Measurement and Simulation of Vector Hysteresis Characteristics

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I. Introduction

The RRSST (Round shaped Rotational Single Sheet Tester) system is one of the possible arrangements to measure the two dimensional vector hysteresis properties. In this case, the specimen has a round shape, and consequently it can be put into a rearranged induction motor [1-3].

The numerical analysis of this measurement system has been performed by using the Finite Element Method (FEM). The vector hysteresis properties of the specimen have been taken into account by a vector Preisach hysteresis model [2]. The magnetic field intensity, the magnetic flux density as well as eddy currents inside the specimen have been determined, and the behavior of these field quantities helped in the design of the measurement system. This paper presents the investigated vector hysteresis measurement system, which aims the identification of the vector Preisach hysteresis model.

II. The Measurement System

The block diagram of the measurement system can be seen in Fig. 1. The RRSST system is an induction motor, which rotor has been removed and the round shaped specimen has been installed in this place. The magnetic field inside the specimen can be generated by a special two-phase winding. The two orthogonal components of the magnetic field intensity or of the magnetic flux density can be controlled by two independent current generators and the waveform of the currents can be set by a program developed in LabVIEW running on a PC. The two orthogonal components of $\boldsymbol{H}(t)$ and of $\boldsymbol{B}(t)$ inside the specimen can be measured by a sensor system. The tangential component of $\boldsymbol{H}(t)$ can be measured by a system of four coils placed onto the surface of the specimen, $\boldsymbol{B}(t)$ inside the specimen can be measured by two coils slipped into holes of the specimen. These six signals can be measured by a NI-DAQ card installed on a PC, and a LabVIEW based software controls the measurements. The implemented controller can be used to generate any kind of magnetic flux density pattern. Fig. 2 presents the magnetic field intensity and the magnetic flux density in the case of circular magnetic flux. Higher harmonics can also be generated by the implemented controller. The measurement system, the sensors, and the program will be presented in the full paper.

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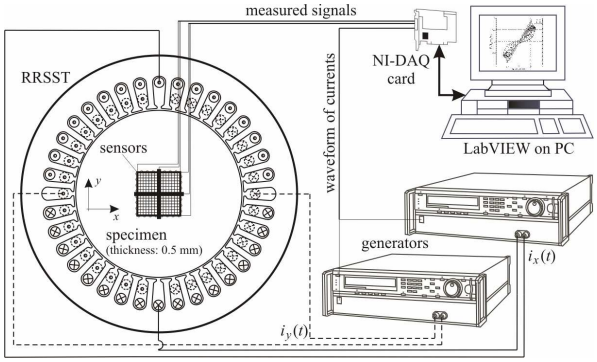

Fig. 1. The block diagram of the measurement system.

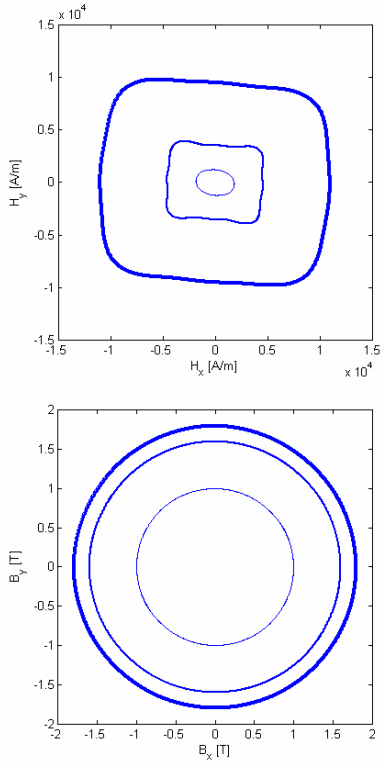

Fig. 2. Loci of the magnetic field intensity and the magnetic flux density.

References

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[3] M. Kuczmann, A. Iványi, *The Finite Element Method in Magnetics*, Akadémiai Kiadó, Budapest, 2008.