

ANALYSIS OF THE EFFECT OF CURRENT VARIATION IN SMAW WELDING OF SG-295 STEEL ON THE POROSITY OF 3 KG LPG CYLINDER HANDLE

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ABSTRACT

This study aims to analyze the effect of current variation in Shielded Metal Arc Welding (SMAW) on the porosity level of welded joints in SG-295 steel used for 3 kg LPG cylinder handles. Porosity is one of the welding defects that can reduce the strength and reliability of the joint; therefore, selecting the proper welding parameters is essential to ensure product safety. The tested welding currents were 40A, 60A, and 80A, using AWS E6013, E7016, and E7018 electrodes. Porosity testing was conducted using the Liquid Penetrant Test (NDT) method, and defect length measurement was carried out with a USB microscope. The research employed a Taguchi orthogonal array L9 experimental design to determine the optimal parameter combination. Data were analyzed using the Signal-to-Noise Ratio (S/N) with a smaller is better characteristic and Analysis of Variance (ANOVA) to determine the significance of each factor. The analysis results showed that welding current had a significant effect on the porosity level ($P\text{-value} = 0.023$), while electrode type had no significant effect ($P\text{-value} = 0.555$). The optimal parameter combination was obtained at 60A current with an E7016 electrode, producing a minimum defect length of 6.4 mm. Excessively high current (80A) tended to increase porosity due to excessive melting, while too low current (40A) resulted in suboptimal penetration.

Keywords: SMAW welding, SG-295, welding current, porosity, Liquid Penetrant Test, Taguchi, ANOVA.