International Journal of Engineering, Science and Mathematics
Vol. 7 Issue4, April 2018(special issue NCIME)
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

ANALYSIS OF DOUBLE TIG WELDING ON SS 316L & ITS COMPARISON WITH SINGLE TIG WELDING

[1]V. Kannan, [2]S. Vigneshwaran, [2]R. Deepak, [2]S. Hari krishnan, [2]R. Harshit
[1]Assistant Professor, [2]UG Scholar, Department of Mechanical Engineering, TRP Engineering College, Trichy

ABSTRACT

The welding of metals is an important manufacturing technology to the industry such as boiler manufacturing, oil piping, building construction etc. Double Tig welding is emerging welding process and its application is found in many manufacturing field. The literature survey was made and it was found that the stainless steel 316L of similar metal welding have not been carried out for evolution and analyzing. The work was carried to join the two similar metals stainless steel 316L. The welding of similar metal process is done by double Tig welding with the use of 316L filler metal as the agent. The weld specimen is tested under two types of testing such as non destructive test and destructive test. The metals were welded by double Tig welding process and then single Tig welding process. The non destructive test by radiography test was used followed by destructive test method such as bend test and tensile test were carried out in the welded specimen. The work is to generate experimental analysis with double Tig welding and single Tig welding process and with obtained numerical value analysis of double Tig welding on stainless steel 316L and its comparison with single Tig welding is executed.

INTRODUCTION

The process of joining similar metals by the application of heat is called 'welding'. Welding can be obtained with or without application of pressure and with or without addition of filler metal, which is known as "electrode". During welding, the edges of these metal pieces are either melted or brought to the plastic condition. The welding process is used for making joints which is obtained by homogenous mixture of two materials. The heat may be developed in several ways for welding operation. A good welded joint is as strong as the parent metal.

LITERATURE REVIEW

Y. M. ZHANG AND S. B. ZHANG, cracking is a major concern in welding aluminum alloys. Although weld solidification cracks can be eliminated through the addition of filler metal, the additives modify the alloy or base metal constituents and may not always be desirable. High-energy beam processes, such as electron beam welding, that result in minimal heat input reduce crack sensitivity, but their high cost limits their applications. In this study, the conventional gas tungsten arc welding process is modified by disconnecting the work piece from the power supply and placing a second torch on the opposite side of the work piece. Such a modification changes the direction of the current flow, improves the weld penetration and reduces the heat input. Using this modified process, 6061-T651 alloy was welded without filler metals. Analysis suggested the reduced heat input, the changed direction of the current flow and the symmetric heating were responsible for the observed reduction of the cracking sensitivity. HIDETOSHI FUJII, A new type of tungsten inert gas (TIG) welding has been developed, in which an ultra-deep penetration is obtained. In order to control the Marangoni convection induced by the surface tension gradient on the molten pool, He gas containing a small amount of oxidizing gas was used. The effect of the concentration of O2 and CO2 in the shielding gas on the weld shape was studied for the bead-on-plate TIG welding of SUS304 stainless under He–O2 and He–CO2 mixed shielding gases. Because oxygen is a surface active element for stainless steel, the addition of oxygen to the molten pool can control the Marangoni convection from the outward to inward direction on the liquid pool surface. When the oxygen content in the liquid pool is over a critical value, around 70 ppm, the weld shape suddenly changes from a wide shallow shape to a deep narrow shape due to the change in the direction of the Marangoni convection. Also, for He-based shielding gas, a high welding current will strengthen both the inward Marangoni convection on the pool surface and the inward electromagnetic convection in the liquid pool. Accordingly, at a welding speed of 0.75 mm/s, the welding current of 160A and the electrode gap of 1mm under the He–0.4%O2 shielding, the depth/width ratio reaches 1.8, which is much larger for Ar–O2 shielding gas (0.7). The effects of the welding parameters, such as welding speed and welding current were also systematically investigated. In addition, a double shielding gas method has been developed to prevent any consumption of the tungsten electrode. M. JIANG, double-sided arcing uses two torches on the opposite sides of the work piece to force the welding current to flow through the thickness. If a keyhole is established through the thickness, part of the welding current will flow through the Keyhole and maintain the electric arc inside the keyhole. It was found the through thickness direction of the welding current and the establishment of a keyhole both helped enhance the concentration of the arc and the density of the arc energy. In addition, the presence of the arc in the keyhole provided a mechanism to directly heat the work piece through the thickness, as well as a mechanism to compensate the energy consumed during heating. In this study, a double-sided arcing technique was developed into a welding process for deep, narrow joint penetration. Experiments confirmed the characteristics of this process.

RESULTS AND DISCUSSION

CONTENTS	SINGLE TIG	DOUBLE TIG
Materials	Stainless Steel 316L	Stainless Steel 316L
Dimensions	Length =300 mm Breadth=300 mm Thickness= 8mm	Length =300 mm Breadth=300 mm Thickness= 6mm
Welding and Filler Material	Single TIG welding , 316L filler metal	Double TIG welding, 316L filler metal
Test Methods	NDT AND DT	NDT AND DT
Non Destructive Test	Radiography Test	Radiography Test
Destructive Test	Tensile test , Bend Test	Tensile test , Bend Test
Bend Test	Accepted	Accepted
Tensile Test	Accepted	Accepted
Radiography Test Result	Accepted	Accepted

TEST RESULTS COMPARISON
DESTRUCTIVE TEST
TENSILE TEST

Identification	SINGLE TIG WELDING		DOUBLE TIG WELDING	
	TS		TS	
	N/mm2	Kgf/mm2	N/mm2	Kgf/mm2
316L/T1	644.94	65.78	572.86	58.43
316L/T2	634.18	64.67	604.37	61.65

BEND TEST

Identification	Type of bend	Remark	
		SINGLE TIG WELDING	DOUBLE TIG WELDING
316L/FB1	Face Bend	Satisfactory	Satisfactory
316L/FB2	Face Bend	Satisfactory	Satisfactory
316L/RB1	Root Bend	Satisfactory	Satisfactory
316L/RB2	Root Bend	Satisfactory	Satisfactory

NON DESTRUCTIVE TEST
RADIO GRAPHY TEST: X-RAY TEST

Identification	Remark	
	SINGLE TIG WELDING	DOUBLE TIG WELDING
316L	Acceptable	Acceptable
316L	Acceptable	Acceptable

International Journal of Engineering, Science and Mathematics
Vol. 7 Issue4, April 2018(special issue NCIME)
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

STAGE 1

STAGE 2

STAGE 3

STAGE 4

Figure PHOTOGRAPHY

CONCLUSION

From the above discussion it can be concluded that the tensile strength of SS316L by using single Tig welding is found to be 644.94 N/mm^2 on the base metal where as in the weld bead the tensile strength has decreased to 634.18 N/mm^2. In double Tig welding on ss316l the tensile strength on base metal is found to be 572.86 N/mm^2 where as the tensile strength on the weld bead has increased to 604.37 N/mm^2.Thus the analysis of double Tig welding is made on SS316L and its comparison is made with single Tig welding.

REFERENCES

1. J. R. Davis (ed). 1994. ASM Specialty Handbook: Aluminum and Aluminum Alloys, ASM International, Materials Park, Ohio.
2. Dudas, J. H., and Collins, F. R. 1966. Preventing weld cracks in high- strength aluminum alloys. Welding Journal 45(6): 241-s to 249-s.
3. Kim, H. T., Nam, S. W., and Hwang, S. H. 1996. Study on the solidification cracking behavior of high strength aluminum alloy welds: effects of alloying elements and solidification behaviors. Journal of Materials Science, Vol. 31, pp. 2859–2864.
4. Nakata, K., et al. 1994. Improvement of weld solidification crack susceptibility of Al-Zn-Mg ternary alloy by low frequency pulsed GMA with Zr added Al-high Mg welding wire. Yosetsu Gakkai Ronbunshu/Quarterly Journal of the Japan Welding Society 12(1): 108–114
5. Katoh, M., and Kerr, H. W. 1986. Investigation of heat affected-zone cracking of GMA welds of Al-Mg-Si alloys using the restraint test. Proceeding of the International Conference on Trends in Welding Research, pp. 759–761, ASM International, Materials Park, Ohio.
6. Tosto, S., Nenci, F., and Hu, J. 1996. Microstructure and properties of electron beam welded and post-welded 2219 aluminum alloy. Materials Science and Technology, Vol. 12, pp. 323–328.
7. Matsuda, F., and Nakata, K. 1982. New self-restrained solidification crack susceptibility test for electron-beam welding of aluminum alloy-taper- shaped hot cracking test. Transactions of JWRI 11(1): 141–143.