

INTISARI

Baja AISI 1045 merupakan baja karbon sedang yang banyak digunakan pada komponen mesin, poros, roda gigi, dan konstruksi karena memiliki kekuatan serta kemampuan pemesinan yang baik. Namun, penggunaan secara terus-menerus dapat menyebabkan penurunan sifat mekanik akibat gesekan, beban, dan tekanan selama pemakaian. Salah satu metode untuk meningkatkan sifat mekanik baja AISI 1045 adalah melalui proses perlakuan panas quenching. Proses ini dilakukan dengan memanaskan material hingga temperatur austenite kemudian didinginkan cepat menggunakan media pendingin tertentu sehingga meningkatkan kekerasan akibat terbentuknya struktur martensite. Penelitian ini bertujuan menganalisis pengaruh variasi media pendingin air, minyak goreng, dan oli SAE 15W-40 terhadap ketangguhan, kekerasan, dan struktur mikro baja AISI 1045 hasil quenching pada temperatur 850°C. Metode penelitian meliputi proses quenching pada temperatur 850°C dengan holding time 25 menit menggunakan variasi media pendingin air, minyak goreng, dan oli SAE 15W-40. Setelah perlakuan panas dilakukan pengujian impak Charpy, pengujian kekerasan Vickers, serta pengamatan struktur mikro. Hasil penelitian menunjukkan bahwa variasi media pendingin berpengaruh terhadap nilai kekerasan, ketangguhan impak, dan struktur mikro baja AISI 1045. Media pendingin air menghasilkan nilai kekerasan tertinggi sebesar 443 HV akibat laju pendinginan yang paling cepat sehingga pembentukan martensite lebih dominan. Sementara itu, media pendingin oli SAE 15W-40 dan minyak goreng menghasilkan nilai ketangguhan impak lebih tinggi, yaitu sekitar 3,1–3,3 J/mm². Pengamatan struktur mikro menunjukkan bahwa proses quenching menghasilkan struktur yang didominasi fase martensite dengan perbedaan ukuran butir pada setiap media pendingin.

Kata kunci: baja AISI 1045, quenching, media pendingin, kekerasan, ketangguhan impak, struktur mikro.

ABSTRACT

AISI 1045 steel is a medium carbon steel widely used in machine components, shafts, gears, and construction applications due to its good strength and machinability. However, continuous use can reduce its mechanical properties due to friction, loads, and pressure during service. One method used to improve the mechanical properties of AISI 1045 steel is the quenching heat treatment process. This process is carried out by heating the material to the austenite temperature followed by rapid cooling using a specific quenching medium, thereby increasing hardness due to the formation of a martensitic structure. This study aims to analyze the effect of variations in quenching media, namely water, cooking oil, and SAE 15W-40 oil, on the toughness, hardness, and microstructure of AISI 1045 steel quenched at 850°C. The research method included a quenching process at a temperature of 850°C with a holding time of 25 minutes using water, cooking oil, and SAE 15W-40 oil as cooling media. After the heat treatment process, Charpy impact testing, Vickers hardness testing, and microstructural observations were conducted. The results showed that variations in quenching media affected the hardness, impact toughness, and microstructure of AISI 1045 steel. Water as the quenching medium produced the highest hardness value of 443 HV due to its fastest cooling rate, resulting in a more dominant martensitic structure. Meanwhile, SAE 15W-40 oil and cooking oil produced higher impact toughness values, ranging from 3.1–3.3 J/mm². Microstructural observations indicated that the quenching process produced a microstructure dominated by the martensite phase with different grain sizes for each cooling medium.

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