ANALISIS KEKUATAN TARIK PADA HASIL PENGELASAN *FLUX CORE ARC WELDING* (FCAW) PADA *WIRE ARC ADDITIVE MANUFACTURING* (WAAM)

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Abstrak

Wire Arc Additive Manufacturing (WAAM) merupakan teknologi manufaktur aditif berbasis pengelasan yang memungkinkan pembuatan komponen logam berukuran besar secara efisien dengan biaya relatif rendah dan fleksibilitas desain yang tinggi. Salah satu proses pengelasan yang berpotensi diterapkan pada WAAM adalah *Flux Core Arc Welding* (FCAW) karena memiliki laju deposisi yang tinggi serta stabilitas busur yang baik. Namun, variasi parameter proses, khususnya kecepatan pengelasan, dapat memengaruhi kualitas deposisi, ikatan antar-lapisan, serta sifat mekanik material yang dihasilkan. Penelitian ini bertujuan untuk menganalisis pengaruh variasi kecepatan pengelasan FCAW terhadap kekuatan tarik hasil proses WAAM pada material stainless steel SS308. Metode penelitian yang digunakan adalah metode eksperimental dengan variasi kecepatan pengelasan sebesar 2,5 mm/s, 3,0 mm/s, dan 3,5 mm/s, sementara parameter pengelasan lainnya dijaga konstan. Spesimen hasil deposisi kemudian dibuat menjadi benda uji dan dilakukan pengujian tarik untuk memperoleh nilai *Yield Strength* (YS), *Ultimate Tensile Strength* (UTS), serta regangan hingga patah. Hasil penelitian menunjukkan bahwa kecepatan pengelasan berpengaruh signifikan terhadap sifat mekanik hasil WAAM, di mana kecepatan 2,5 mm/s menghasilkan nilai UTS dan YS tertinggi, sedangkan peningkatan kecepatan pengelasan menyebabkan penurunan kekuatan tarik akibat kurang optimalnya fusi antar-lapisan..

Kata kunci : *Wire Arc Additive Manufacturing, Flux-Cored Arc Welding*, kecepatan pengelasan, uji tarik, *stainless steel 308*, kualitas sambungan.

ANALYSIS OF TENSILE STRENGTH OF FLUX-CORED ARC WELDING (FCAW) JOINTS IN WIRE ARC ADDITIVE MANUFACTURING (WAAM)

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Abstract

Wire Arc Additive Manufacturing (WAAM) is a metal-based additive manufacturing technology that enables the fabrication of large-scale components with high efficiency, relatively low cost, and flexible design capability. One welding process that can be applied in WAAM is Flux Cored Arc Welding (FCAW), which offers a high deposition rate and stable arc characteristics. However, variations in process parameters, particularly welding travel speed, can significantly affect deposition quality, interlayer bonding, and the resulting mechanical properties. This study aims to analyze the effect of FCAW welding travel speed on the tensile properties of WAAM-fabricated stainless steel SS308. An experimental method was employed by varying the welding travel speed at 2.5 mm/s, 3.0 mm/s, and 3.5 mm/s, while other welding parameters were kept constant. The deposited materials were machined into tensile test specimens and subjected to tensile testing to determine the Yield Strength (YS), Ultimate Tensile Strength (UTS), and elongation to fracture. The results indicate that welding travel speed has a significant influence on the mechanical properties of WAAM products. The lowest travel speed of 2.5 mm/s produced the highest UTS and YS values, indicating improved interlayer fusion and more stable heat input. In contrast, increasing the welding travel speed resulted in a decrease in tensile strength due to insufficient fusion between deposited layers.

Keywords : *Wire Arc Additive Manufacturing, Flux-Cored Arc Welding, welding speed, tensile test, stainless steel 308, weld quality.*