INTISARI

Baja coran (*ingot steel*) memiliki banyak cacat antara lain porositas, inklusi, segregasi, dan struktur dendritik yang mengakibatkan sifat mekanisnya relatif rendah. Untuk meningkatkan sifat mekanisnya, penerapan *Thermo-mechanical controlled process* (TMCP) biasa diperlakukan pada baja ingot. *Thermo-mechanical controlled process* merupakan proses untuk meningkatkan sifat mekanis (kekuatan tarik, ketangguhan dan keuletan) baja melalui kombinasi perlakuan panas dan proses mekanis penempaan (*hot forging*). Penelitian ini bertujuan untuk mempelajari pengaruh jumlah penempaan pada proses penempaan panas (*hot forging*) terhadap struktur mikro dan sifat mekanis baja 0,182 C; 1,069 Mn; 2,423 Si serta mempelajari sifat mampu las baja.

Baja *ingot* dengan komposisi 0,182 C- 1,069 Mn- 2,423 Si- 0,228 Cr- 0,043 Ni- 0,367 Mo- 0,02 P- 0,01 S- 0,012 V, dan sisanya Fe yang telah dibuat pada penelitian sebelumnya. Mula-mula baja diperlakukan proses homogenisasi struktur melalui pemanasan 1250^{o}C selama 15 menit dan didinginkan di udara. Penempaan panas dilakukan pada suhu antara 1250- 1100 ^{o}C dengan variasi jumlah penampaan sebanyak 1, 3, dan 5x tempa. Baja hasil *hot forging* disiapkan untuk pengujian tarik, struktur mikro, pengujian ketangguhan *impact*, dan pengujian kekerasan. Sebagai tambahan, sifat mampu las baja dipelajari melalui perhitungan nilai *carbon equivalent* (CE), investigasi visual dan *destructive test*.

Hasil penelitian menunjukkan bahwa penempaan panas (*hot forging*) menyebabkan penghalusan struktur ferit dan bainit sehingga terjadi peningkatan sifat mekanis baja. Sifat mekanis terbaik diperlihatkan oleh spesimen 5x tempa, kekuatan tarik sebesar 882 Mpa, ketangguhan *impact* 12.88 kg/mm^2, kekerasan Vickers 267.74 VHN, dan prosesntase regangan 16 %. Berdasarkan pengamatan struktur mikro, tidak ada retak yang terdeteksi dapat disimpulkan bahwa kemampuan baja itu baik.

Kata Kunci: penempaan panas (*hot forging*), struktur mikro, sifat mekanis, sifat mampu las (*weldability*)

ABSTRACT

Cast steel (steel ingot) has many defects, among others porosity, inclusions, segregation, and dendritic structures that result in relatively low mechanical properties. To improve the mechanical properties, the application of Thermo-mechanical controlled process (TMCP) is commonly applied in a steel ingot. Thermo-mechanical controlled process is a process to improve the mechanical properties (tensile strength, toughness and ductility) steel through a combination of heat treatment and mechanical process such as rolling and forging. This research aimed to study the effect of ammount of forging on the microstructure and mechanical properties of steel 0.182 C- 1.069 Mn- 2.423 Si as well as studying the weldability of steel.

Steel ingot with a composition of 0,182 C- 1,069 Mn- 2.423 Si- 0.228Cr- 0.043 Ni- 0,367 Mo- P 0.02- 0.01 S- 0.012 V, and the rest Fe has been made in previous studies. Initially treated steel structure homogenization process by heating 1250^{o}C for 15 minutes and was cooled in the air. Hot Forging was done at temperatures between 1250- 1100 ^{o}C with the ammount of forging variation (1, 3, and 5 times of forging). Steel hot forged were prepared for tensile testing, microstructure, impact toughness testing and hardness testing. In additonal, weldability was conducted by calculating the value of carbon equivalent (CE), visual investigation and destructive tests.

The results showed that the hot forging led to the refinement of ferrite and bainite structure and finally increased mechanical properties of steel. The Best mechanical properties were exhibited at 5x of forging, tensile strength of 882 MPa, impact toughness of 12.88 kg / mm2, Vickers hardness 267.74 VHN, and prosesntase strain 16%. Based on microstructure observations, no cracks was detected, it can concluded that the weldability of the steel was good.

.**Keywords:** Hot forging, microstructure, mechanical properties, weldability