ABSTRAK

Baja ST 37 banyak digunakan pada aplikasi seperti rangka atap rumah, pagar, kanopi, tangki dan konstruksi manufaktur karena kemampuannya menahan beban sedang serta kemudahan dalam proses pemesinan. Kandungan karbonnya yang rendah (sekitar 0,25%wt C) membuat baja ini cocok untuk proses pengelasan. Namun, area *heat affected zone* (HAZ) pada sambungan las sering menjadi titik lemah yang dapat menurunkan kekuatan dan ketahanan material. Penelitian ini bertujuan untuk mengevaluasi pengaruh perlakuan panas *annealing* terhadap sifat mekanik dan struktur mikro hasil pengelasan baja ST 37. Proses *annealing* bertujuan untuk memperbaiki struktur, mengembalikan sifat mekanik dan mengurangi tegangan sisa setelah proses pengelasan, Pengujian yang dilakukan meliputi *magnetic particle test*, uji tarik, uji kekerasan, dan pengamatan struktur mikro. Hasil penelitian menunjukkan kekerasan tertinggi pada spesimen tanpa *annealing* terletak di area *weld* yaitu 79,99 HRB, sedangkan terendah pada *annealing* 860°C yaitu 72,62 HRB, membuktikan bahwa *annealing* efektif menurunkan kekerasan material, dengan penurunan yang semakin signifikan seiring peningkatan temperatur *annealing*. Selain itu, hasil pengujian tarik menunjukkan spesimen tanpa *annealing* memiliki kekuatan tarik tertinggi yaitu 180,060 MPa dan terendah pada *annealing* 860 yaitu 147,785 MPa dengan regangan yang semakin menurun, membuktikan bahwa *annealing* efektif meningkatkan keuletan material setelah proses pengelasan, meskipun disertai penurunan kekuatan tarik. Dari sisi struktur mikro, menunjukkan semakin tinggi temperatur *annealing* menghasilkan penghalusan butir, peningkatan homogenitas, serta pengurangan tegangan sisa yang terjadi akibat proses pengelasan.

Kata kunci: pengelasan, *annealing*, HAZ, kekerasan, struktur mikro, keuletan

ABSTRACT

ST 37 steel is widely used in applications such as roof trusses, fences, canopies, tanks, and manufacturing constructions due to its ability to withstand moderate loads and ease of machining. Its low carbon content (approximately 0.25% wt C) makes this steel suitable for welding processes. However, the heat-affected zone (HAZ) in welded joints often becomes a weak point that can reduce the strength and durability of the material. This study aims to evaluate the effect of annealing heat treatment on the mechanical properties and microstructure of welded ST 37 steel. The annealing process is intended to improve the structure, restore mechanical properties, and reduce residual stress after the welding process. The tests conducted include magnetic particle testing, tensile testing, hardness testing, and microstructural observations. The results show that the highest hardness in the specimen without annealing is found in the weld area, at 79.99 HRB, while the lowest hardness is observed in the specimen annealed at 860°C, at 72.62 HRB, indicating that annealing is effective in reducing the material's hardness, with a more significant decrease as the annealing temperature increases. Additionally, tensile test results show that the non-annealed specimen has the highest tensile strength at 180.060 MPa, and the lowest strength is found in the 860°C annealed specimen at 147.785 MPa, accompanied by a decrease in elongation. This proves that annealing effectively increases the ductility of the material after welding, although it is accompanied by a reduction in tensile strength. From a microstructural perspective, it is shown that higher annealing temperatures result in grain refinement, improved homogeneity, and a reduction in residual stresses caused by the welding process.

Keywords: welding, annealing, HAZ, hardness, microstructure, ductility