

# Novel Solution to Eddy-Current Heating of Ferromagnetic Bodies with Nonlinear B-H Characteristic Dependent on Temperature

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**Abstract** — An efficient solution is presented for coupled nonlinear eddy currents – thermal diffusion problems. Applying the fixed point polarization method to the nonlinear eddy-current field, with the magnetization dependent on the magnetic induction and on temperature, allows the field computation for each harmonic separately. Since the fictitious permeability can be chosen to be everywhere that of free space, the matrices of the linear systems to be solved at each iteration remain unchanged even when the nonlinear *B-H* characteristic changes with the temperature. A simple integral equation is used to compute the eddy currents, the inversion of the matrices corresponding to the harmonics being performed only once, before the beginning of the iterative process. The heat conduction – diffusion equation is solved at each time step by the finite element method. An illustrative example is also presented.