**Mathematical Analysis of the Effect of Process Parameters on Angular Distortion of MIG Welded Stainless Steel 202 Plates by using the Technique of Response Surface Methodology**

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# **ABSTRACT**

Gas Metal Arc Welding (GMAW) is a widely used semi-automated joining process used in metal fabrication and for producing good quality welds with high deposition rate. The process is versatile because of its ability to weld in all positions and all the materials with corresponding filler material. The process further can be fully automated by using programmable robots thus making it suitable for mass production. Like other fusion welding processes, because of rapid heating and cooling cycles, various types of distortions are encountered, which are detrimental to the performance of the weld. Out of various kinds of distortions, the angular one is found to be prominent. This distortion once occurred cannot be corrected economically and creates design related issues because of the mismatch in the assembly. Therefore, the endeavour should be to keep this distortion minimum by selecting the weld parameters optimally. The present investigative work aims to study the effect of different individually controllable input parameters like wire feed rate, welding speed, voltage, nozzle to plate distance and torch angle on the resulting angular distortion of Stainless Steel 202 plates. SS 202 is manganese alloyed austenitic stainless steel, which is designed as a cost-effective alternative to 302 grades with similar corrosion and mechanical properties at lower temperatures and less harsh corrosive environment. By the use of statistical approach, an attempt has been made to develop a mathematical model that relates these input parameters to the response parameter which is angular distortion. This model would prove to be helpful in predicting the resulting angular distortion at different combinations of input parameters. Statistical technique of central composite face centred design has been used to develop the model and ANOVA is used to check the adequacy of the same. Response Surface Methodology (RSM) has been used to analyse the results graphically.

*Keywords: Stainless steel 202, GMAW, angular distortion, mathematical modelling, ANOVA, RSM.*