CEFC2008 CD.PDF - Adobe Acrobat Pro

파일(F) 편집(E) 보기(V) 문서(D) 주석(C) 양식(R) 도구(T) 고급(A) 창(W) 도움말(H)

작성 결합 공동 작업 보안 서명 양식 멀티미디어 주석

a 1/680 78.1% 찾기


# 13TH IEEE CEFC 2008

## Athens, 11-15 May 2008

Booklet

Program

Digests

Authors' Index by Page

Authors' Index by Session

Search

MAIN





## Invited Lecture — Macedonia

15:40 – 16:10 Session Chair: **J. Tegopoulos, B. Trowbridge**



## OB1 – Devices and Applications — Macedonia

16:15 – 17:35 Session Chair: **N. Takahashi, C. T. M. Choi**

# Dynamic Characteristic Analysis Considering Core Losses in Transverse Flux Linear Machine with Solid Cores

[1]Ji-Young Lee, [1]Ji-Won Kim, [1]Seung-Ryul Moon, [1]Do-Hyun Kang, and [2]Jung-Pyo Hong
[1]Transverse Flux Machine Research Group , KERI, Changwon, KOREA, email : jylee@keri.re.kr
[2]Dept. of Automotive Engineering, Hanyang University, Seoul, KOREA, email : Hongjp@hanyang.ac.kr

**Abstract — This paper deals with a method for dynamic characteristic analysis considering core losses in transverse flux linear machines with solid cores. The magnetic field characteristics of the machines are calculated by using a 3-dimensional Equivalent Magnetic Circuit Network method. Two measured core loss data are used to calculate the core loss ratio, which is used for core loss calculation. The magnetic field analysis results and core loss data are used for dynamic simulation. The accuracy of the method is examined by comparing the input currents of the dynamic simulation model with the measured input current of an example TFLM.**

## I. Introduction

Transverse Flux Machines (TFM) have a 3-dimensional flux path, and this characteristic makes difficult to fabricate with silicon steel cores. Solid materials, e.g. SM490A, are considered as the substitute cores of the TFM in spite of high core losses because of its usefulness for a rigid and inexpensive fabrication.

In this paper, a Transverse Flux Linear Machine (TFLM) with solid cores is dealt, which has been already introduced in other papers for characteristic analysis [1,2]. However, dynamic analysis results were not very successful except the latest paper [2], and even the results of [2] are only good for just narrow speed range because the core loss ratio was calculated by using the measured data of silicon steel samples.

Therefore, this paper deals with dynamic characteristic analysis considering core losses in the TFLM with solid cores. First of all, a mathematical model of the dynamic simulation and motor parameter calculation methods are briefly explained. For motor parameter calculation, magnetic field analysis is performed by using a 3-dimensional Equivalent Magnetic Circuit Network method [2]. Then, a core loss calculation method is presented. The loss ratio, which is the ratio of core loss increment to area increment, is calculated by using the measured data of solid core samples, and it is used for the core loss calculation. These calculated parameters are used in the dynamic simulation. In order to verify the usefulness of the method, the input currents of the dynamic simulation with and without considering core losses are compared with the measured currents of an example solid core TFLM.

## II. Results and Discussion

Fig. 1 shows the configuration of a fabricated TFLM. Both the mover and stator have solid cores for rigid fabrication, and PMs and armature coils are in the mover. The mathematical model and block diagram of [2] are used for dynamic simulation. Fig. 2 shows the measured core loss which is used for the loss ratio calculation. Fig. 3 shows the comparison of the input current for 10,000N load. The dynamic simulation result considering core losses has good aspect estimating the measurement results.

## III. References

[1] Ji-Young Lee, Do-Hyun Kang, Jung-Hwan Chang, and Jung-Pyo Hong, "Rapid Eddy Current Loss Calculation for Transverse Flux Linear Motor," *IEEE Industry Application Annual meeting*, Vol. 1, p400-406, Oct. 2006

[2] Ji-Young Lee, Ji-Won Kim, Jung-Hwan Chang, Shi-Uk Chung, Do-Hyun Kang, and Jung-Pyo Hong, "Determination of Parameters Considering Magnetic Nonlinearity in Solid core Transverse Flux Linear Motor for Dynamic Simulation," *IEEE Trans. on Magnetics,* will be published, April, 2008

[3] W. A. Roshen, "A Practical, Accurate and Very General Core Loss Model for Nonsinusoidal Waveforms," *IEEE Trans. on Power Electronics*, vol. 22, No. 1, pp.30-40, Jan 2007

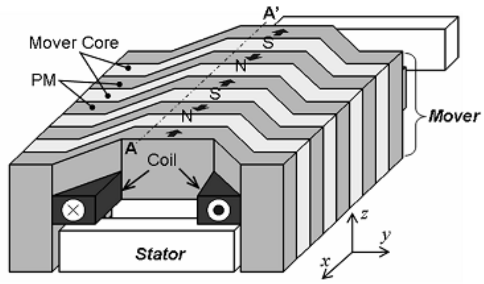


Fig. 1. Configuration of one-phase TFLM

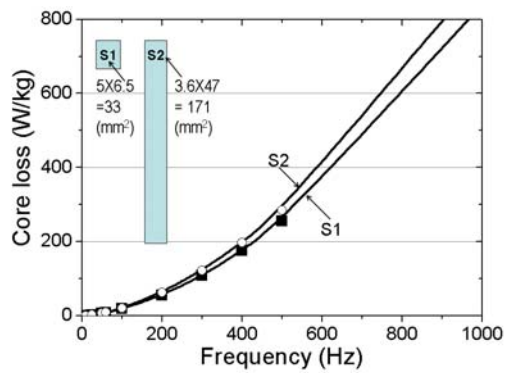


Fig. 2 Measured core loss according to cross section area of samples (SM490A material S1 and S2) and frequency at flux density 0.5T

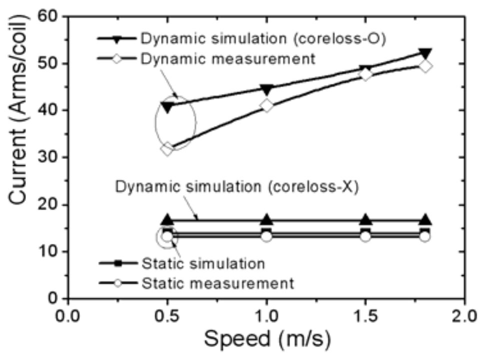


Fig. 3 Comparison of input currents for 10,000N load