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## The Calculation of The Heating Efficiency About Using The High-temperature Superconducting Induction Heating Device To Heat The Medium and Low-carbon Steel and Alloy Steel

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The high-temperature superconducting induction heating technology could widely use in industrial production such as penetrating heating, quenching heating, welding and melting of steel. The steel uses the strong static magnetic field generated by the superconducting magnets of the high-temperature superconducting induction heating device. The steel rotate in the air gap and cut magnetic lines to produce the eddy current losses which can produce the Joule heats and heat the steel. Comparing with the tradition AC induction heating device, the high-temperature superconducting induction heating device can increase the heating speed of the steel and improve the uniformity of the heating effect. The heating depth is 10-20cm. This paper using the finite element software to calculate the distribution of the magnetic field, eddy current losses and the temperature of the steel in the heating area. The influence of the different rotate speeds of the steel on heating time is discussed. And the heating time of the steel with different diameters is calculated. It takes no more than 432 seconds to heat the steel to 1500°C when the steel rotates at 500rpm. And using AC induction heating device to heat the steel takes at least 1800 seconds to 1500°C. The comparison between the high temperature superconducting induction heating device and the AC induction heating device shows the advantages of the high temperature superconducting induction heating device.

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