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A REVIEW PAPER ON PRE-HEAT TREATMENT ON WELD JOINTS

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ABSTRACT- The main objective of shielded metal is welding or stick welding is to perform arc welding using a covered metal electrode to shield the weld joint, welding is one of the most popular ways to combine two metal parts into one. To observe the influence of pre welded heat treatment on heat affected zone when joining heavy thickness plates while performing SMA W. In this process the pre-welded heat treatment and heat input strongly affected the HAZ microstructure and hardness. This works on the principle of heat produced by the electric arc, the electrode used in the process is consumable; the current type used in the process either AC or DC depending on base metal. The parameters of this process weld process are current, length of the arc, angle, manipulation, and speed. SMAW arc welding uses the arc heat to melt the base metal and tip of a consumable electrode. The electrode and base metal are part of the electric circuit or welding circuit. The welding starts when and are struck between the tip of the electrode and base metal. The heat melts the tip and the surface of the work. Tiny globules of molten metal form on the electrode tip then transfer to the arc into the molten pool. Filler is deposited as the electrode is consumed. The lux coating disintegrates and gives off vapor's that serve as a shielding gas and provides a protective layer of slag. After chipping and cleaning the destructive and non-destructive testing is done This process is widely used in many industrial applications due to its versatility, simplicity, and indoor and outdoor applicability. SMAW process is commonly used across range of including aerospace, automotive, energy and construction among others.

INTRODUCTION

Welding is the most economical and effective way to assemble metal permanently. It is the only way to assemble two or more pieces of metal into a single piece. Heat is important for our economy. It is generally said that more than 50% of the total U.S.A. it has to do with heat in a certain way. Welding is at the forefront of industrial processes and involves more science and flexibility than those involved in any other industrial process. There are many ways to weld and many different types of welding. Some processes cause sparks and some do not require even more heat. Welding can be done anywhere - outdoors or indoors, underwater and outdoors. Almost everything we use in our daily lives is welded or made of welded materials. Burners help build metal products from coffee shops to buildings. They help build spacecraft and millions of other products from oil rigs to automobiles. In construction, burners are likely to rebuild the ground, extend subway trains, build bridges, and help improve the environment by building pollution controls. The use of welding is unlimited. There is no shortage of variability in the type of work being done. SMAW (SHIELDED METAL ARC WELDING) Shielded metal arc welding (SMAW) is often referred to as stick welding. This welding process can use either alternating current (AC) or direct current (DC). The electrodes (rods) that are used have a coating called flux. During the welding process the flux forms a gas shield that protects the weld puddle from atmospheric contamination. SMAW is currently used in a wide variety of industry applications. The equipment for SMAW is cheap and simple, as shown in Fig. 2, which means that the method is straightforward to use outdoors, as opposed to other methods requiring shielding gas, which are unsuitable in wind. The welder has more freedom of movements. More importantly, it is possible to weld a wide variety of metals by changing only the electrode materials. Therefore, the SMAW is the most used arc welding technology. However, the arc time factor of SMAW is relatively low due to the time required for chipping away slag after welding and changing the electrodes.

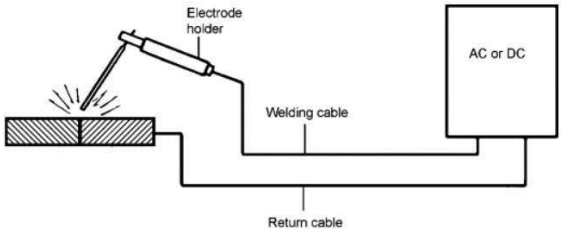

Fig: shielded metal arc welding

SMAW is usually used in steel industries, construction, mechanical and all other automotive sectors. Shielded metal of arc welding is most used process over all other welding process because of its relevancy, compatibility, and all other parametric reviews. For melting the weld metal between plates and the heating source is electric arc. SMAW is like oxy-acetylene welding, a fusion welding process. The electrode is covered with a coating material known as flux. The decomposition of material is prevented by shielding of coated material. This shielding controls the mechanical, electrical, and metallurgical properties of weld metal. The flux in the coating melts and intermingles with the molten metal protecting it against oxidations. The flux forming slag with the oxide deposits on surface of bead and protects the bead, while hot from oxidation. Cooling rate in shielded metal arc welding is always high. The blanket of slag tends to reduce it but only to a limited extent. To a limited extent it refines the grain structure as well. SMAW is used for stainless steel, cast iron and ductile iron. While as in case of it is used in nickel based, aluminium based and in non- ferrous alloy welding. Sometimes the welding is depending upon the skill of welder and thickness of fabrics which is being welded. Here in shielded metal arc welding, the welding strength is very important requirement in welding joint. Higher the strength rate, higher the lifetime will be. The load bearing

capability totally depends upon welding strength. There is drawback of weak welding is that less load bearing in automobile industry, therefore the fastening strength is primary need in shielded metal arc welding. Keeping the stability of heat sources, the fastening strength can be improved.

LITERATURE SURVEY

[1] Maridurai T et.al to investigate that the tensile properties of carbon steel P91 when root pass was carried by using TIG welding and then SMAW and SAW welding to be perform. the study of characteristics of fracture, toughness, and tensile properties of P91 material in SAW process. The fracture, toughness and tensile properties of base metal are evaluated by using crack tip opening displacement and properties are measure at room temperature, the range of temperature during welding is 400-600 degree centigrade.

[2] J. Dutta et. al. the difficulties on mechanical properties of SMAW and GTAW due to heat source, the temperature of heat source has been obtaining by experimental work the effect of heat source on SMAW and GTAW has been judge by optical and scanning electron micrograph in weld joint of different region. In experimental work the peak temperature of GTAW is75degree centigrade higher than the peak temperature of SMAW is more durable than SMAW.

[3] Ravindra Kumar, et al. Shielded metal arc welding (SMAW) was used to weld 13 together ASTM SA210 GrA1(Low Carbon Steel) steel. The oxidation studies were conducted on different regions of shielded metal arc element such as base metal, weld metal and heat affected zone (HAZ) specimens after exposure to air at 900 ◦C under cyclic conditions. The thermo-gravimetric technique was used to establish kinetics of oxidation. X- ray diffraction (XRD) and scanning electron microscopy/energy dispersive analysis (SEM/EDAX) techniques were used to analyse the oxidation products. The base metal oxidized in air indicated the formation of high intensity of Fe2O3 (Iron oxide) as revelled by XRD analysis and form a thicker oxide scale on the base metal than that of Weld metal at 900 ◦C. The oxidation resistance was found to be maximum in case of HAZ due to the formation of densely inner oxide scale and it was least in case of base metal.

[4] Ghosh P.K et al. carried out an experiment on plate weld deposition of 10 mm thick the arc characteristics and behaviour of metal transfer affecting the quality of pulsed current GMA weld is depends upon the pulse parameters and arc voltage primarily due to their influence on arc profile, stability in shielding of arc environment as well as nature of droplets transferred during welding. The arc characteristics defined by its root diameter, projected diameter and length, stiffness of arc affecting the weld quality.

[5] Tong L.G, et al. proposed a physical model represents the fluid and thermal dynamics of the SMAW process are quantitatively described, and the drop short circuit transition process is analysed. To investigate the effects of material parameters on the fluid and thermal dynamics of the weld pool during SMAW, FR (Fusion Ratio) and FL (Fusion Length) are proposed to describe the pool accurately. The evolution and geometry of a weld pool with V-type grooves during butt SMAW were investigated. The results provide a theoretical basis for improving the welding process and welding quality while avoiding welding defects.

[6] Palani P.K, et al. uses different methodologies for Pulsed welding is a controlled method of spray transfer, in which the arc current is maintained at a value high enough to permit spray transfer and for long enough to initiate detachment of a molten droplet. Once the droplet is transferred the current is reduced to a relatively low value to maintain the arc. Parameters of peak current, background current, peak current duration, background current duration, pulsing frequency, and load duty cycle; it has a distinct effect on the characteristics such as the stability of the arc, 14 weld quality, bead appearance and weld bead geometry. Improper selection of these pulse parameters may cause weld defects including irregular bead surface, lack of fusion, undercuts, burn-backs and stubbing- in.

[7] Vivek Goel, et al. developed an expert system can be used, usually by a welding engineer, to plan for SMAW jobs. This paper presents an expert system to help plan and train shielded metal arc welding (SMAW) operations. It accumulates most of the available information on the SMAW process including edge preparation, electrode selection, economic evaluation, analysis of weld defects and troubleshooting.

[8] S.M. Tabatabaeipour,et al.studied the ultrasonic testing of two welding processes such as shielded metal arc welding (SMAW) and gas tungsten arc welding (GTAW) and the ultrasonic testing technique used is time-of-flight diffraction (ToFD).The specimens were examined by the ultrasonic ToFD technique under identical conditions. B-scan images obtained from ToFD measurements of the two welds indicate that inspection of the specimen prepared by the SMAW process is easier than the one made by the GTAW process due to higher scattering of waves in the latter.

[9] Masaya Shigeta, et al. developed a quantitative evaluation system for arc characteristics such as arc stability and welding spatter generation related to shielded metal arc welding (SMAW) without human sensory evaluation. Factors that correspond to sensory evaluations by welders were investigated based on image processing. For the quantitative evaluation of arc stability, results show that the root mean square and the standard deviation of the arc centre fluctuation correspond to welders' sensory evaluation at AC and DC discharges. For welding spatter generation, a method of counting white pixels in a binarized image evaluates the number and size of welding spatters which closely coincide with welders' sensory evaluations.

[10] Gurpreet Singh Sidhu, et al. studied to investigate the roll of intermixed weld metal of shielded metal arc welding consumable on weld properties. Intermixing of weld fluxes, change the chemical compositions of electrodes etc. are applied for purpose of high weld quality, high productivity, strength, and economy in pipeline Fabricators look for welding process which is cost effect and is able to give higher deposition rate better penetration and robust structures

[11] Izzatul Aini Ibrahim, et al. studied, the effects of different parameters on welding penetration, microstructural and hardness measurement in mild steel that having the 15 6mm thickness of base metal by using the robotic gas metal arc welding are investigated. The variables that used in this study are arc voltage, welding current and welding speed. The penetration, microstructure and hardness were measured for each specimen after the welding process and the effect of it was studied. The value of depth of penetration increased by increasing the value of welding current 90, 150 and 210
A. Welding current, welding speed and Arc voltage is factor that will determine the penetration.

[12] D.S. Nagesh, et al proposed a model based on artificial neural network on shielded metal arc welding suggested that Bead geometry and penetration (depth and area) are important physical characteristics of a element. Higher electrode feed rate produced higher bead width making the bead flatter. Current, voltage and arc-travel rate influence the depth of penetration. The other factors that influence the penetration are heat conductivity, arc-length and arc-force. Back-propagation neural networks are used to associate the welding process variables with the features of the bead geometry and penetration.

[13] B. Rajesh Kumar Singh, et al. does experimentation on welding so Effect of the variations in joint designs on the properties of the element was studied. Mild steel plates, IS 2062: E250, were taken as sample for the study using the shielded metal arc welding (SMAW) technique. Main objective was to compare the effects of variations in geometry of butt-joint welding on the mechanical properties of mild steel plate. The welding was Double- V joint was the superior of all other joints, having better mechanical properties than other joints. Single-V was having more width of HAZ was recorded as compared to others.

CONCLUSION

The weld ability based on tensile strength of shielded metal arc welding and oxy-acetylene gas welding weldments of mild steel were studied, and its shows the yield strength and ultimate tensile strength of shielded metal arc welding are better than that of gas welding. The experimental result shows that % elongation of shielded metal arc welded work piece to parent metal is very large (54.32%) as compared to gas welded work piece (11.12%). So, we see those results of shielded metal arc welded work piece are for better than those of gas welded work piece

RESULT AND DISCUSSION

In this we will learn how to join two metal plates with pre-heating them before welding and joining them. Pre-heating is frequently used when arc welding steels to reduce the cooling rate of the weld and base material to • reduce the incidence of hydrogen cracking in carbon-manganese steels. • To prevent over hardening of medium carbon and low alloy steels. • reduce residual stresses and minimize distortion. • control weld microstructure. Preheating is used in flash butt welding to extend the capacity of machines and permit the joining of larger cross sections than otherwise would be possible. In this instance the raised work piece temperature also makes the flashing process easier to start and maintain and reduces the temperature gradient through the work pieces. Preheating may be required when brazing to reduce the necessary weld energy (heating) and reduce the time required to complete the joint

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