International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 11 | Nov -2017 www.irjet.net p-ISSN: 2395-0072

AN INVESTIGATION ON EFFECT OF WELDING SPEED ON STRENGTH OF WELDED JOINT USING TIG WELDING PROCESS

Prof. Janunkar Rajeshwar G [1], Prof. Allurkar Siddharaj[2], Prof. Kanase Ravindra M[3]

[1] *Assistant Prof, Automobile Engineering Department, Dhole Patil College Engineering, Wagholi , Pune, India*
[2] *Head of Dept, Automobile Engineering Department Dhole Patil College Engineering, Wagholi ,Pune, India*
[3] *Lecturer, P. Dr. V.V. Patil College of Engineering And Technology, Pravaranagar, Maharastra, india*

---***---

***Abstract* -** *Tungsten Inert Gas Welding performance is generally calculated on the basis of Tensile Strength, Depth of Penetration, Aspect Ratio and Hardness. The important TIG machining parameters results to the performance measures of the process are voltage, current, welding speed, shielding gas flow rate, voltage, current, electrode gap, root gap and filler materials .The measurement of TIG performance on the basis of Tensile Strength, Bead Geometry, Depth of Penetration and Hardness for various materials. A number of approaches are used in the literature to clear the problems related with optimization of the parameters. It is observed that a review of the variety of approaches developed would help. Recently in aerospace, shipping and in process industry aluminum and its alloys are generally used because of their valuable properties such as light weight and better weld ability. The current study aim to compare mechanical properties of AA5083 and AA6063 for different bevel heights and groove angle keeping root opening constant. The specimens are prepared by using V groove butt weld joints. For this Project work gas tungsten arc welding process is selected because TIG welding is the process of joining two materials in the presence of inert gas with high quality*.

Keywords- TIG,Bevel Angle,Groove Angle.

1. INTRODUCTION

There are wide range of welding methods available for welding materials such as submerged arc welding, electro slag welding, electron beam welding, Gas Tungsten arc welding methods and Gas metal arc welding .The method of the weld depends on materials to be welded, the thickness of the base materials and type of voltage and current. TIG (Tungsten inert gas) welding is the most popular gas arc welding process used in several industries. Other arc welding processes have poor quality when they are compared to TIG (Tungsten inert gas) welding processes. TIG welding also needs more accuracy in spatter reduction and welding quality of the bead. Shielding gas in TIG welding is suitable for protection of atmospheric conditions.

In this TIG (Tungsten inert gas) welding we discuss the effect of the power source, gas flow rate, type of current, filer wire, electrodes, TIG Machine settings and shield gases which are most needful in determining arc penetration, arc stability and defect free welds. Welding of dissimilar aluminum alloys and magnesium alloys is an important issue because of their wide applications in industries.

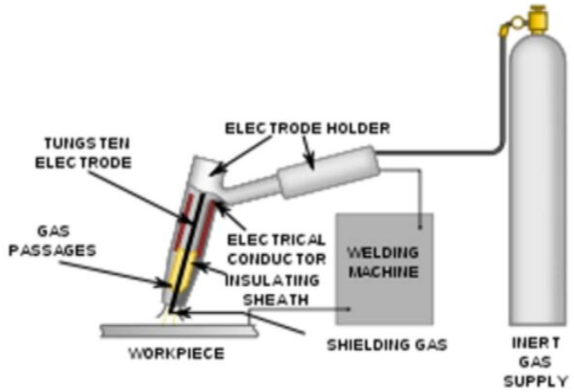


Fig1: Tungsten Inert Gas Welding Process

2. LITERATURE REVIEW

Hyde.T.H. et. al. observed some typical results obtained from continual damage mechanics analyses for calculating weld repair performance. Results presented cover a range of analysis, taking account of the effects of repair dimensions, geometry change during creep system biding, reheating effects in the weld metal of damage level and initial partial repair welds etc.

Balasubramanian.R.R.et.al. Analyzed and compared the mechanical properties of non-heat treatable Aluminum alloy AA5083 and heat treatable Aluminum alloy AA7020 using TIG welding. AA5556 filler material was used to weld AA7020 alloy and 5183A filler material for AA5083 alloy. Effect of pulsing mode over conventional mode process was also investing iGATE for AA5083 alloy. Low heat input process interrupt because AA5083 and AA7020 have low melting point material. The alternating current (A.C) power source has been selected because of better cleaning action and more heat concentration on the materials can be avoided. Mechanical testing like impact test, tensile test, hardness test and bend have been critically analyzed and the properties were summarized and correlated with microstructure.

Juang.S.C. et.al stated that the selection of process parameters for obtaining an optimum geometry of the weld pool has several quality example, the front height, back height, front width and back width of the weld pool .To consider these quality characteristics. Taguchi's method is adopted to analyze the effect of each then to determine the process parameters with the optimal weld geometry. Experimental results are provided to calculate the proposed approach.

Hyde.T.H. et.al. studied damage analysis and finite element creep were performed for a series of new, partially repaired, service aged and fully repaired circumferential welds in Cr Mo main heat pipes under internal pressure and a uniform axial stress, using simplified symmetric models. Thickness of pipe was 64.5mm, angle 18 and welding width is 48 mm. Authors stated that because of complicated nature of the problem analytical solutions cannot be obtained for stress and strain within welds.

Oh .Y. J. et. al. studied for bottom nozzle failure mechanics of R.P. (water reactor pressure vessel) under conditions concluding that crack and severe accident, like separations were revealed at the nozzle weld material to R.P.V. (water reactor pressure vessel) interfaces indicating the need of normal stress component rather than the shear stress in the creep stress.

Ipek .N. E.et.al. stated that the gas metal arc welding (GMAW) process which is commonly used in manufacturing of variety of nonferrous and ferrous metals because it mostly increases the quality of welding. The aim of this study is to develop an approach that gives the determination of critical GMAW variables and optimization of process variables by using integrated and goal programming (GP) methods conjunctively. This paper presents a methodology for determining the variables of a GMA process with multiple objectives utilizing full- factorial design of regression analysis, experiments and goal programming.

III. MATERIALS AND METHOD

3.1 Materials

The material used to carry out experimental work to investigate V groove butt weld joint for strength analysis using AA6063 and AA5083. The dimensions of weld materials are 4×50×200mm.

Table 1. Chemical composition of Filler material AA6063

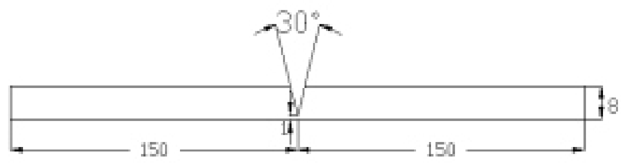
Elements	Al	Si	Cu	Mg	Cr
Weight %	97.9	0.6	0.28	1.0	0.2

Table 2. Chemical composition of work material AA5083

Elements	Al	Si	Cu	Mg	Cr
Weight %	95.45	0.4	0.1	4.0	0.05

3.2 Welding geometry

The both plates are welded by the single V-groove butt weld with different groove angles and bevel heights. The geometry of butt weld joint is as follows.



3.3 Welding process

- TIG Welding

TIG welding is an electric arc welding process in which the energy is produced by an electric arc burning between the non consumable tungsten electrode and the work piece. The inert gases are used to give the shielding over the electrodes and weld pools. Inert gases are in active in nature so neglected the contaminate. Different types of tungsten electrodes are used within the process.

3.4 Experimental

Tensile Testing Results

The tensile test carried out on welded specimen is Tabulated Bellow

Table 3.Tensile strength& Percentage Elongation

Specimen	Ultimate Tensile strength (MPa)	% Elongation
Welded Specimen	185 to 234	08
Unwelded Specimen	250	20

The specimen were welded effectively at welding speed of 0.3,0.6,0.9,1.2 cm/sec. The results of the tensile test are mentioned bellow. The metal will be welded with these four different welding speeds by using TIG welding process.

Table 4. Tensile strength at weld speed 0.3 cm/sec

Work piece No.	Welding Speed (cm/sec)	Bevel Angle (degrees)	Bevel height (mm)	Tensile Strength (M.PA)
1	0.3	30	1	199
2	0.3	40	1.5	230
3	0.3	50	2	215
Base Metal				250

Table 5. Tensile strength at weld speed 0.6 cm/sec

Work piece No.	Welding Speed (cm/sec)	Bevel Angle (degrees)	Bevel height (mm)	Tensile Strength(M.PA)
1	0.6	30	1	225
2	0.6	40	1.5	234
3	0.6	50	2	230
Base Metal				250

Table 6. Tensile strength at weld speed 0.9cm/sec

Work piece No.	Welding Speed (cm/sec)	Bevel Angle (degrees)	Bevel height (mm)	Tensile Strength (M.PA)
1	0.9	30	1	195
2	0.9	40	1.5	220
3	0.9	50	2	225
Base Metal				250

Table 7. Tensile strength at weld speed 1.2 cm/sec

Work piece No.	Welding Speed (cm/sec)	Bevel Angle (degrees)	Bevel height (mm)	Tensile Strength (M.PA)
1	1.2	30	1	180
2	1.2	40	1.5	185
3	1.2	50	2	182
Base Metal				250

From the above table, it will be observed that there are no drafting changes in the tensile strength of the welded specimen at welding speed 0.3 cm/sec. However there is a sudden decrease in the strength of welded speed at 1.2 cm/sec.

IV.CONCLUSION

Following are the possible outcomes which are obtained at the end of test and experimentation.

1) The depth of weld bead will decrease with increase in bevel height at different groove angles of V butt joint.

2) Maximum tensile strength of 234 MPa has been observed at will speed of 0.6 cm/sec. These indicate the strength of welded specimen is lower than base metal.

3) Tensile strength is always higher with lower welding speed. This suggests that lower range of welding speed will be more suitable for drive highest tensile strength.

4) It will be observed that bevel angle is suitable for maximum strength ranging from 30 degree to 45 degree.

ACKNOWLEDGEMENT

First and foremost, I would like to express my deep sense of gratitude and indebtedness to my supervisor Siddharaj Allurkar H.O.D, Automobile Engineering Department for his invaluable encouragement and providing me extraordinary experiences throughout the work and every phase of work inspired for innumerable ways and the vital contribution as and when required during this project. His involvement with originality has triggered and nourished my intellectual maturity that has helped me for a long time to come. I am proud to record that I had the opportunity to work with an exceptionally experienced Professor like him. I am highly grateful to Principal, Dhole Patil College Engineering, Wagholi , Pune, India for their kind support and permission to use the facilities available in the Institute.

REFERENCES

[1] Ugur Esme, Melih Bayramoglu, Yugut Kazancoglu, Sueda Ozgun Optimization of weld bead geometry in Tig welding process using grey relation analysis and taguchi method. Original scientific article/Izvirni znanstveni clanek -2009, P 143 149.

[2] S.C. Juang, Y.S. Tarng Process parameter selection for optimizing the weld pool geometry in the tungsten inert gas welding of stainless steel. Journal of Materials Processing Technology 122 (2002), P 33–37.

[3] S. Krishnanunni, Dr. Josephkunju Paul C, V Narayanan Unni Effect of Welding Conditions on Hardness of Commercially Pure Titanium Akgec International Journal of Technology, Vol. 3, No. 2, P 19-24.

[4] Raghuvir Singh, Dr. N.M Suri, Prof. Jagjit Randhawa Optimization of Process Parameters for TIG welding of 304L Stainless Steel using Response Surface Methodology. International Journal of Mechanical Science and Civil Engineering Volume 2 Issue 2 (June 2013 Issue), P 36-40.

[5] Wenchao Dong, Shanping Lu, Dianzhong Li, Yiyi Li GTAW liquid pool convections and the weld shape variations under helium gas shielding. International Journal of Heat and Mass Transfer 54 (2011), P 1420–1431.

[6] Dongjie Li, Shanping Lu, Wenchao Dong, Dianzhong Li, Yiyi Li Study of the law between the weld pool shape variations with the welding parameters under two TIG processes. Journal of Materials Processing Technology 212 (2012), P 128– 136.

[7] Parikshit Dutta, Dilip Kumar Pratihar Modeling of TIG welding process using conventional regression analysis and neural network-based approaches. Journal of Materials Processing Technology 184 (2007), P 56–68.

[8] Shanping Lu, Hidetoshi Fujii, Kiyoshi Nogia Arc ignitability, bead protection and weld shape variations for He–Ar–O2 shielded GTA welding on SUS304 stainless steel. Journal of materials processing technology 209 (2009), P 1231–1239.