Rotational magnetization modeling by using a Tabu Search approach.

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In the present paper, a Tabu Search metaheuristic [1] will been customized to reconstruct the rotational magnetization of electrical steels with weak anisotropy referring to the so called Moving Vector Hysteron Model (MVHM) proposed in [2]. The MVHM is formalized by means of some parameters that identify the hysteron's probability distribution function. These parameters vary with the value of the magnetization. Hence, an optimal set of them has to be found for each loop in order to identify the so-called moving functions [2].

In [3], a Tabu Search algorithm has been developed to solve the MVHM identification problem for the scalar magnetization of a non oriented grain Silicon steel with an angle of 0°. Therefore, the magnetic induction along the y axis can be neglected. The model parameters space has been explored in a smart way allowing to identify the corresponding values that minimize an error function while limiting the computation effort. The search has been performed for different magnetization values and the best fitting functions have been derived. Model validation has been performed with experimental data showing encouraging results.

In the present paper, the moving functions selected for the scalar magnetization will be tested on different magnetization angles in order to test their generalization capabilities.

Then, the more general rotational magnetization reconstruction problem will be addressed by deeply exploring the parameters space of the moving functions. In [2], it has been highlighted that, in the rotational case, these moving functions not only depend on the magnetization amplitude M but also on the magnetization angle ϑ. Hence, the Tabu Search algorithm will be customized in order to identify the optimal hysteron's probability distributions as a function of both magnetization amplitude and angle. The energy losses during the rotational cycles will be possibly considered during the optimization process.

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