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Performance Analysis of Control techniques of Full-Bridge Resonant Inverter for Induction Metal Surface Hardening

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Abstract : In this paper, several control techniques for induction metal treating are examined to assess their performances using resonant series inverter. In fact, many types of steel are treated with heat to increase toughness and resistance to wear. Induction heating seems to be appropriate and provides several advantages in comparison with conventional techniques. In this paper, these techniques are evaluated comprehensively, through simulation and experiment, and compared to each other in terms of heating rate and efficiency, using one metal sample hardened to 1mm in depth up to 700°C, with a 400 W power supply. The simulation results obtained are satisfactory, and agree with those of the experiments. Furthermore, the study shows the control strategy based on frequency may not be sufficient, but should be associated with other control techniques in order to address appropriately the hardening process, bearing in mind processing time and efficiency. The strategy with frequency associated with phase shift control appears to fit well metal treating during the hardening, and can be easily tailored to its hardening requirements, compared to the other techniques

Keywords : Induction metal hardning; Resonant Inverter; Power control