Jordan University of Science and Technology

Impact of gas metal arc welding parameters on bead geometry and material distortion of AISI 316L

Authors: Samir Khrais, Hadeel Al Hmoud, Ahmad Abdel Al, Tariq Darabseh

Abstract: This study investigates the impact of gas metal arc welding (GMAW) parameters on the bead geometry and material distortion of AISI 316L. Three parameters?arc current in ampere (A), filler feed rate (m/min), and gas composition?were modified at varying levels in order to examine their effects. This study sheds new light on MAG welding lines? physical properties and behavior and highlights the influence of quaternary shielding gas compositions. Taguchi analysis, which includes signal-to-noise (S/N) ratio and analysis of variance (ANOVA), was utilized to analyze and optimize the welding parameters. This study found that arc current significantly impacts bead geometry, while the shielding gas composition has the most significant effect on angular distortion and transverse shrinkage. The optimal welding parameters for achieving the best bead height and width are 160 A, 3.5 m/min, G1, with a bead height of 4.89 mm, and 120 A, 3 m/min, G2, with a bead width of 6.69 mm. Moreover, the optimal welding parameters for minimizing both angular distortion and transverse shrinkage are 120 A, 4 m/min, G2, resulting in an angular distortion value of 0.0042? and a transverse shrinkage value of 0.0254 mm. This research has practical implications for improving welding performance and can contribute to the advancement of MAG and MIG welding in manufacturing applications.