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An Experimental Study to Show the Effect of Peak Current on Mechanical Properties of welded joints

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Abstract- Manufacturing industry is in boom and a vast Varity of processes are used in manufacturing, one and the most widely used process is welding. The objective of this research is to study the Effect of Peak current on the mechanical properties of welded joints as current plays an important role in welding processes.

Keywords: Welded joints, Mechanical properties, Peak Current.

1. INTRODUCTION

As a part of the fabrication process, welding is one of the most important manufacturing technologies used in the aluminum alloy industry. The most widely used joining methods for aluminum alloys are Tungsten Inert Gas (TIG), Metal Inert Gas (MIG), Variable Polarity Plasma Arc (VPPA) and Electron Beam (EB) welding. These processes allow us to obtain optimum mechanical properties with minimum distortion due to the high heat intensities provided by these sources. However, the high conductivity, high reflectivity, high reactivity and high coefficient of thermal expansion make welding of aluminum alloys difficult. The high heat input associated with high thermal conductivity and high coefficient of expansion could lead to severe distortion of parts during welding. Careful control of welding parameters is a must to get a sound weld in aluminum alloys.

Compared to the above mentioned fusion welding processes that are routinely used for joining structural aluminium alloys, Friction Stir Welding process is an emerging solid state joining process in which the material that is being welded does not melt and recast. Therefore, when alloys are friction stir welded, phase transformations that occur during the cooling of the weld are of a solid state type. Due to the absence of parent metal melting, the new FS welding process is observed to offer several advantages over fusion welding.

Aluminum alloys of 5xxx series and their welded joints show good resistance to corrosion in sea water. 5083-H321 is one of such an excellent marine environment corrosion resistant aluminum alloy, most commonly used in North America. It is a marine grade alloy used for its excellent corrosion resistant properties.

2. PROBLEM STATEMENT

Aluminum alloys of 5xxx series and their welded joints show good resistance to corrosion in sea water. 5083-H321 is one of such an excellent marine environment corrosion resistant aluminum alloy, most commonly used in North America. It ismarine grade alloy used for its excellent corrosion resistant properties. In the ship manufacturing industries, TIG welding is used to join the different aluminum parts of the ship structure, these weldments are generally remaining dip in saline water of sea or remain in salt foggy atmosphere, which gets eroded early when comes in contact with salt-water solution due to the HAZ area of TIG weldments which is generally large and causes initiation of localized corrosion easily. The problem can be solved if the welding process is changed to friction stir welding that produces comparatively very less HAZ area, and also if we compare the cost of welding process, it was observed that the cost of friction stir welding is 15-20 times less than the cost of TIG welding. It has been decided to explore the possibilities of success of using FSW in marine corrosion behavior of welded joint of AA 5083-H321 aluminum alloy widely used in ship structure building.

3. METHODOLOGY

1. Substrate material, i.e., AA5083-H321, will be procured in sheet form.
2. Specimen plates will be cut from sheet for friction stir welding and TIG welding.
3. Specimen plates will be mounted on FSW set up and plates will be welded.
4. Specimen plates will be mounted on TIG set up and plates will be welded.
5. The joints will be tested for the evaluation of the mechanical properties such as

tensile strength, impact strength, and hardness.

4. RESULT AND DISCUSSION

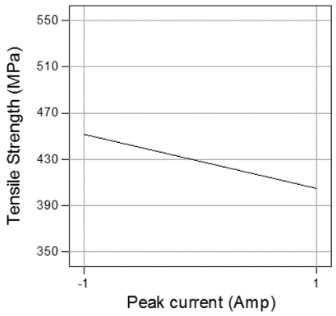

Fig.4.1Effect of Peak current on Tensile Strength

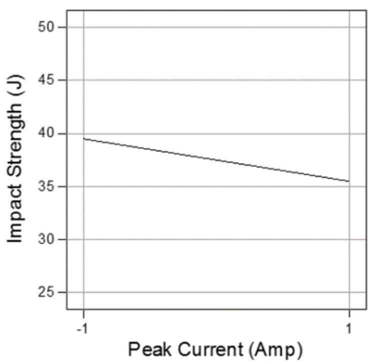

Fig. 4.2 Effect of Peak current on Impact Strength

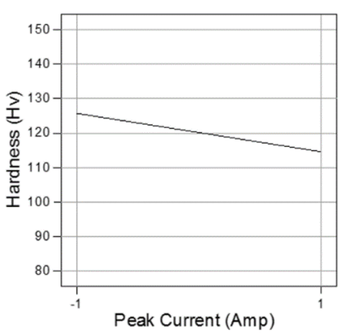

Fig 4.3 Effect of peak Current on Hardness

The effect of variation of tensile strength with weld bead at center is as given in Fig.4.1 It can be seen from the graph that there is decrease in ultimate tensile strength with increasing peak current. It is understood that UTS value is inversely proportional to peak current. Fig 4.2 It can be clearly seen that the impact strength also decreases with increasing peak current.Fig.4.3 shows that maximum hardness value is obtained at the peak current of 55 Amp (low level) and at the base current of 25Amp (low level). It means that hardness value is inversely proportional to peak current.

REFERENCES

[1]. Anjaneya Prasad B. and Prasanna P., “Experimental Comparison of the MIG and Friction Stir Welding Processes for AA 6061(Al Mg Si Cu) Aluminium Alloy". International Journal of Mining, Metallurgy & Mechanical Engineering, vol 1, pp 137-140, 2013.

[2]. Malarvizhib S., Balasubramanian V., 2011. Fatigue crack growth resistance of gas tungsten arc, electron beam and friction stir welded joints of AA2219 aluminium alloy. Materials and Design 32: 1205–1214.

[3]. Montgomery D. C., (1984), “Design and Analysis of Experiments”, Second edition. John Wiley and Sons. New York.

[4]. S. Jannet, P.K. Mathews, R. Raja, "Comparative investigation of Friction stir welding & Fusion welding of 6061T-6 & 5083-0 Aluminium Alloys based on mechanical properties & microstructure". Journal of Acheivements in Materials & Manufacturing Engg, vol 61, pp 181-186, Dec 2013.

[5]. Squillace A., Fenzo A. D, Giorleo G., Bellucci F., 2004. A comparison between FSW and TIG welding techniques: modifications of microstructure and pitting corrosion resistance in AA 2024-T3 butt joints. Journal of Materials Processing Technology 152 (1): 97-105.

[6]. Thomas W. M, Nicholas E. D., (1997) “Friction stir welding for the transportation industries’, Materials & Design 18(4-6), pp. 269-273.

[7]. Wang, X., Wang, K., Shen, Y., Hu, K., (2008) “Comparison of fatigue property between friction stir and TIG welds,” Journal of University of Science and Technology Beijing, Mineral, Metallurgy, Material, 15, pp. 280-284

[8]. Zhao J., Jiang F., Jian H., Wen K., Jiang L., Chen X., 2010. Comparative investigation of tungsten inert gas and friction stir welding characteristics of Al–Mg–Sc alloy plates. Materials & Design 31(1): 306-311.