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Weld quality in gas metal arc welding using various process parameters: A Review

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Abstract: Welding of various grades of stainless steel is still a potential area of research. In the present work investigation is carried out through welding of butt joints of austenitic to ferritic stainless steels using gas metal arc welding. Parametric studies have been done by planning the experiments making the butt joints as per plan, conducting visual of the welded specimens, tensile testing, hardness measurements at different zones and microstructural studies. The input parameters taken into consideration are current, gas flow rate and nozzle to plate distance.
Keywords: Gas metal arc welding, Stainless steel, Butt joints, Tensile, Hardness

I. Introduction

Gas metal arc welding (GMAW) is an arc welding process in which the source of heat is an arc formed between consumable metal electrode and the work piece with an externally supplied gaseous shield of gas either inert such as argon or helium [1]. These are greatly influenced by various variables such as welding geometry, groove angle, shielding type and different input parameters: current, voltage, electrode, gas flow rate, welding speed, nozzle to plate distance [2-3] etc. The effect of various input parameters determines the extent of joint strength that should meet the weld. Therefore, preparation of a good weld quality seems to be a challenging job. Dissimilar metal combination between Ferritic stainless steels and Austenitic stainless steels is in demand in certain applications because Austenitic stainless steel has good creep strength and oxidation resistance which are required in the higher temperature regions, while Ferritic stainless steel is preferred to avoid the problem of nickel leaching by molten magnesium. stainless steels are widely used in many industrial applications due to its excellent corrosion resistance, fabric ability, and they possess good mechanical properties at elevated temperatures [4-5] and their availability in the market with cheaper cost has made them popular. Joining of dissimilar materials may be reduce the weight of product and minimize the cost of production as well as without compromising the safety and structural requirements. Dissimilar weld must possess sufficient tensile strength and ductility, so that the joint will not fail within the weld. Dissimilar metal joints are used in various engineering applications such as nuclear power plants, coal fired boilers, automobile manufacturing industry etc [6-7].

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II. Literature Review

Various process parameters of GMAW interact influence directly or indirectly various aspects of weld quality. Several attempts had been made by different researchers to find out the parametric influence on the desired welding characteristics. A literature review is made on it in the context of finding scope and objective of the present work. A literature review is made and given below with emphasis on GMA welding of stainless steels, especially austenitic stainless steel, Ferritic stainless steel and welding of dissimilar metals, particularly dissimilar stainless steels. However, to arrive at the scope of the present work on welding of dissimilar materials between Austenitic to Ferritic stainless steel. **B. Vijaya Sankar et al. [6]** studied the effects of the welding parameters such Weld voltage, Weld Current and Gas flow rate on the weld joints AISI 310. **B. Das et al. [7]** welded EN-3A mild steel specimens by metal inert gas welding and showed the effect of various welding process parameters on its weldability. **K. Sittichai et al. [8]** investigated the effects of shielding gas mixture, welding current and welding speed on the ultimate tensile strength and percentage elongation of GMA welded austenitic stainless steel (AISI 304) of 3 mm thickness. **J. P. Mathew et al. [9]** studied corrosion behaviour of FSS (AISI 430) weldment welded by TIG and MIG welding processes using austenitic filler metal/electrode. **Y. Ruan et al. [10]** investigated on mechanical properties and microstructures of 6082-T6 joint welded by twin wire metal inert gas arc welding with the SiO_2 flux. **C. Ugur et al. [11]** made an investigation on microstructural characteristics of dissimilar AISI 430 Ferritic and AISI 304 Austenitic stainless steel materials. **S. Srivastava et al. [12]** to study the effect of various process parameters on IS:2062 mild steel plate using gas metal arc welding process to determine the mechanical properties of the weld such as tensile strength , hardness etc.

III. Proposed Work

In dissimilar metal welding, base metal contributes 15% dilution from each metal while the filler metal contributes 70% to the total weld nugget composition. When welding dissimilar metals, good solid solubility is essential for sound weld properties. The trends of welding similar/ dissimilar metals present considerable challenges, still now. Welding of Ferritic and Austenitic stainless steel in general and GMAW welding of such steels. The areas where more extensive which contribute to the precise control of the welding process for better and acceptable quality of weldment. So, the work is planned to investigate dissimilar welding quality of weld under varied input parameters by using gas metal arc welding.

IV Conclusion

This paper focuses on study of GMAW of dissimilar welding between Austenitic to Ferritic stainless steel by MIG welding, under varied input parameters (Welding current, Gas flow rate, and Nozzle to plate distance. So, it is concluded that the effect of input parameters on output responses has been established; identifying weld quality and determining optimum parametric condition with reference of the work.

References:

[1].https://me-mechanicalengineering.com/gas-metal-arc-welding-gmaw/dated08.02.2014

[2].https://www.sciencedirect.com/topics/engineering/gas-metal-arc-welding/dated16.02.2014.

[3].M. Singla, D. Singh and D. Deepak, "Parametric optimization of gas metal arc welding processes by using factorial design approach", Journal of Mineral and Material Characterization and Engineering 9 (2010) pp.353-363.

[4]U.Esme, M. Bayramoglu,Y. Kazancoglu and S. Ozgun, "Optimization of weld bead geometry in TIG Welding process using grey relation analysis and Taguchi method", Material and Technology. 43 (2009) pp. 143–149.

[5].V.V. Satyanarayana, G. M. Reddy and T. Mohandas, "Dissimilar metal friction welding of austenitic–ferritic stainless steels", Journal of Material Processing and Technology. 160 (2005) pp. 128–137

[6].B. Vijaya Sankar, I. Daniel Lawrence, S. Jayabal, "Experimental Study and Analysis of

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Weld Parameters by GRA on MIG Welding" ,Materials Today: Proceedings, Volume 5, Issue 6, Part 2, 2018, pp. 14309-14316
[7].B. Das, B. Debbarma, R. N. Rai, S. C. Saha"Influence of process parameters on depth of penetration of welded joint in mig welding process," International journal of research in engineering and technology 02 issue: 10 (oct-2013) pp. 220-224, ISSN: 2321-7308
[8]. K. Sittichai, N. Santirat, and P. Sompong, "A study of gas metal arc welding affecting mechanical propertie of austenitic stainless steel AISI 304", World Academy of Science, Engineering and Technology Vol.6 No.1, (2012), pp. 100-103.
[9]. J. P. Mathew , Dr. Binod Kumar , Dr. A. K. Pathak , Razaullah Khan "Study of Corrosion Behavior of TIG and MIG Welded Joints of Ferritic Stainless Steel (FSS) (Aisi-430) in Different Environments"International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 3, March 2017.
[10]. Y. Ruan, Xiao Ming Qiu, Wen Biao Gong, D.- Q. Sun, Y.P. Li"Mechanical properties and microstructures of 6082-T6 joint welded by twin wire metal inert gas arc welding with the SiO2 flux" March 2012, Materials and Design , 35:pp. 20–24.
[11]C. Ugur, D. Halil and T. Mustafa, "Microstructural characteristic of dissimilar welded components (AISI ferritic-AISI 304 austenetic stainless steels) by CO_2 laser beam welding". GU J. Sci, 25 (2012)pp. 35-51
[12]. S. Srivastava, R.K. Garg "Process parameter optimization of gas metal arc welding on IS:2062 mild steel using response surface methodology". Journal of manufacturing Processes 25(2017)296-305.

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