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WELDING OF TWO DISSIMILAR METAL WELDED JOINTS: A REVIEW

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Abstract - *Welding process is an efficient tool of joining materials, may be metals or other materials, by the fusion, that is distinct from techniques like brazing and soldering which uses very little temperature, that don't melt parent metal. In addition to melting base metal, an additional material is sometimes superimposed to the joint to create a pool of melted material (the weld pool) that cools to create a joint that's usually having more strength than the parent material. Pressure may additionally be employed along with heat, to create a weld. Welding conjointly needs a type of shield to safeguard the filler metals or molten metals from being contaminated or oxidized. Moreover, there are some welding methods like solid state friction welding during which metal doesn't melt.*

Key Words*: *Dissimilar metal, welded joint, CATIA, ANSYS, Thermal Analysis.

1. INTRODUCTION

Until the end of the 19th century, the sole welding method was forge welding, that blacksmiths had used for millennia fuse iron and steel by heating and blowing. Arc welding and oxyfuel welding were among the primary processes to develop late within the century, and electric resistance welding followed shortly after. Welding technology advanced quickly in the early 20th century because the world wars drove the demand for reliable and cheap joining ways. Following the wars, many fashionable welding techniques were developed, as well as manual ways like SMAW, is one in every of the most standard welding ways, likewise as semi- automatic and automatic processes like GMAW, SAW, FCAW and ESW.

Innovations continued with the invention of light beam, electron beam, magnetic pulse (MPW), and friction stir welding. Today, the research continues to advance. Automated welding is common place in industries, and researchers still develop new welding ways and gain larger understanding of weld quality.

Some of the most effective known welding processes include:

1. Oxy-fuelwelding
2. Shielded metal arc welding (SMAW)
3. Gas tungsten arc welding (GTAW)
4. Gas metal arc welding (GMAW)
5. Flux-cored arc welding (FCAW)
6. Submerged arc welding (SAW)
7. Electroslag welding (ESW)
8. Electric resistance welding (ERW)

1.1. DISSIMILAR WELDING MATERIALS

Welding of Nickel with Copper, Tin and Lead

a) Nickel Copper Welding

Nickel copper welding are employed from past 50 years successfully for the fabrication of piping industry working under sea water as it is corrosion resistant. It is not difficult to weld copper and nickel together as they can be welded by conventional processes without any obstacles by a normal welder but it needs cleanliness a beat more as the surface after weld is not as fine as in case of steel weldments. One more advantage of using copper to be weld with nickel is they are ductile in nature and hence they are machinable which means the surface roughness can be easily removed by choosing some machining operations like filling etc.

b) Nickel Tin Welding

Out of many metals required for furnishing metal industry, nickel-tin is proven to be the best in this group of elements. The nickel and tin together when joint gives the resistance to surface imperfection and when employed to the surface of any metal it also acts as a reagent which resist the attack of atmospheric contaminants to get dissolve and destroyed the base metal at any means.

c) Nickel Lead Welding

Although lead is not considered for joining in mechanical or construction industry but it have good density when compared with same family of material that is nickel, copper, tin etc which we have talked about in above sections so for our present study we are very curious to know what will be impact of joining this material with nickel and is it feasible to use for construction purpose or not and then we will conclude our research in later section.

2. LITERATURE REVIEW

R. K. Kesharwania et al.(2014)[1] presented the multi-objective optimization of the parameters affecting weld quality in custom-made friction-to-mix butt welding of 2.0 mm thin dissimilar sheets of AA5052-H32 and AA5754-H22 using the approach based on the gray Taguchi.C. Wiedniga et al.(2014)[2] established the weldability of cast 625 nickel-based alloy with martensitic cast 9-11 cost CB2 stainless steel, using electron beam welding (EBW). Similar welding experiments (A625 / A625) and dissimilar welding on 50 mm thick plates were dead. Sadeesh Pa et al.(2014)[3]applied welding of AA2024 and AA6061 dissimilar aluminum plates 5 mm thick by friction stir welding (FSW).P. Mithilesh et al. (2014) [4] studied the weldability, metallurgical and mechanical properties of the dissimilar joints of metal 625 and AISI 304. Dissimilar joints were obtained by the gypsum tungsten arc welding process using ERNiCrMo-3.Madduru Phanindra Reddy et al.(2014)[5] investigated The crack propagation (FCP) behavior within the surface boundary of the dissimilar joint between 6061- T6 aluminum (Al) alloy and kind 304 stainless-steel obtained by a friction stir welding (FSW) technique. Joaquin M. Piccinia et al.(2015)[6]Examine the result of the penetration depth of the tool throughout the weld, as well as the relative position of the materials used in the superimposed joints, once the AA5052-AA6063 sheet samples have been welded.V.B. Shaibu et al. (2015)[7]analyzed the thermal, metallurgical and physical steps of the dissimilar stainless steel-copper pair AISI 304 throughout the fixing of the optical device in keyhole mode numerically and then validated by experimentation.M. Balasubramanian(2015)[8]carried out a mechanical test in the manufacture of the titanium alloy and 304 stainless steel seals with silver interlayer and the results of the mechanical tests have shown that the shear strength values have an instantaneous relationship with the bonding time .

2.1. OUTCOMES FROM LITERATURE SURVEY:

Following are the Outcomes from the Literature Survey about the topic "Computer aided Modling and Analysis of Two Dissimilar Metal Welded Joint".

1. Different materials are joined by using a suitable filler material in between the two.
2. A number of methods are there to join the material having dissimilar properties.
3. Ferrous as well as non ferrous materials are joined together using proper welding technique.
4. For better results some simulation study were performed to get rid of the difficulties encountered in terms of strength and weak zones after welding.
5. CAE/FEA software's are used for simulation purpose.

3. FACTORS TO BE CONSIDERED FOR DISSIMILAR METAL WELDING:

There are various factors effecting how well the welding can be done and how long it work effectively and efficiently some of the main factors are listed below:

i. **Solubility:** This is the metal's ability to dissolve in a solvent. Both metals should able to dissolve together.
ii. **Inter metallic compounds:** These form during the welding process in the transition zone and have a metallic bond
iii. **Weldability:** Based on the above two factors, the degree of weldability between the two metals can be determined.
iv. **Thermal Expansion:** On changing temperature how it effects the shape of metals
v. **Melting Rates:** The point at which metals get melted
vi. **Corrosion:** If joining metals are extremely different electrochemically, then corrosion may occur
vii. **End Service Conditions:** This is the end operating conditions on which metals are required to work

4. CONCLUSION:

It is being observed that around 30% manufacturing cost is associated with welding in any automobile, ship building, automobile, home appliance industry etc. So, it is very important to study and analyse the best welding practice over conventional welding practices and modern welding practices. The study of dissimilar metal welding is one of the key focus in this direction.

5. SCOPE OF THIS STUDY

1. The analysis of weld residual stresses in joining of two dissimilar metals welding can be carried out.

2. One can consider the factors discussed here to carry out their own work for this kind of weld elements.

3. Some kind of virtual analysis can be carried out to see how dissimilar weld metals behave while joined together.

4. Mechanical materials which enhance the properties like strength and fatigue life can be considered for analysis purpose.

5. The best techniques in such type of welding can be

studied and analyzed in future.

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