**Mathematical analysis of angular distortion on GTA welded hot rolled E250 grade low carbon steel plates**

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**ABSTRACT**

GTAW is commonly used fusion welding process which can successfully be used to weld almost all the metals. Though the process is basically an autogenous one for welding primarily thin sheets but with the application of external filler wire, it can be used for production applications. It can be automated and be used for mass production manufacturing systems. Presently the process is extensively used in food processing, aviation, automotive and chemical industry. Like other fusion welding processes, in this process as well the weldment is subjected to thermal cycles involving rapid heating and cooling. This results in the generation of non-uniform thermal stresses in the material which if free to deform will experience distortion. The distortions once produced will destroy the aesthetics of the weld and the fitment of the weldment to the parent structure thereby creating design related issues. These distortions cannot be economically corrected once produced. Hence becomes pertinent to optimize the weld parameters in such a manner to minimize the resulting distortion. In the present investigative work, angular distortion is analysed during the GTA welding of carbon steel grade IS 2062 E250 C. This steel is generally used for manufacturing automobile frames, pipes and a variety of industrial products. The input weld parameters like welding current, welding speed and torch angle were selected. Full factorial technique was adopted for the carrying out the weld runs and analysis of results. A mathematical model was developed to predict the angular distortion.

*Keywords: GTAW, angular distortion, carbon steel, input welding parameters, mathematical model.*