

ABSTRAK

PENGARUH *PREHEATING* PADA PENGELASAN *DISSIMILAR* ANTARA BAJA AISI 1020 DAN BAJA AISI 1045 MENGGUNAKAN LAS SMAW

Oleh

Muhammad Hafizh

Pengelasan *dissimilar* antara baja AISI 1020 dan baja AISI 1045 banyak digunakan pada aplikasi struktural, namun perbedaan sifat termal dan kandungan karbon dapat menurunkan kualitas sambungan las. Penelitian ini bertujuan untuk menganalisis pengaruh variasi suhu *preheating* terhadap hasil uji tarik dan karakteristik struktur mikro sambungan las *dissimilar* menggunakan metode *Shielded Metal Arc Welding* (SMAW). Proses pengelasan dilakukan pada kondisi tanpa *preheating* serta dengan *preheating* pada suhu 250°C, 300°C, dan 350°C, kemudian didinginkan secara alami di udara. Pengujian tarik dilakukan berdasarkan standar ASTM E8, sedangkan pengamatan struktur mikro dilakukan menggunakan mikroskop optik pada daerah logam las dan *Heat Affected Zone* (HAZ). Hasil uji tarik menunjukkan bahwa spesimen tanpa *preheating* memiliki nilai kekuatan tarik maksimum rata-rata sebesar 254,51 MPa dan kekuatan luluh rata-rata 180,23 MPa. Penerapan *preheating* 250°C meningkatkan kekuatan tarik maksimum rata-rata menjadi 255,56 MPa. Nilai tertinggi diperoleh pada suhu *preheating* 300°C dengan kekuatan tarik maksimum rata-rata sebesar 295,43 MPa, sedangkan pada suhu 350°C diperoleh nilai sebesar 287,23 MPa. Pengamatan struktur mikro menunjukkan bahwa *preheating* mampu mengurangi gradien termal antara kedua material, menghasilkan distribusi fasa *ferrite-pearlite* yang lebih homogen serta penyempitan daerah HAZ. Berdasarkan hasil penelitian, suhu *preheating* 300°C memberikan performa mekanik sambungan las yang paling optimal.

Kata kunci: *pengelasan dissimilar, preheating, SMAW, uji tarik, AISI 1020, AISI 1045.*

ABSTRACT

THE EFFECT OF PREHEATING ON DISSIMILAR WELDING BETWEEN AISI 1020 STEEL AND AISI 1045 STEEL USING SMAW WELDING

By

Muhammad Hafizh

Dissimilar welding between AISI 1020 and AISI 1045 steels is widely applied in structural components; however, differences in thermal properties and carbon content may adversely affect joint performance. This study aims to investigate the effect of preheating temperature variations on the tensile properties and microstructural characteristics of dissimilar welded joints produced using the Shielded Metal Arc Welding (SMAW) process. Welding was conducted under four conditions: without preheating and with preheating at 250°C, 300°C, and 350°C, followed by natural air cooling. Tensile testing was performed in accordance with ASTM E8, while microstructural observations were carried out using optical microscopy in the weld metal and Heat Affected Zone (HAZ). The results show that the non-preheated specimen exhibited an average ultimate tensile strength of 254.51 MPa with an average yield strength of 180.23 MPa. Preheating at 250°C slightly increased the average ultimate tensile strength to 255.56 MPa. The highest tensile performance was achieved at a preheating temperature of 300°C, with an average ultimate tensile strength of 295.43 MPa, whereas preheating at 350°C resulted in an average value of 287.23 MPa. Microstructural analysis revealed that preheating reduced thermal gradients between the two steels, leading to a more homogeneous ferrite-pearlite distribution and a narrower HAZ. Overall, preheating significantly improves the tensile performance of dissimilar welded joints, with an optimal preheating temperature of 300°C.

Keywords: *dissimilar welding, preheating, SMAW, tensile properties, AISI 1020 steel, AISI 1045 steel.*