

FEM Electro-Thermal Coupled Simulations for Process Industry with High Energy and Time Consumption

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The coupled simulations of the electromagnetic resistive heating and thermal variations has been carried out using the finite element method. The impedance boundary conditions have been implemented in order to avoid very fine mesh at certain position for fast simulations. The main objective of the simulations is to achieve rapid, cost effective and uniform heating in the thermal process system by replacing conventional energy sources with microwaves.

The heat generated by microwaves in the workload has been transferred to rest of the thermal process by conduction, convection and radiations. The designed model for the system has negligible reflections back to waveguide and uniform heating. The plots of simulated return losses, heating rate of process and uniformity of heating has been figured out along with power consumption required for several combinations of electrical, mechanical and thermal properties. The experimental results are expected soon but keeping in view the theoretical aspects, a good agreement is expected between simulated and experimented results.