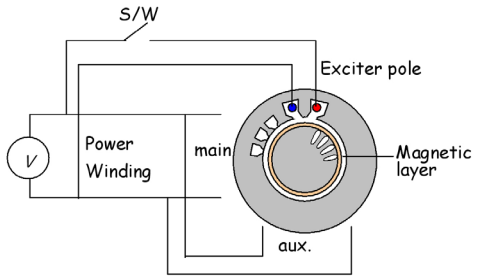


Fig. 1. A single-phase WPM.

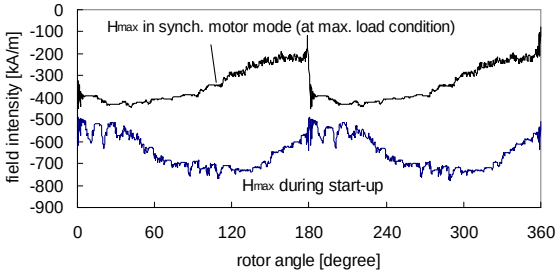


Fig. 2. Magnetic field intensity on magnet.

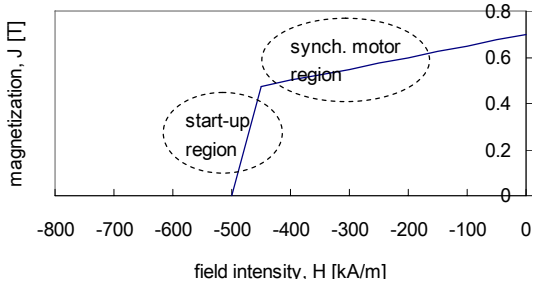


Fig. 3. Designed magnetic property of magnet.

REFERENCES

[1] Menzies, R. W. and LI Ge, "Theory investigation of 3-Phase Written Pole Motors", Proceedings of the 2002 IEEE Canadian Conference, pp. 162165, 2002.

DQ08

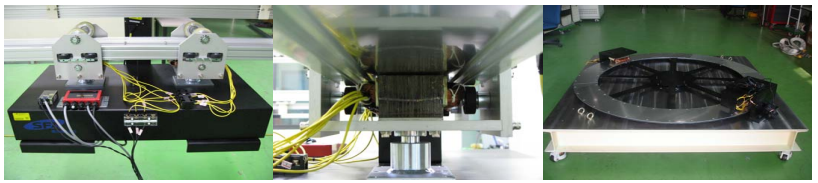
Slip Control of Linear Induction Motor in Electric Monorail System to Reduce Normal Force Considering Magnetic Characteristics

Ji-Woo Moon[1]*, Mi-Jung Kim[1], Dae-Wook Kang[1], Yeon-Ho Jeong[1], Ki-Chang Lee[1], Dae-Hyun Koo[1], and Yun-Hyun Cho[2]

[1]Electric Motor Research Group of KERI, 28-1 Sungju-dong Changwon-city Kyeongsangnam-do, Korea
[2]Electrical Engineering Dept. of Dong-A University, Korea

*Corresponding author: Author1 Moon, e-mail: hoopman99@keri.re.kr

This paper proposes the method in order to reduce the levitation force using the normal force of linear induction motor in the magnetic levitation propulsion system. Generally, LIM generates the normal force to the direction of increasing the levitation load [1, 2]. As the structure of EMS in this paper is hanging type as shown in Fig. 1(a) and 1(b), the normal force of LIM has a role of reducing the levitation force. However, it operates as the disturbance to the levitation system because of fluctuation according to slip and synchronous frequency. Therefore, this paper deals with the method to keep the normal force as available max value considering magnetic characteristics such as thrust force, normal force and efficiency of LIM. Fig. 2 shows the analysis data of LIM using finite element method. In this simulation, line voltage is 100[V] at 40[Hz]. Fig. 3 shows the control block for slip control of LIM. The Normal force and efficiency is controlled by slip frequency and d-axis current.



(a) EMS **(b) LIM** **(c) Load test system**

Fig. 1. Propulsion system and load test system is EMS.

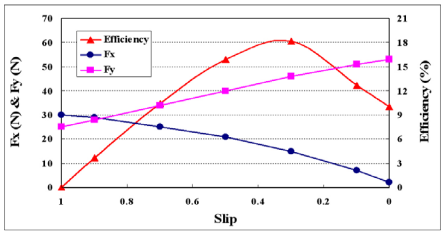


Fig. 2. Thrust force(Fx), normal force(Fy) and efficiency of LIM.

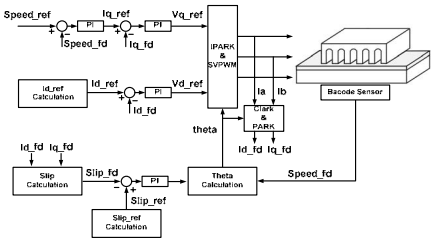


Fig. 3. Control Block diagram.

This work is joint research between KERI and SFA.

REFERENCES

[1] Yoshida, K *et al*., International Conference IEMD, 769118 (1999).
[2] Rong-Jong Wai *et al*., IECON 2007, 4460113 (2007).