STUDY EFFECT OF TIG WELDING PROCESS PARAMETERS ON MECHANICAL PROPERTIES OF SS-304 -A REVIEW

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ABSTRACT

Welding is one of the generally utilized assembling procedure. Tungsten Inert Gas welding is a procedure that delivers electric circular segment kept up between a nonconsumable tungsten electrode and the part to be welded. The warmth influenced zone, the tungsten terminal and the liquid metal are all protected from environmental tainting by a cover of dormant gas nourished through TIG light. Idle gas has latent substance properties. In these paper mechanical properties of SS-304, for example, quality, hardness, malleability, and grain structure, modulus of elasticity and HAZ were concentrated on and looked into. This paper additionally manages process parameters of TIG welding, for example, welding current, voltage and travel speed with the assistance of Taguchi technique.

Keywords— *Austenitic Stainless Steel, Hardness, HAZ, Tensile Strength, TIG.*

1. INTRODUCTION

The joining of materials for any Situations arises in industrial practice. The materials are depended in the same structure and properties for effective and economical utilization of each material. Welding is a two joining similar and dissimilar metals welded technique. This Process is completed by melting work pieces and simultaneously filler material is added which forms a molten metal pool that is cooled to develop a strong joint, with pressure sometimes used in conjunction with heat. This is contrast with soldering and brazing, which include liquefying a lower-softening point material between the work pieces to frame a bond between them, without dissolving the work pieces. Just along these lines can the planner utilize most suitable materials for every piece of a given structure. The developing accessibility of new materials and higher Necessities being put on materials and the welding procedures. When all is said in done austenitic stainless steels are effortlessly weldable. At the point when austenitic stainless steel joints are utilized in cryogenic and destructive environment the amount of ferrite in the welds must be minimized/controlled to evade property debasement amid administration. Moreover these steels are inclined to sharpening of their combination welds. These issues have been tended to by strong state welding procedures, for example, erosion welding.

2. LITERATURE REVIEW

F.B. Pickering, Physical metallurgy [1] of stainless steel improvements of the 12%Cr, controlled change, high-chromium ferritic and austenitic sorts. For every real sort of steel, the impact of synthesis on the constitution and change attributes is examined, and where conceivable quantitative connections are condensed. An account of transformable 12% Cr steel and control change steel, the nature of treating attributes is considered as far as the carbide precipitation and auxiliary solidifying response, and the utilization of age-solidifying responds to create expanded quality is additionally depicted. For controlled change steel, the metallurgical procedures for affecting change are talked about, together with the improvement of the TRIP steel. Concerning the ferritic high-chromium and austenitic stainless steels, a diagram of handling is given together with a thorough review of the structure-property connections. Much consideration is paid to the formability of these steels, especially on account of the austenitic steels. And the utilization of the marten site change to outline for certain shaping prerequisites is talked about.

S. Kou, Welding Metallurgy, [2] an investigation of Gas tungsten arc welding (GTAW) is a procedure that melts and joins metals by warming them with a circular segment set up between a nonconsumable tungsten anode and the metals, as appeared in Figure 1.The light holding the tungsten electrode is associated with a protecting gas chamber and in addition one terminal of the force source. The tungsten electrode is as a rule in contact with a water-cooled copper tube, called the contact tube. The protecting gas experiences the light body and coordinated by a spout toward the weld pool to shield it from the air. Assurance from the air is much betters in GTAW than a dormant gas, for example, argon or helium is generally utilized as the protecting gas and in light of the fact that the protecting gas is coordinated toward the weld pool.

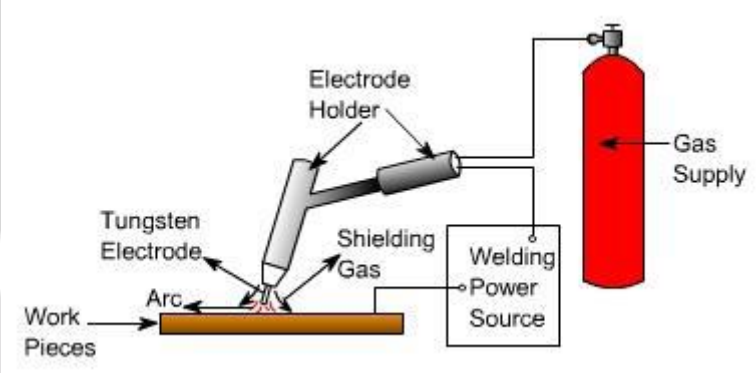

Fig.1: Schematic diagram of TIG welding process [2]

W.A. Baeslack, D.J. Puquette, W.F. Savage, [3] Effect of ferrite on stress corrosion cracking in duplex stainless steel weld metals at room temperature, Stress-consumption splitting in austenitic stainless steels has been an issue of significant significance to the Nuclear force and synthetic commercial enterprises. Various studies have been performed to decide the qualities of chloride-affected stress corrosion splitting wonders in both sharpened and unsensitized austenitic stainless steels. Despite the fact that stretch consumption breaking in these compounds has been widely explored, and all around reported, a few firmly related regions stay ineffectively comprehended and highly controversial. Early on studies finished at Rensselaer Polytechnic Institute have found that both the anxiety erosion breaking weakness and the disappointment method of a duplex 18Cr-8Ni stainless steel weld metal may vary from the helplessness and disappointment method of a toughened 18Cr-8Ni base metal with the same chemical composition.

Dr.L.Suresh kumar at el."Analysis of welding characteristics on stainless steel on TIG.[4] In this paper researchers studied the welding characteristics by taking 16 cylindrical rods of SS-304.Welding processes of TIG was applied on material under varied conditions of current, voltage, speed. Also corrosion resistance and

microstructure were studied. Brinell's Hardness test, tension test and Dye penetrate test were conducted. Researchers obtained hardness, ultimate load, ultimate tensile strength and yield strength of the material for TIG welding.

Habsah Md Ishak at el.[5]"Effect of Temperature on Corrosion Behaviour of AISI 304 Stainless Steel. In this paper researchers Specimens of 20 x 10 x 2 mm thickness were cut from sheets of AISI 304 (10.5% Ni, 20% Cr, 0.08% C, 2% Mn, 0.05% P, balance Fe) steel. The specimens were ground successively with 180, 320 and 600 grades of Sic abrasive paper and cleaned with acetone. Every example was weighed and measured for the length, width and thickness. The examples were warmed to around 100oC on a hot plate. A compressed air firearm was utilized to shower the soaked MgCO3 watery arrangement noticeable all around fog until an about uniform covering of the salt was acquired. The salt coupons were transferred into crucibles and dried in oven at 70oC for about 30 min, then cooled to room temperature and weighed.Oxidation dynamic studies were did in high temperature heater at 900oC, 950oC and 1000oC for the length of time of 24–120 hours.

E.M.Anawa at el[6]."Parametric optimization of TIG welding for SS-304. Each three process parameters and their These three parameters of TIG welding viz.current, voltage, and travel speed are taken for the analysis. A plan of experiments based on Taguchi technique has been used to acquire the data. The analysis for signal- to- noise ratio was done using MINITAB-13 software for higher the better quality characteristics.Comparision of predicted values with the experimental values was done by performing conformation test to analyze the tensile strength of the joint.

3. RESULTS AND DISCUSSION

A diagram of the physical metallurgy of welding is given together with a discussion of the metallurgy of certain corrosion effects. Methods for increasing the quality of both the ferritic and austenitic steels are outlined, and the way of precipitation-hardening reactions in both types of steels is talked about. [1]

We discuss about this paper is effect of ferrite on stress corrosion cracking in duplex stainless steel weldments at room temperature. One such area concerns the stress corrosion cracking properties of duplex austenitic stainless steel weldments. [3]

In this way the welding parameters must be upgraded to get a controlled Ferrite level 20 to 70%.These conditions must be improved taking into record the thickness of the items and welding gear. Just finish arrangement toughening warmth treatment may be considered. At last we have watched every one of the parameters great results in TIG welding. In this way, TIG welding is best process for Austenitic evaluation materials. As the speed decreases and the current increases the heat affected zone increases. [4]

The impact of temperature on the consumption conduct of AISI 304 stainless steel with MgCO3 store has been concentrated on. The oxidation rates were observed to be impacted by both of time of introduction and temperature. At 900oC and 950oC, the spotted range demonstrated setting consumption and at 1000oC, anxiety splitting corrosion and severely disintegration.[5]

The result shows that the analysis of signal-to-noise ratio was used to obtain the optimum welding parameters combination. The confirmation tests indicated that Taguchi method is well suitable to increase the tensile strength significantly. The effect of parameters on the ultimate tensile strength can be ranked in decreasing order as follows: voltage> speed> current.[6]

4. CONCLUSIONS

The way of the treating qualities is considered as far as the carbide precipitation and auxiliary hardening responses and the utilization of age-hardening responses to create expanded quality. [1]

The studies have been performed to decide the attributes of chloride-prompted stress-corrosion splitting wonders in both sharpened and unsensitized austenitic stainless steels. [3]

TIG welding parameters are affected the weld strength in terms of weld bead geometry and mechanical strength. We can conclude that TIG welding process by welded can be higher loads, tensile strength and yield strength. Stainless steel 304 can be successfully welded of TIG welding process in the corrosion resistance. [4]

The high cooling rate during solidification process and thermal fluctuations produce a finer structure. The XRD Results proved presence of ferrite in both CW and PW specimens. The amount of ferrite in PW specimen is higher than CW specimen. The higher amount of ferrite could improve mechanical and corrosion properties. The studies of grin size have indicated PW specimen has finer grain size than CW specimen. [5]

TIG welding process is very successful to join stainless steel (SS-304) metal. The influence of process parameters for current, voltage and welding speed on the increased ultimate tensile strength used for Taguchi method. [6]

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