

THE EFFECT OF COOLING MEDIA VARIATIONS IN THE QUENCING PROCESS OF AISI 1045 STEEL ON THE HARDNESS AND MICROSTRUCTURE OF THE MATERIAL

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ABSTRACT

This study aims to analyze the effect of variations in cooling media in the quenching process of AISI 1045 steel on hardness and microstructure values. AISI 1045 steel is a medium carbon steel that is widely used in automotive components because its mechanical properties can be improved through heat treatment. The quenching process was carried out at a temperature of 850 °C with a holding time of 45 minutes using three cooling media, namely water, salt solution, and PVA (polyvinyl alcohol) solution. Tests carried out included Rockwell hardness tests and microstructure observations. The results showed that the type of cooling media affected the mechanical properties and microstructure. The highest hardness value was obtained in the salt solution at 53.3 HRC, followed by water at 51.03 HRC, PVA solution at 21.5 HRC, and raw material at 16.03 HRC. The high hardness in the salt solution was caused by a faster cooling rate so that martensite formation was more dominant. The microstructure results show that the raw material is dominated by ferrite and pearlite, water produces a mixture of martensite and pearlite, the salt solution is dominated by denser martensite, while the PVA solution shows a mixture of bainite, pearlite, and a little martensite due to slower cooling. In addition, variations in the volume of the salt solution also have an effect, where a volume of 2000 ml produces the highest hardness of 52.43 HRC, indicating that the volume of the cooling medium also affects the cooling rate and microstructure formation.

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

