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Study the Influence of Applied External Magnetic Field on the Quality of ARC Welding

S Karthik[1], S Naveen Kumar[2], N Sarathkumar[3], D Thirumalai[4], Vishalpandrangbhosle[5]
[1]Assistant Professor, [2,3,4,5]Department of Mechanical Engineering, Karpagam Institute of Technology, Coimbatore, India.

Abstract: *The point of this study is to demonstrate the trademark changes got by the avoidance of welding curve in the vicinity of outside attractive field. The attractive field has been connected from different introductions upon the weld globule. The welding process which has been considered under study is protected metal circular segment welding on Gentle steel plate. The target of this paper is to concentrate on impact of attractive field on the weld quality and geometry at the point when the field is connected longitudinal to the cathode travel i.e. the field lines are opposite to the cathode travel. However there is absence of data for ideal parameters, next to no work has been accounted for in this course. An attractive field remotely connected to the welding circular segment, redirects the curve by electromagnetic power in the plane typical to the field lines. The attractive field applies power on the electrons and particles inside of the circular segment, which causes the circular segment to be avoided far from the typical bend way. The welding bend can be redirected forward, in reverse, then again sideways as for cathode and welding heading relying on the course of an outer attractive field. In this paper different mechanical properties tests, for example, elasticity, hardness, sway test and so forth are directed to see the impact of outer attractive field on it. It is watched that weld pool entrance lessens while the weld dab width increments along these lines influencing the parameters of the procedure. The results and conclusions are examined according to the perceptions while the rigidity and hardness of guardian materials are seen also.*

Keywords: *magnetic field, arc welding, joining*

I. INTRODUCTION

Welding is a procedure in which materials of the same central sort or class are united and brought on to join (and get to be one) through the arrangement of essential synthetic bonds under the joined activity of warmth and weight . The definition found in IS0 standard is "Welding is an operation in which progression is acquired between parts for get together, by different means". Thus, the welding is the combination of two or more bits of metal together by utilizing the warmth delivered from an electric circular segment welding machine. Circular segment welding goes back to the late 1800's, the point at which a man was welding with a uncovered metal bar on iron, the sparkles from the welding got a heap of daily papers ablaze close him keeping in mind welding, he seen that his welds began looking a great deal better. The reason for this was the smoke took the oxygen out of its welding environment and diminished porosity. The bend is struck between the anode and the metal. It then warms the metal to a softening point. The cathode is then evacuated, breaking the circular segment between the anode and the metal. This permits the liquid metal to "stop" or harden. The bend is similar to a fire of serious warmth that is produced as the electrical current passes through an exceptionally safe air crevice. Amid welding, attractive field is set up in the plane of the parts being joined and circumferentially around the cathode and the plate as appeared in Fig 1. The field, F1, is set up around the cathode; the field F2, around the plate plates being joined and the field, F3, in the plates adjoining the bend and in a bearing like that of field F1. Since it is unrealistic to expel these fields from welding operation, it is important to utilize outer control as a intends to defeat these attractive impacts [1]. An attractive field remotely connected to the welding circular segment redirects the curve by electromagnetic power (Lorentz power) in the plane ordinary to the field lines. The

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attractive field applies power on the electrons what's more, particles inside of the circular segment, which causes the bend to be diverted far from the ordinary bend way. Deminskii, et al. [3], directed investigations utilizing a GMAW process on an aluminum-magnesium amalgam while a longitudinal attractive field was connected to the welding curve. The attractive fields connected were rotating and of the request of 40 gauss. They reported the curve swayed over the weld hub. Subjecting the welding curve to transverse attractive fields has useful impacts just when the circular segment is avoided forward with admiration to the heading of terminal travel [4] [5]. Applying an ideal attractive field to a welding curve on both nonmagnetic and attractive materials expands welding speed a few times at which sans undercut and no porosity welds can be made It is known the degree of bend avoidance is the circular segment current, bend length, thus on [4,6 ,7].

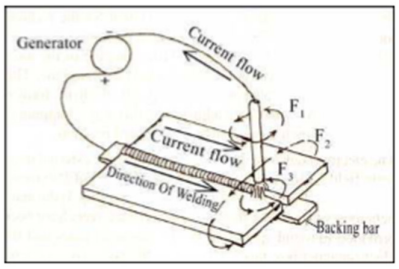
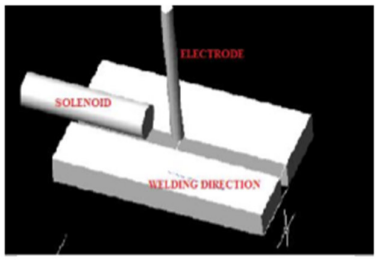


Fig 1.Shows Planes of Magnetic Field Set-up

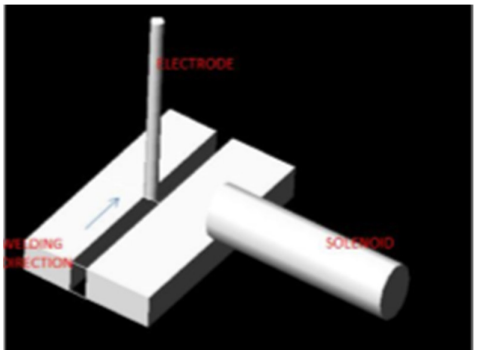
2. Application of Magnetic Field

2.1 Longitudinal Magnetic Field



An attractive power follows up on the bend, in this framework when the point between the heading of the electron stream and attractive lines of power are not zero. As the circular segment has a cone like shape and the current conveying electrons moreover moves along the surface of the curve, their movements can be determined in two parts, one along the pivot of the curve and other opposite to it. The segment along the curve does not add to the attractive development. The segment opposite to curve applies a power on the bend bringing about the curve to turn clockwise or anticlockwise contingent on the bearing of the attractive field and extremity utilized.

2.2 Transverse Magnetic Field



By Flemings left hand lead the circular segment in the impact of transverse attractive field will be avoided forward or in reverse contingent on the bearing of attractive field lines power and the extremity of welding framework. Work of prior examination can be

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broke down keeping this in mind. Kovalev demonstrated that the transverse attractive field can be utilized as consequently managing the profundity of entrance. Hicken and Jackson discovered valuable impacts of consistent transverse attractive field when the bend was avoided forward as for the terminal travel speed. It was conceivable to expand the welding speed four times and steel acquires the welds free from undermines. Weld width was found to decrease with expansion in attractive field. Sheinkin found the use of transverse attractive field to build the efficiency of the submerged bend welding process utilized for making butt joints between arranged edges.

3. Experimental Procedure

3.1 Preparation of Specimens

The gentle steel bits of the measurement 100 mm X 50 mm X 7 mm are utilized as a work-piece for the welding. Every metal piece initially cleaned for dust and rust. Some time recently the real welding handle the space between the examples is settled with a backing. The space between the examples for the butt welding is relies on the thickness of the work-piece. For a 6 mm thickness there is no necessity of making section, so a 3 mm hole is kept up amid the entire procedure of welding. The quality and geometry of weld is much relies on upon right and same hole all through length of the example.

3.2 Welding In Magnetic Field (M)

The magnetic field is applied as per the set-up and then the arc welding machine and electrodes are fixed at their respective places. Multi-meter, clamp-meter and gauss-meter are placed and connected to take the readings.

Welding Without Magnetic Field (WM)

The similar setting as with magnetic welding is used inwithout magnetic field process of welding. Only change is that the magnetic field arrangement is removed. The range of current and voltage are remained similar to the magnetic field welding. The weld-pieces obtained after the process.

Test to be performed

- Hardness test
- Impact test
- Tensile strength test

5. Conclusions

On the basis of different experiments welding process and effect of magnetic field in the longitudinal direction the following conclusions are derived:

- Effect of magnetic field applied longitudinal to welding direction affects the bead width of joint and decreases it.
- Undercuts, spatter etc. welding defects are reduced.
- The tensile strength of the weld joint is on improvement side due the refinement of grains.
- Hardness of the weld Increases as compared with the weld-pieces which are welded without magnetic field.
- Reinforcement height of weld reduces as the weld bead width is increasing.

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- Toughness of the weld metal increases.
- When solenoid is introduce in the transverse direction then the mechanical properties such as Hardness, Toughness and Tensile strength are decreases.
- If travel speed is increased, tensile strength of weld generally increases.
- If magnetic field is increased, tensile strength of weld generally increases.

Hence, we can say that the use of external magnetic field longitudinal to the welding direction is helping in improvement of weld quality and weld geometry. It can also affect the weld quality.

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