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A REVIEW PAPER ON WELD QUALITY CHECKING BETWEEN ARC WELDING AND TIG WELDING

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Abstract

Shielded metal arc welding (SMAW) is also known as manual metal arc welding, is a manual arc welding process which uses a consumable electrode. As electrode melts, a layer that protects the electrode melts and covers the weld area from oxygen and other atmospheric gases whereas gas tungsten arc welding (GTAW) also known as tungsten inert gas (TIG) welding[1], is an arc welding process which uses a non-consumable tungsten electrode to produce the weld. The weld area and electrode is covered from air or other atmospheric contamination by an inert shielding gas (argon or helium), and a filler metal is normally used, though some welds.[2]

I. INTRODUCTION

Welding is a process of joining two similar and non-similar metal or non-metal with the application of heat and pressure, but in some cases without the application of pressure the process has been done. The filler wire or electrode is usedtoJoin the metal with the help of spool gun. Welding is used for making permanent joints. It is used for the manufacturing of automobile parts, railway wagons, aircraft frames, machine parts, tanks, structural works, boilers, ship building furnitureetc[3].

Weldingis an arc welding process which produces the binding of metals by heating them with an arc between a continuously fed filler metal or electrode and the work. The arc and the weld pool are shielded from atmospheric contamination by passing a suitable gas through the nozzle to form a protective shield around the weldingarea.

ProcessParameters:

- ElectrodeSize
- WeldingCurrent
- WeldingVoltage
- Arc TravelSpeed
- ElectrodeExtension
- ElectrodePosition
- Gas Flow Rate and Types of shielding gases

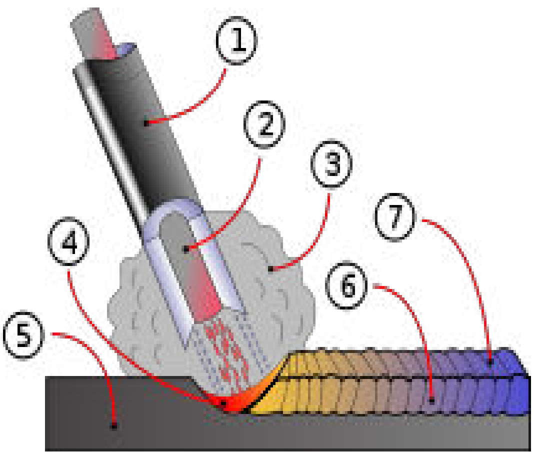

Figure 1.1: Arc Welding Process

1.1 Types of WeldingJoint

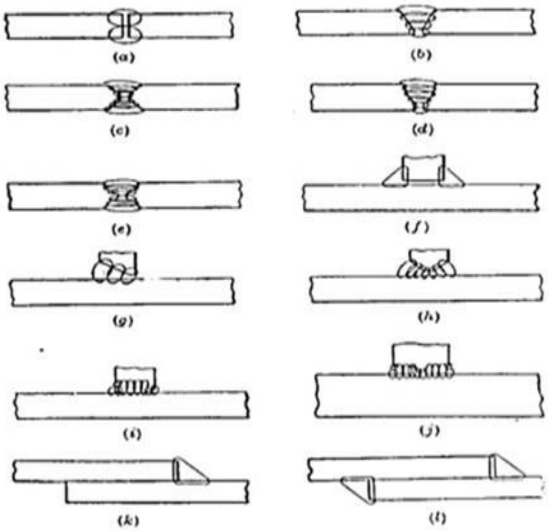

Figure.1.2: Types of welding joints

square butt joint; (b) single-v butt joint; (c) double-v butt joint; (d) single-u butt joint;(e) double-u butt joint; (f) square-t joint; (g)single- bevelt-joint;(h)double-bevelt-joint; (i)single-u t-joint; (j) double-u t-joint; (k) single-bead lap joint; (l) double-bead lapjoint.

1.2 Applications ofarc welding and tig welding

- These are well developed electrodes and are marketed under different brand. Most of the belong to rutile, and basic coated types with or without iron powder. Heavily coated variety can be used as touch electrode which is excellent for welding in vertical position[4].
- Because TIG welding can be used with such a large variety of metals, the process can be applied to several industries and aid in the creation and repair of many items. This form of welding is common in the aerospace, automotive, repair and art fields[4].

I. LITERATUREREVIEW

1. **Vahid A. Hosseiniet al. (2018)** reviewed that the Low-temperature phase separations (T < 500) resulting in changes in mechanical properties, of super duplex stainless steel (SDSS) base and weld metals were investigated for short heat treatment times (0.5 to 600 minutes)[5]

   Conclusion

   That Low-temperature phase separations (T<500) and embrittlement of 2507 SDSS were investigated in functionally graded base and weld metals are heat treated between 0.5 and 600 minutes.

2. **Yong Huang et al. (2018)** Gas pool coupled activating TIG (GPCA-TIG) welding put forward in-house can dramatically enhance weld penetration of TIG welding through introducing active element oxygen to reverse the Marangoni convection flow in the molten pool .The distributions of arc pressure in different directions were evaluated[7].

   Conclusion

   The results indicate the welding torch developed in-house has good structure symmetry and the GPCA-TIG arc can be used to weld in any direction required.

3. **Mohit Singhmar et al. (2015)** reviewed that the various combination of parameters were obtained by conducting the experiment as per the orthogonal array[8].

   Conclusion

   Arc current has the highest influence on tensile strength with contribution of 41%followed by Arc voltage with contribution of 20% and gas flow rate with contribution

4. **Husain Mehdi et al. (2019)**in the present work the Tungsten inert gas welding is the most commonly used process for joining of aluminum alloy, which are highly demanded in aerospace application. In this process coarse grain structure, micro crack and porosity was obtained due to persisting thermal conditions when the fusion zone start to solidify that new approach of TIG + FSP process can improve the microstructure and mechanical properties of TIG welded joint[9].

   Conclusion

   In this study, to avoid coarse grain structure, porosity and micro-crack, friction stir processing is used after Tungsten inert gas welding.

5. **Ericson et al. (2014)** reviewed the sheds a light on the question why robust in-process monitoring and adaptive control are not fully implemented in the welding industry. In the research project FaRoMonitA, the possibilities to monitor the weld quality during welding have been investigatedconducted examines why robust in-process monitoring and adaptive control are not fully implemented in the welding industry[10].

   Conclusion

   Weld penetration depth was chosen as quality property to monitor because of its importance for the welding industry.

6. **Kumar et al. (2013)** this paper shows that the result of the analysis of variance (ANOVA) for the Hardness (BM, WZ, HAZ).The analysis of variance was carried out at 95% confidence level. The ANOVA is carried out to investigate the influence of the design parameters on hardness by indicating that which parameter is significantly affected the quality characteristics[11].

   Conclusion

   In this experimentation work, the authors have generated results for S/N ratios of Hardness (BM, WZ, and HAZ)

7. **D. B Jabarajet al. (2013**Tungsten Inert Gas (TIG) is an electric arc welding process, which produces an arc between a no consumable tungsten electrode and the work to be welded. TIG is used very commonly in areas, such as rail car manufacturing, automotive and chemical industries. Stainless steel is extensively used in industries as an important material, because of its excellent corrosion resistance[12].

   Conclusion

TIG welding is one of the welding processes, often used to weld similar and dissimilar stainless steel joints that Several aspects of Microstructure and corrosion resistance properties, dissimilar metal welding and Optimization of different welding processes using statistical and numerical approaches have been highlighted.

8. **Silva Costa etal.(2013)**inthisstudy,The associations of tungsten inert gas (TIG) and metal inert gas/metal active gas (MIG/MAG) welding process intends to take advantage of the higher productivity of the MIG/MAG process with the greater heat control imposed by the TIG process[13].

Conclusion

Based on the P value, the polarity of the MIG/MAG electrode had a significanteffect on penetration, width, fused area, and wettability

9. **Guo-lu Li et al. (2012)** in this study the self-fluxing NiCrBSi coatings with 800 μm thickness were prepared on the surface of AISI1045 steel substrate by plasma spraying. And the remembered coating was obtained using the tungsten inert gas (TIG) arc process. The microstructure, surface roughness, hardness, phase composition, and wear resistance of the sprayed coating and re-melted coating were systematically investigated[14].

Conclusion

After TIG re-melting, the porosity decreases from 5.6% to 0.2%, and the microstructure and the compactness of the coating are improved significantly.

10. **K. T. Andrews et al. (2013)** in this study a one-dimensional model is proposed for the simulations of resistance spot welding, which is a common industrial method used to join metallic plates by electrical heating. The model consists of the Stefan problem, in enthalpy form, coupled with the equation of charge conservation for the electrical potential[15].

Conclusion

The model is general enough to allow for the welding of plates of different thicknesses or dissimilar materials and to account for variations in the Joule heating through the material thickness due to the dependence of electrical resistivity on the temperature.

11. **Vahid A Hosseini et al. (2018)** in this study the Approaches to determining ferrite fraction (%) and ferrite number (FN) were examined for super duplex stainless steel (SDSS) welds. A reference sample was produced by bead-on-plate gas–tungsten arc welding of a type-2507 SDSS plate[16].

Conclusion

The ranking of etching procedures giving maximum to minimum contrasts between ferrite and austenite is as follows: modified Beraha color etching, 20% NaOH electrolytic etching, two-step electrolytic etching using 10%NaOH and 7% oxalic acid, and 10% oxalic acid electrolytic etching.

12. **Belinga Mvola et al. (2014)** in this study the manufacturing industry has shown interest in the opportunities offered by welding of dissimilar metals. The need for appropriate and effective techniques has increased in recent decades because of efforts to build light and strong vehicles with reduced fuel consumption. In addition, the thermal conductivity, corrosion resistance, and recyclability are other reasons to weld dissimilar non-ferrous metal. The welding quality of dissimilar non-ferrous metals is enhanced by using an appropriate process[17].

Conclusion

Mg/Al dissimilar metals could be successfully joined by CMT welding, with pure copper as a filler metal.

13. **Aghakhani et al. (2011)**used Taguchi's method to design process parameters of GMAW that optimize weld dilution for welded joints. The process parameters considered were feed rate, welding voltage, arc gap, welding speed and gas flow rate. L25 orthogonal array was used for designing experiments[18].

Conclusion

From the study it was concluded that wire feed rate was most significant parameter and gas flow rate was least significant parameter for weld dilution.

14. **Haragopal et al. (2011)** used Taguchi's method to design process parameters of MIG welding that optimize mechanical properties of INTERNATIONAL JOURNAL OF CURRENT ENGINEERING AND SCIENTIFIC RESEARCH (IJCESR) ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, VOLUME-4, ISSUE-7, 2017 61 weld specimen for aluminium alloy (Al-65032). The process parameters considered were gas pressure, current, groove angle and pre-heat. L9 orthogonal array was used for designing experiments[19].

Conclusion

It was concluded from the work that current was most influencing parameter for ultimate tensile strength (UTS) and pressure was most influencing parameter for proof stress, %age elongation and impact energy

Conclusion

From the review paper study, it is found that when the welding current ,voltage ,GFR increases ,The tensile strength decreases ,but when welding speed increases ,the tensile strength also increases. In the case of elongation is also same to tensile strength. The Study found that the control factors had varying effects on the response variables.

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