

ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh variasi *holding time* pada proses heat treatment terhadap kekerasan dan struktur mikro baja AISI 1045 dengan media pendingin air garam (brine). Variasi *holding time* yang digunakan adalah 15 menit, 25 menit, dan 35 menit pada suhu austenitisasi, sebelum dilakukan proses *quenching*. Pengujian kekerasan dilakukan menggunakan metode Rockwell (HRB), sedangkan karakterisasi mikrostruktur dianalisis melalui mikroskop metalografi dengan pembesaran 200x dan etsa nital 2%. Hasil penelitian menunjukkan bahwa *holding time* berpengaruh signifikan terhadap pembentukan mikrostruktur dan nilai kekerasan. *Holding time* 25 menit menghasilkan nilai kekerasan tertinggi sebesar 20,65 HRB serta menunjukkan homogenitas austenit yang lebih optimal sebelum *quenching*. *Holding time* 15 menit masih menyisakan struktur ferit-perlit, sedangkan *holding time* 35 menit menimbulkan pertumbuhan butir berlebih yang berdampak pada penurunan kekerasan. Media pendingin air garam terbukti memberikan laju pendinginan cepat sehingga mendukung pembentukan martensit lebih optimal dibanding kondisi tanpa perlakuan. Temuan ini merekomendasikan durasi *holding time* 25 menit sebagai waktu paling efektif untuk meningkatkan kekerasan dan kualitas mikrostruktur baja AISI 1045 dalam aplikasi komponen teknik seperti valve.

Kata Kunci: AISI 1045, Heat Treatment, Quenching, Holding Time

ABSTRACT

This study aims to analyze the effect of holding time variations during the heat treatment process on the hardness and microstructure of AISI 1045 steel using brine as the quenching medium. The holding times applied were 15 minutes, 25 minutes, and 35 minutes at the austenitizing temperature prior to quenching. Hardness was measured using the Rockwell HRB method, while microstructural characterization was performed using metallographic microscopy at 200x magnification with 2% nital etching. The results show that holding time significantly affects microstructural transformation and hardness values. A holding time of 25 minutes produced the highest hardness value of 20.65 HRB and demonstrated the most homogeneous austenite formation prior to quenching. A 15-minute holding time retained ferrite–pearlite structures, while a 35-minute holding time resulted in excessive grain growth, leading to reduced hardness. The brine quenching medium provided a rapid cooling rate, promoting optimal martensite formation compared to untreated material. These findings indicate that a 25-minute holding time is the most effective duration to enhance hardness and microstructural quality of AISI 1045 steel, particularly for technical applications such as valve components.

Keywords: AISI 1045, Heat Treatment, Quenching, Holding Time