

ABSTRAK

Material Low Alloy (A)/ baja chromium paduan rendah adalah bahan yang digunakan untuk pembuatan teeth bucket, komponen dari alat berat seperti ekskavator hasil produksi dari PT. Komatsu Indonesia. Sesuai dengan letak dan fungsi dari teeth bucket, yaitu sebagai penggaruk pemecah lapisan tanah dan batuan, maka ketahanan impak dan aus yang tinggi menjadi sifat material yang wajib dipenuhi. Didukung juga oleh sifat-sifat material seperti kekerasan, yield strength, tensile strength, elongation, reduction area. Dan sifat-sifat material dari teeth bucket tersebut sebagian besar dipengaruhi proses heat treatment setelah quenching, yaitu proses temper. Di PT. Komatsu Indonesia proses perlakuan panas meliputi Normalizing (950 - 970°C, 2-4 jam) + (Quenching 900 - 930°C, 1-2 jam) + Tempering (180°C-225°C, 4-6 jam) namun secara sifat mekanik material belum didapatkan hasil maksimal. Oleh karena itu perlu dilakukan penelitian yang berkaitan dengan pengaruh variasi temperatur tempering pada rentang temperatur 180 - 225°C untuk perlakuan panas Quenching-Tempering Tempering (QTT) terhadap struktur mikro dan sifat mekanik material Low Alloy (A)/baja chromium paduan rendah. Pengujian yang dilakukan meliputi pengujian magnetic particle test, kekerasan, tarik, impak dan struktur mikro. Berdasarkan hasil pengujian Kesimpulan yang didapatkan dari hasil penelitian ini adalah sebagai berikut : Pada hasil pengecekan mikrostruktur as *Quenching* didapatkan pembentukan *Martensite* & sisa *austenite*. Dimana setelah dilakukan variasi *tempering* T1(180°C), T2(195°C), T3(210°C), dan T4(225°C) menunjukkan adanya perubahan mikrostruktur martensite temper dan sisa austenite yang lebih sedikit. Pada pengujian destruktif menunjukkan beberapa hasil:

- a. Sifat kekerasan as *Quenching Tempering Tempering* (QTT) versus as-Cast rata-rata mengalami kenaikan. Nilai variasi temperatur *tempering* berpengaruh terhadap nilai kekerasan. Semakin tinggi temperatur tempering menyebabkan nilai kekerasan yang semakin rendah.
- b. Semakin tinggi temperatur tempering menyebabkan nilai *Yield Strength* semakin rendah.
- c. Semakin tinggi temperatur tempering menyebabkan nilai *Tensile Strength* semakin rendah.
- d. Semakin tinggi temperatur tempering semakin tinggi nilai impak.
- e. Semakin tinggi temperatur tempering maka nilai elongasi akan semakin tinggi.

Dari hasil pengujian, mekanikal properties pada material *Low Alloy* (A)/ Baja Chromium paduan rendah, dapat disimpulkan keuletan dan ketangguhan berada optimal pada range temperatur tempering 195°C sampai 210°C, dimana nilai impak semakin tinggi dan nilai Tensile serta hardness masih pada batas spesifikasi standard.

ABSTRACT

Low Alloy Material (A)/ low alloy chromium steel is a material used for the manufacture of teeth buckets, components of heavy equipment such as excavators produced by PT. Komatsu Indonesia. In accordance with the location and function of the teeth bucket, namely as a rake for breaking soil and rock layers, high impact and wear resistance are material properties that must be met. Also supported by material properties that are hardness, yield strength, tensile strength, elongation, reduction area. And the material properties of the teeth bucket are mostly influenced by the heat treatment process after quenching, which is the tempering process. At PT. Komatsu Indonesia heat treatment process includes Normalizing (950 - 970°C, 2-4 hours) + (Quenching 900 - 930°C, 1-2 hour) + Tempering (206°C, 4-6 hours) but the mechanical properties of the material have not obtained maximum results. Therefore, it is necessary to conduct research related to the effect of tempering temperature variations in the temperature range of 180 - 225°C for Quenching-Tempering Tempering heat treatment of the microstructure and mechanical properties Low Alloy (A)/ low alloy chromium steel material. Tests carried out include magnetic particle test, hardness, tensile, impact and microstructure. Based on the test results of several tempering parameters, it was found that the maximum result was at temperature 210°C. In the results of checking the microstructure of the Quenching axle, the formation of Martensite & residual austenite was obtained. Where after tempering variations T1(180°C), T2(195°C), T3(210°C), and T4(225°C,) showed changes in the microstructure of tempered martensite and less austenite remains. On destructive testing showed several results:

- a. The hardness of as Quenching Tempering Tempering (QTT) versus as-Cast on average increased.
- b. The value of tempering temperature variation affects the hardness value.
- c. The higher the tempering temperature leads to a lower hardness value.
- d. The higher the tempering temperature causes the lower the Yield Strength value.
- e. The higher the tempering temperature causes the lower the Tensile Strength value.

From the test results, mechanical properties of Low Alloy (A) / Low alloy Chromium Steel materials, it can be concluded that ductility and toughness are optimal in the tempering temperature range of 195°C until 210°C, where the impact value is higher, and the Tensile value and hardness are still at the standard specification limits.