

Identification of Jiles-Atherton model parameters using genetic algorithms

Mounir AMIR, Mourad ZERGOUG, S. AZZI, Y. BENNEDJOUE

Abstract : The purpose of this paper is to propose a robust and fast method to estimate the parameters of Jiles-Atherton model of ferromagnetic hysteresis by using genetic algorithms for reconstruction of hysteresis loops. The performance of the method is evaluated by experimental data. Jiles-Atherton model with five parameters describes the hysteresis behavior of ferromagnetic materials. To calculate the model parameters, many researchers use analytical and classical iterative methods, the most often those methods does not converge or give unphysical results. Because the characteristic equations are sensitive to the initial values of iteration and has non-unique solutions, which is caused by nonlinearity of the characteristic equations and the fact that there are more unknown quantities. The optimization by genetic algorithms method allows to avoid local minima and find global roots is then applied to obtain the model parameters. The proposed method overcomes the difficulties of the other techniques which assume zero remanence. It is also robust as it is guaranteed to converge to physical solutions.

Keywords : Jiles-Atherton model, hysteresis loops, Identification of parameters, genetic algorithms (GA)