A review paper on process parameters of resistance welding and its recent developments

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Abstract *– This paper analysed the various process parameters of resistance welding and the latest enhancements that have been used in industries. Electric opposition welding (ERW) alludes to a gathering of welding procedures, for example, spot and crease welding that create blend of faying surfaces where warmth to frame the weld is produced by the electrical obstruction of material joined with the time and the power used to hold the materials together amid welding. A few components impacting warmth or welding temperatures are the extents of the workpieces, the metal covering or the absence of covering, the terminal materials, anode geometry, cathode squeezing power, electrical current and length of welding time. Opposition welding techniques are effective and cause little contamination, however their applications are constrained to generally thin materials and the gear cost can be high (in spite of the fact that underway circumstances the expense per weld might be low).*

Resistance welding

Introduction

Resistance welding has vast application in fabrication industries. It can be accomplished by either riveting or welding. In the earlier days of shipbuilding rivets were conventionally used to make permanent joints in their hulls but due to advancement in welding technologies, there has been quite a shift toward using welding technique as a basic process while building hulls of ship and planes. bodies of automobiles, coaches of the train. both riveting and welding had their advantages and disadvantages. Welded joints were lighter in weight as compared to the riveted joints. they were always watertight. there was a protruding head which will damage the streamline design of the body.

Background

In antiquated occasions, metal welding was done as fashion welding (metals warmed up to liquefying point are squeezed together) and brazing (weld utilizing combination of low dissolving point). With the coming of power, welding innovation progressed amazingly; to be specific, opposition welding, curve welding and gas welding were developed toward the finish of nineteenth century. From that point, different welding advances, for example, ultrasonic, grating, electron bar, plasma, laser welding have been designed.

Despite the fact that we have next to no opportunity to encounter the welding innovation, it is connected extensively in an assortment of ventures and contributed their development.

Process Parameters

Welding process can be accomplished in two ways either by application of heat and pressure or it can be accomplished by only applying heat. the welding that is under discussion is resistance welding which has both heat and pressure applied. there are several types of the resistance welding like seam welding, spot welding, projection welding, butt welding and several more. spot welding is the simplest form of resistance welding.

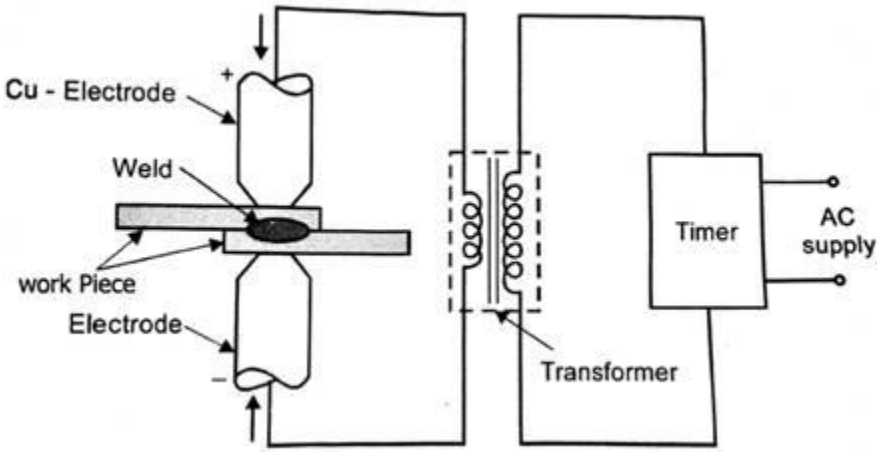

Fig-1 Schematic View of Resistance welding

as shown in Fig-1 there are several parts of basic spot welding set. there are two electrodes which are used to hold the workpiece together and apply pressure. when a job is held between the electrodes current in several kiloamperes passes through the workpiece to be joined this current produces a large amount of heat which can be found by relation H=RT(I^2). A process may involve current up to few kilo ampere and voltage of 2 to 12 volts. pressure, current and voltage requirement vary from plate to plate as there thickness and material changes. in a resistance welding process, there are two electrodes made of copper or tungsten or any of their alloy. these material are chosen because they have high electrical conductivity and they don't deform much when their temperature is raised. spot welding is one of the most commonly used resistance welding because of requirement of welding thin sheets with each other in a large number of industrial application, for example, rain coach manufacturing, body of an automobile and many more. there are many more resistance welding processes like seam welding, projection welding, flash welding, upset butt welding, high-frequency resistance welding, high-frequency induction welding. last three welding process are not very common as they are only used in the specific spot, for example, upset butt welding is used for joining shaft end to end with each other. the spot welding is the most common form of the resistance welding as this process has a large number of applications in the industries for example welding sheets in coaches of trains and automobiles for production of the body.

in this process, there are several parts which are shown in the figure below. this system is using single phase AC supply power supply it can be using three phase ac supply or DC current. AC is supplied is most famous out of these three because of its simplicity. DC supply can be used where a large amount of current is required. in this process, there are two electrodes one of which is stationary and the other is movable. the sheets which need to be welded are held between the electrodes with pressure. when the supply of current starts through the plates.

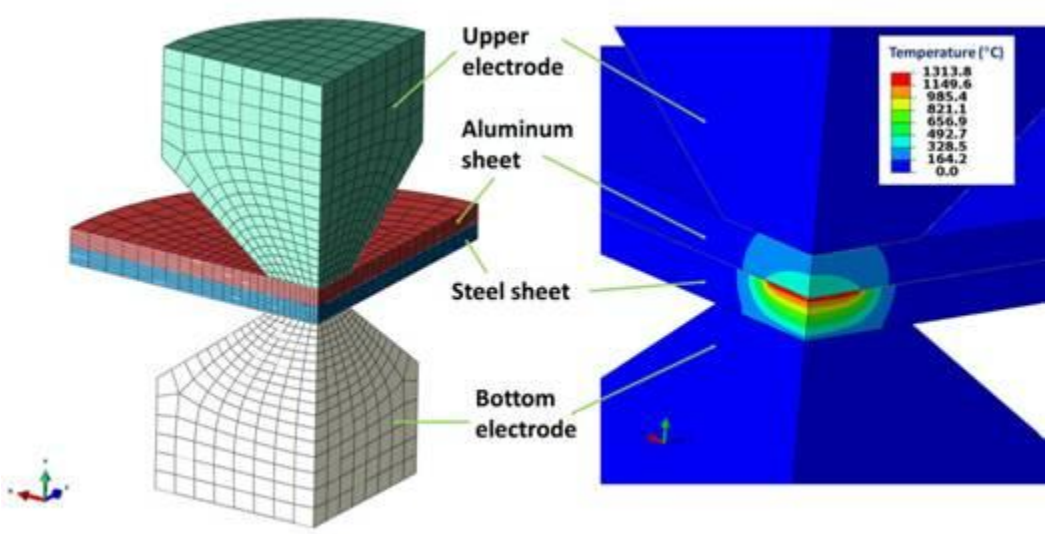

Fig-2 FEMA View of Resistance welding

as it is clear from the figure that the most heat is liberated locally around the interface of two sheets which results in the formation of nugget at the interface of the sheets. which after solidification results in the welded joint. which should have proper penetration in both the sheets if the penetration is less the optimum value it is going to result in a weak joint if the penetration is more than the optimum value it results in very less metal left over the outer surface of the upper and lower sheet which can result in weaker joint too. that is why the proper amount of current should be applied which can be decided based on various factors. in the

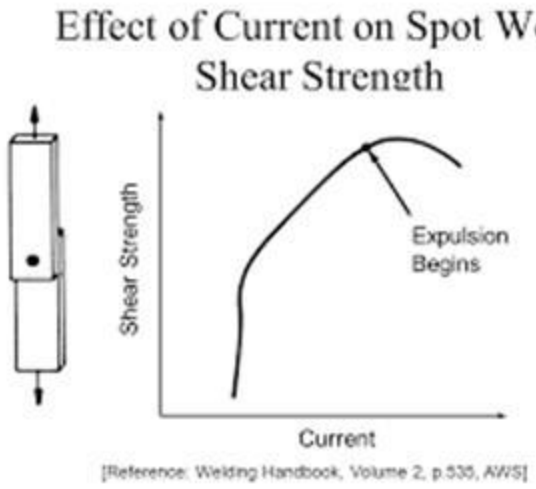

Fig-3: Graph between shear strength and Current

spot welding if we increase the value and maintain the balance with the force and voltage the value of shear strength increases same goes for the time for which the current passes through the interface. it does have an optimum value for good quality join. the decision of how much pressure should be applied depends upon the properties of the metal which need to be welded if a large amount of pressure is applied on soft metal it can result in indentation which can result in the weaker joint formation but the optimum amount of pressure can result in proper nugget formation. the other type of resistance welding is seam welding. in this process, overlapping sheets are held between rollers which act as electrodes. when a supply of current is turned on it results in heat generation locally around the interface. in this process, the Nuggets are overlapping each other and producing continuous welding. it will be called continuous weld only when the nuggets are overlapping each other more than 50%. if the operator wants less overlapping he can use the pulsating current. as good as this process sounds it does have several disadvantages like the equipment required to perform the job are bulky and expensive. the one other major disadvantage is that the welding can be only performed on the sheets which have a thickness less than 3mm.

Applications

Opposition crease welding can be utilized to make gas-or liquid tight joints in an assortment of sheet metal manufactures. Steel fuel tanks for engine vehicles are a prime model. It is likewise utilized in making tin jars, steel drums and local radiators.

The procedure loans itself especially to welding creases which are straight or have a normal ebb and flow: sudden changes in the weld line in any plane ought to be maintained a strategic distance from. Welding isn't conceivable into interior corners or where different highlights of a part deter access for the wheel anodes.

Access to the two sides of the joint is vital, and a lap joint design is for the most part required. Segments containing two half shells might be welded, for instance oil tanks or residential

radiators. On the other hand, sheet can be moved into tubular shape and the longitudinal crease welded, as in tin jars or steel drums.

- Opposition welding is broadly utilized in car ventures.
- Projection welding is generally utilized underway of nut and screw.
- Crease welding is utilized to deliver spill demonstrate joint required in little tanks, boilers and so on.
- Streak welding is accustomed to welding channels and tubes.

Conclusion

In the past century, the methods of welding have seen quite a development. it has found its application in large number in the industries. and the future of resistance welding includes further development in the technique as long as we are in the need of a lightweight and strong permanent joint in sheet metals. the problem of checking joint after the joining process is quite difficult for the welding as compared to the checking of the riveted joints this inspection process should see the advancement by application of advanced techniques. the other problem being how difficult is to transport the equipment of the spot welding around even the workshop let alone different manufacturing points. this problem has a solution we come up with equipment which is concise and easy to operate.

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