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Appraisal of the Impact Strength on Mild Steel Cladding Weld Metal Geometry

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Abstract : The research focused on the appraisal of impact strength on mild steel cladding weld metal geometry. Over the years, poor welding has resulted in failures in engineering components, poor material quality, the collapse of welded materials, and failures in material strength. This is as a result of poor selection and combination of welding input process parameters. The application of the Tungsten Inert Gas (TIG) welding method with weld specimen of length 60; width 40, and thickness of 10 was used for the experiment. A butt joint method was prepared for the welding, and tungsten inert gas welding process was used to perform the twenty (20) experimental runs. A response surface methodology was used to model and to analyze the system. For an adequate polynomial approximation, the experimental design was used to collect the data. The key parameters considered in this work are welding current, gas flow rate, welding speed, and voltage. The range of the input process parameters was selected from the literature and the design. The steps followed to achieve the experimental design and results is the use of response surface method (RSM) implemented in central composite design (CCD) to generate the design matrix, to obtain quadratic model, and evaluate the interactions in the factors as well as optimizing the factors and the response. The result expresses that the best impact strength of the mild steel cladding weld metal geometry is 115.419 Joules. However, it was observed that the result of the input factors is; current 180.4 amp, voltage 23.99 volt, welding speed 142.7 mm.s and gas flow rate 10.8 lit/min as the optimum of the input process parameters. The optimal solution gives a guide for optimal impact strength of the weldment when welding with tungsten inert gas (TIG) under study.

Keywords : mild steel, impact strength, response surface, bead geometry, welding
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