

Modeling and Simulation of a cooking inductors by Electromagnetic Induction

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Abstract – The fundamental concepts of induction heating have been discovered and applied to industrial processes since the 1920s. Its principle is based on the direct application of two physical laws, Lenz's law, and the Joule effect. The development of electromagnetic induction principles in cooking systems is progressing, as they offer better working conditions, good safety, high energy efficiency, and low pollution. Induction heating is the transmission of electromagnetic energy through the surface of a heated material via three physical phenomena: permeability, electrical conductivity and thermal conductivity, depending on temperature. This electro-thermal technique permits electrical conductive materials to be heated without physical contact with an electrical source. In particular, the study of the inductor position in the heating plate can improve and normalize the induction heating temperature. In this work, we proposed several geometries for cooking inductor position based on numerical modeling of induction heating processes using the finite element method on Matlab to solve all electromagnetic problems. The chosen geometrical model with 3 inductors has a good temperature distribution in the heating plate of about 650 K° (377 C°).

Keywords – Induction Heating, Lenz's Law, Joule Effect, Electromagnetic, Cooking Inductors, Finite Element Method