ABSTRAK

Baja karbon sedang merupakan material yang banyak digunakan dalam industri permesinan dan konstruksi karena memiliki keseimbangan antara kekuatan dan keuletan. Salah satu metode untuk meningkatkan sifat mekaniknya adalah melalui perlakuan panas *quenching*. Penelitian ini bertujuan untuk menganalisis pengaruh variasi media pendingin, yaitu air, minyak pelumas SAE 15W-40, dan minyak goreng, pada temperatur 900°C terhadap laju pendinginan, ketangguhan, kekerasan, dan struktur mikro baja AISI 1045. Pengujian ketangguhan dilakukan menggunakan metode *impact* Charpy, kekerasan dilakukan menggunakan metode Vickers, dan pengamatan struktur mikro dilakukan melalui pengujian *metallography*. Hasil menunjukkan laju pendinginan tertinggi pada air (80°C/s), diikuti minyak (33–40°C/s) dan oli (22–25°C/s). Kekerasan tertinggi pasca *quenching* didapat pada media air (415–451 HV), menengah pada minyak (352–371 HV), dan terendah pada minyak pelumas (304–334 HV), sesuai dengan dominasi struktur *martensite* pada air serta campuran *bainite*, *pearlite*, dan *ferrite* pada minyak pelumas dan minyak goreng. Ketangguhan terendah terjadi pada air (1,85–2,675 J/mm²), sedangkan minyak pelumas dan minyak goreng lebih tinggi (3,3–3,75 J/mm²). Penelitian ini menunjukkan bahwa variasi media pendingin pada proses *quenching* berpengaruh signifikan terhadap sifat mekanik dan struktur mikro baja AISI 1045.

Kata Kunci: Baja AISI 1045, *quenching*, media pendingin, ketangguhan, kekerasan Vickers, *metallography*.

ABSTRACT

Medium carbon steel is a material widely used in the machinery and construction industry because it has a balance between strength and ductility. One method to improve its mechanical properties is through quenching heat treatment. This study aims to analyze the effect of variations in cooling media, namely water, SAE 15W-40 oil, and cooking oil, at a temperature of 900°C on the cooling rate, toughness, hardness, and microstructure of AISI 1045 steel. Toughness testing was carried out using the Charpy impact method, hardness was carried out using the Vickers method, and microstructure observation was carried out through metallography testing. The results showed the highest cooling rate in water (80°C/s), followed by oil (33–40°C/s) and oil (22–25°C/s). The highest post-quenching hardness was obtained in water (415–451 HV), medium in oil (352–371 HV), and the lowest in oil (304–334 HV), in accordance with the dominance of the martensite structure in water and a mixture of bainite, pearlite, and ferrite in oil and oil. The lowest toughness occurred in water (1.85–2.675 J/mm²), while oil and oil were higher (3.3–3.75 J/mm²). This study shows that variations in cooling media in the quenching process have a significant effect on the mechanical properties and microstructure of AISI 1045 steel.

Keywords: AISI 1045 steel, **quenching**, cooling media, toughness, Vickers hardness, metallography.