

THE EFFECT OF TEMPERATURE ON THE HEAT TREATMENT PROCESS OF AISI 1045 STEEL WITH AIR COOLING MEDIA ON THE HARDNESS AND MICROSTRUCTURE OF THE MATERIAL

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ABSTRACT

This study aimed to analyze the effect of temperature variation during the heat treatment process of AISI 1045 steel using water as the quenching medium on its hardness and microstructure. AISI 1045 steel is a medium-carbon steel widely used in automotive components, particularly in parts that are subjected to friction and compressive loads. One of the methods used to improve the mechanical properties of this material is heat treatment through the quenching process using water as the cooling medium. This research employed an experimental method by applying heat treatment at temperatures of 800°C, 850°C, and 900°C with a holding time of 45 minutes, followed by water quenching. The tests conducted included Rockwell hardness testing and microstructural observation. The results showed that the hardness value of the raw material was 15.63 HRC. After the quenching process, the hardness increased to 52.53 HRC at 800°C, 50.56 HRC at 850°C, and 30.10 HRC at 900°C. The highest hardness value was obtained at the temperature of 800°C. Microstructural observations revealed that the raw material was predominantly composed of ferrite and pearlite phases. At 800°C, the microstructure consisted mainly of martensite with a small amount of pearlite. At 850°C, the austenite phase was transformed into martensite. Meanwhile, at 900°C, the dominance of martensite decreased, accompanied by the appearance of a mixture of ferrite and pearlite phases.

Keywords: AISI 1045 steel, heat treatment, quenching, cooling media, Rockwell hardness, microstructure.