

ANALISIS PENGARUH SUHU *PREHEAT* TERHADAP DISTORSI *GAS METAL ARC WELDING* (GMAW) PADA SAMBUNGAN *SINGLEPASS V BUTT JOINT* BAJA ASTM A36

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ABSTRAK

Proses pengelasan *Gas Metal Arc Welding* (GMAW) berpotensi menimbulkan distorsi akibat ketidakseimbangan distribusi panas selama pengelasan, yang dapat memengaruhi kualitas, presisi dimensi, dan integritas struktural komponen. Salah satu metode yang umum digunakan untuk mengendalikan distorsi adalah penerapan suhu *preheat* sebelum proses pengelasan. Penelitian ini bertujuan untuk menganalisis pengaruh variasi suhu *preheat* terhadap besarnya distorsi pada pengelasan GMAW baja ASTM A36 melalui pendekatan simulasi numerik menggunakan ANSYS serta validasi eksperimental. Hasil validasi menunjukkan bahwa model simulasi mampu merepresentasikan perilaku termal dan distorsi dengan baik, ditunjukkan oleh rata-rata error temperatur sebesar 5,89% dan error distorsi sebesar 8,46%. Variasi suhu *preheat* yang diuji meliputi 28°C, 50°C, 100°C, dan 150°C. Hasil menunjukkan bahwa peningkatan suhu *preheat* mampu menurunkan distorsi secara signifikan, dengan deformasi maksimum berkurang dari 1,2181 mm tanpa *preheat*, menjadi 0,89118 mm pada suhu 150°C. Penelitian ini menyimpulkan bahwa penerapan *preheat* efektif dalam mengurangi distorsi pengelasan GMAW, dengan suhu *preheat* optimal berada pada rentang 100–150°C, sehingga dapat meningkatkan kualitas dan ketelitian hasil pengelasan.

Kata kunci : GMAW, *Preheat*, *Finite Element Method*, Distorsi

ANALYSIS OF THE EFFECT OF PREHEAT TEMPERATURE ON DISTORTION IN GAS METAL ARC WELDING (GMAW) OF ASTM A36 STEEL SINGLE PASS V BUTT JOINT

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ABSTRACT

The Gas Metal Arc Welding (GMAW) welding process has the potential to cause distortion due to an imbalance in heat distribution during welding, which can affect the quality, dimensional precision, and structural integrity of components. One method commonly used to control distortion is the application of preheat temperature before the welding process. This study aims to analyze the effect of variations in preheat temperature on the magnitude of distortion in GMAW welding of ASTM A36 steel through a numerical simulation approach using ANSYS as well as experimental validation. The validation results show that the simulation model is able to represent thermal behavior and distortion well, indicated by an average temperature error of 5.89% and a distortion error of 8.46%. The preheat temperature variations tested include 28°C, 50°C, 100°C, and 150°C. The results show that increasing preheat temperature is able to reduce distortion significantly, with maximum deformation decreasing from 1.2181 mm without preheat, to 0.89118 mm at a temperature of 150°C. This study concludes that the application of preheat is effective in reducing GMAW welding distortion, with the optimal preheat temperature range being 100–150°C, thereby improving the quality and accuracy of welding results.

Keywords : *GMAW, Preheat, Finite Element Method, Distortion*