CHAPTER 58

TECHNOLOGY
MANUFACTURING PROCESSES
&
AUTOMATION ENGINEERING

Doctoral Thesis

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Some Studies on The MIG Welding of Stainless Steel 409M.
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Abstract
(Not Verified)

Literature survey has revealed that the recently developred grade of stainless steel 409M has not been much researches upon. this has inspired the present research work. The strength of a welded joint depeends upon bead geometry parameters like depth of penetration, weld width, height of reinforcement, weld dilution, weld penetration shape factor and weld reinforcement form factor. these parameters inturn depend upon input parameters like weld current, voltage, welding speed, nozzle to plate distance etc. A mathematical model was developed to relate the response parameters with the input parameters and the results were validated. The knowledge of temperature distribution during and after welding is essential as it decides the formation of different microstructures which further affect the performance of the weld joint. A temperature sensing and recording system was used to record the temperature at various distances from the weld line and real time graphs were plotted. From these graphs, weld isotherms were plotted which were helpful in predicting the important weld bead dimensions. Angular distortion is almost inevitable in welding processes due to non uniform rates of cooling. This distortion has negative effects on the geometry of the weld and should be minimum. A mathematical model was developed to study the effects of input parameters like welding current, welding speed, voltage and groove angle etc on angular distortion. Dring welding due to non uniform heating and cooling cycles, residual stresses are induced in the welds which have a detrimental effcet on the strength and the service life of the weld. residual stresses were measured and their distribution was investigated in the present research work. Finally, metallurgical investigations were carried out to ascertain the type of microstructures formd in different zones of weld. To corroborate the resuts of optical microscopy, microstructural study was followed by a detailede microhardness survey.

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