Vector Hysteron Model Implementation for 2-D dynamic hysteresis loops

Francesco Riganti Fulginei[1], Antonino Laudani[1] , Gabriele Maria Lozito[1] , Alessandro Salvini[1], Antonio Faba[2] ,Ermanno Cardelli[2] , Simone Quondam Antonio [2]

[1] Department of Engineering, Roma Tre University, Italy

[2] Department of Engineering, University of Perugia, Italy

Several approaches have been investigated in literature to represent the behavior of magnetic materials. The modified Preisach model, the VHM (Vector Hysteron Model), is able to represent correctly the rotational losses and is promisingly representative of the magnetization process. Unfortunately, this model exhibits the congruency property of minor loops for both scalar and rotational magnetizations. Several experiments showed the absence of this property for physical materials, and for this reason, it should be removed in the model behavior. A solution to this problem is found by considering a variable hysteron density distribution, which changes during the magnetization process. This is called the “moving” approach [1][2]. For the research proposed in this paper, the focus will be on an electrical steel with non-oriented grain. This kind of material is often used for electrical machines such as transformers, motors and generators. The VHM featuring a moving approach is characterized by a set of parameters that has to be found using an optimization technique. In this work, the parameters are found, at different frequencies, by using a powerful optimization algorithm, the Metric-topological–evolutionary optimization (MeTEO) [3]. The experimental dataset used for model identification comes from a set of measurements performed on a RSST (Rotational Single Sheet Tester). Then, a comparison between measured and computed data will be presented (see Fig. 1), along with a discussion on the accuracy of the proposed approach.

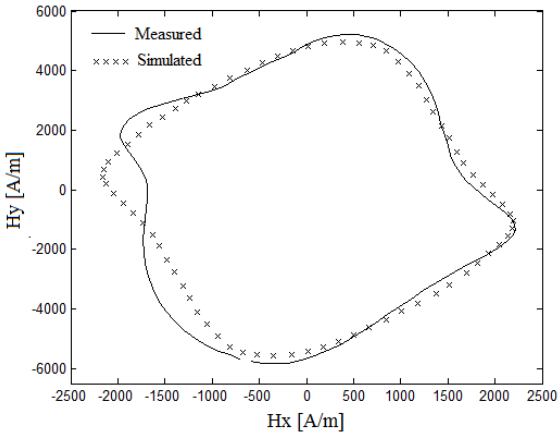

Figure 1. Comparison with measured data performed at 700 Hz.

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