

ANALISIS PENGARUH *TEMPERATURE PRE-HEATING* PENGELASAN PADA MIKROSTRUKTUR DAN SIFAT MEKANIS SS 304

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ABSTRAK

Sistem perpipaan memiliki peranan penting dalam industri untuk mengalirkan fluida, mengingat sistem perpipaan dapat membentang hingga ribuan kilometer maka diperlukan pengelasan disetiap sambungan sistem perpipaan. Penelitian ini mengkaji pengaruh variasi *temperature pre-heating* pengelasan terhadap mikrostruktur dan sifat mekanis SS 304. Spesimen diberikan pemanasan atau *pre-heating* dan tidak *pre-heating* kemudian dilakukan pengelasan, kemudian dilakukan pengamatan mikrostruktur menggunakan *scanning electron microscope* (SEM) dan *optical microscope*, pengujian kekerasan pada daerah *base metal* (BM), *heat affected zone* (HAZ), dan *weld metal* (WM), serta pengujian tarik untuk menentukan nilai *ultimate tensile strength* (UTS). Hasil penelitian menunjukkan bahwa peningkatan temperatur *pre-heating* menyebabkan perbesaran ukuran butir akibat efek *annealing* tanpa mengubah fasa, di mana mikrostruktur tetap berupa dendrite austenite. Nilai kekerasan cenderung menurun mulai dari *base metal* hingga daerah *weld metal* seiring kenaikan temperatur *pre-heating*, namun menjadikannya lebih seragam pada *pre-heating* 200°C. Sedangkan nilai *ultimate tensile strength* (UTS) meningkat dan mencapai nilai tertinggi yaitu 624,92 MPa pada *pre-heating* 200°C.

Kata kunci : Pengelasan, SS 304, *Pre-heating*, Mikrostruktur, Kekerasan, UTS

EFFECT OF PRE-HEATING TEMPERATURE WELDING ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF SS 304

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ABSTRACT

Piping systems play an important role in industry for fluid flow, considering that piping systems can extend for thousands of kilometers, welding is required at every joint in the piping system. This study examines the effect of variations in pre-heating temperature on the microstructure and mechanical properties of SS 304. Specimens were subjected to preheating or no preheating, then welded, followed by microstructure observation using a scanning electron microscope (SEM) and optical microscope, hardness testing on the base metal (BM), heat-affected zone (HAZ), and weld metal (WM), as well as tensile testing to determine the ultimate tensile strength (UTS). The results showed that an increase in preheating temperature caused grain size enlargement due to the annealing effect without changing the phase, where the microstructure remained in the form of austenite dendrites. The hardness value tended to decrease from the base metal to the weld metal area as the preheating temperature increased, but it became more uniform at 200°C preheating. Meanwhile, the ultimate tensile strength (UTS) value increased and reached the highest value of 624,92 MPa at 200°C preheating.

Keyword : *Welding, SS 304, Pre-heating, Microstructure, Hardness, UTS*