8

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Effect of Welding Parameters on Bead Dimension Using MIG Welding of EN 10025 Carbon Steel

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Abstract:
Welding is a process of joining two similar and non-similar metals or non-metals with the application of heat and pressure. Depth level of penetration is a key in fillet welded joints because the penetration gives the effects on the strength of the welded joint. The present work investigates the influence of the metal inert gas (MIG) welding process parameters such as welding current, welding voltage, and gas flow rate on bead geometry in EN 10025 low carbon steel material. The objectives are to determine the effect of welding current, welding voltage, and gas flow rate to the bead geometry, as well as to optimize the welding parameters for enhancing the weld penetration and to analyze the welding defects that can be considered and accepted using different welding parameter. The experimental work has been carried out using the MIG welding process. The work pieces were inspected and measured using non-destructive testing (NDT) method and a digital caliper to observe the effects of welding parameters on the weld bead condition. For optimization, the Taguchi method L9 orthogonal array and signal-to-noise ratio were used. Then, the data were analyzed using the main effect of means and analysis of variance (ANOVA). From the results, welding current, welding voltage, and gas flow rate were found to be main limitations which affect the bead geometry. The optimal welding setting for EN 10,025 carbon steel was at 180 A current, 26 V voltage and 16 ℓ/min gas flow rate.