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A Review on Resistance Spot Welding process for Steel Sheets

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A B S T R A C T

The present work aims at critical review of the research article based on the resistant spot welding process. Most of researcher work on the low carbon steel sheet and coated steel sheet. The most important process parameters has been identified in resistance spot welding process. Welding current, weld time and electrode pressure paly very important role to produce the quality of spot weld joints. Quality of spot weld joints evaluates by tensile shear test and nugget size.

Keywords:RSW, Welding current, Weld time, Electrode Pressure

1 Introduction

Welding as it is normally understood today is comparatively a new comer amongst the fabrication processes though smith forging to join metal pieces was practiced even before chirst. Though there are a number of well-established welding process. Welding process is process which is used to join or weld the ferrous alloy and nonferrous alloy with and without using the help of filler material, electrode and pressure.

1.1 Welding process classification

Welding process can be divide in different categories as shown below in Figure

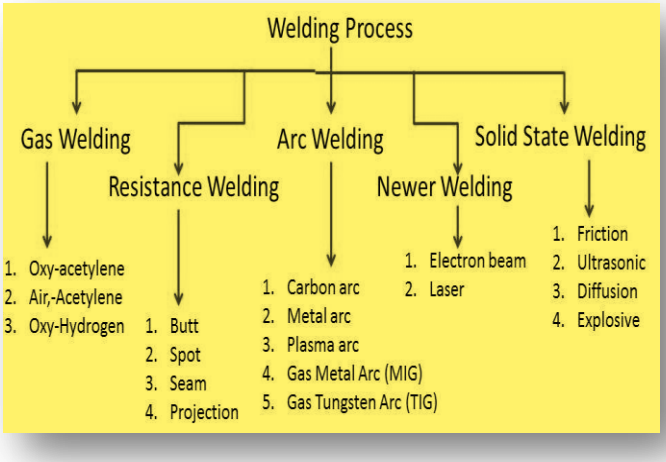

Figure 1 Classification of welding process

1.2 Resistance Welding Process

1.2.1 Resistance spot welding process

Resistance Spot Welding (RSW) is utilized to joint sheet metal sheets up to 3.2 mm thickness, when the plan allows the utilization of lap joints and release tight creases won't be needed. Once in a while the cycle is utilized to join steel plates 6.35 mm thick or thicker; in any case, stacking of such joints is restricted and the joint cross-over adds weight and cost to the get together when contrasted with the expense

of a bend welded butt joint. The vast majority of the auto businesses use RSW process as it is effortlessly robotized and burns-through no filler material. In addition, the cycle requires extremely less administrator's ability. In RSW, the weld piece is created at the faying surface of metal sheets by the hotness produced because of the electrical opposition presented by the metal sheets. The hotness created in the process is sufficient to soften and combine the faying surfaces. The all out heat age in the process increments with the increment in the welding current.

The process is used in preference to mechanical fastening, such as riveting or screwing, when disassembly for maintenance is not required. It is much faster and more economical because separate fasteners are not needed for assembly.

Spot welding is used extensively for joining low carbon steel sheet metal components for Automobiles, Cabinets, Furniture, and similar products. RSW also used to weld stainless steel, aluminum, and copper alloys. Now a day many application of spot welded structure are use in load bearing condition and their mechanical strength has a strong effect on the integrity of the whole structure.

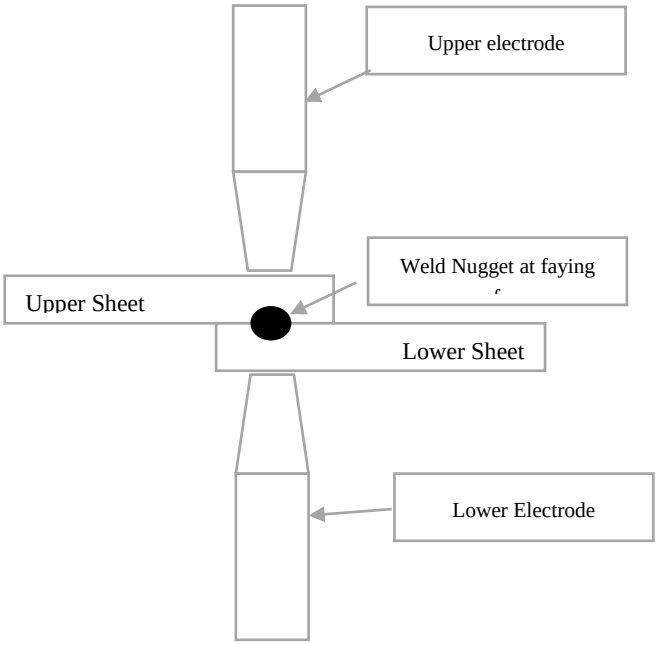

Figure 2 Schematic of RSW Process

2. Critical Literature Review

Input process parameters play very important role to produce the quality of spot weld joint for similar and dissimilar material. According to the literature review, the following the most input process parameter of resistance spot welding process are given below

- Welding current
- Weld time
- Electrode pressure
- Hold time
- Squeeze time

In the formula, $Q = I^2 R t$, current has a greater effect on the generation of heat than either resistance or time. Therefore, it is an important variable to be controlled. Two factors that cause variation in welding current arc fluctuations in power line voltage and variations in the impedance of the secondary circuit with AC machines. Impedance variations are caused by changes in circuit geometry or by the introduction of varying masses of magnetic metals into the secondary loop of the machine. Direct current machines are not significantly affected by magnetic metals in the secondary loop and are little affected by circuit geometry. In addition to variations in welding current magnitude, current density may vary at the weld interface. This can result from shunting of current through preceding welds and contact points other than those at the weld. An increase in electrode face area, or projection size in the case of projection welding, will decrease current density and welding heat. This may cause a significant decrease in weld strength [1].

The rate of heat generation must be such that welds with adequate strength will be produced without excessive electrode heating and rapid deterioration. The total heat developed is proportional to weld time. Heat is lost by

- Conduction into the surrounding base metal
- Conduction into the electrodes
- A very small amount is lost by radiation.

Above three losses increase with increases in weld time and in metal temperature, but they are essentially uncontrollable [1].M. Veral et al. They performed the experiments with two different steel sheet. One is the zinc coated steel sheet and another one is the austenitic stainless steel sheet. They performed the experiments to produce the spot weld joint. After that they cut the sample form the center of weld nugget to observe the structure of generated spot welded joints.

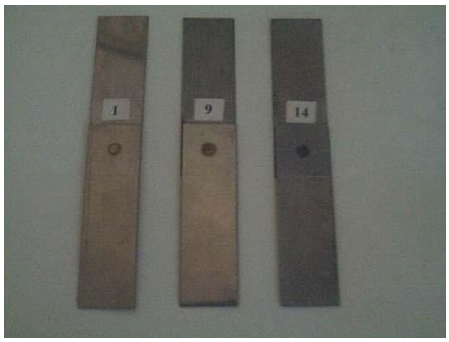

Figure 1 Spot welded sample for analysis [1]

Boriwal L et al [2] the author's did experimentation work on 0.8 mm galvanized steel sheet. They developed the design matrix for theexperimentation. Furthermore they did tensile shear strength and peel strength test to evaluate the joint strength of the galvanized steel sheet.

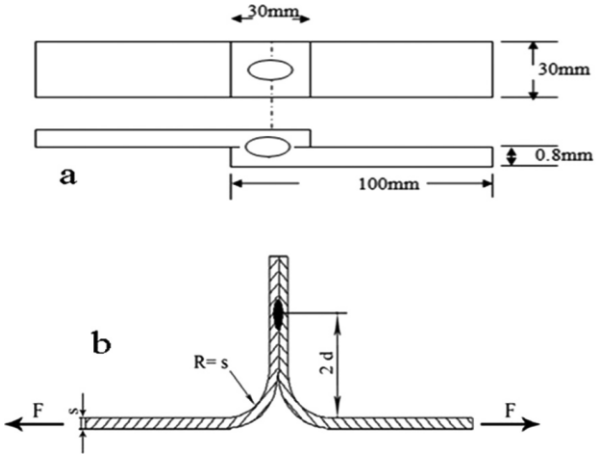

Figure 2 Dimension for tensile shear strength and peel strength sample

Luo Yi et al [4] they did the experimentation to developed the spot welded joints of galvanized steel sheet. Furthermore, they used their results to develop the regression model. The investigational results presented that there was a more precise prediction on nugget size and mechanical properties of spot welds by the models optimized.Gupta and Parmar [8] have used the fractional factorial technique 25 to develop mathematical models to predict the weld bead geometry and shape relationships for the SAW of micro alloyed steel; the thickness ranged between 10 and 16 mm. They investigated bead penetration, weld width, reinforcement; dilution, width/penetration, and width/reinforcement as affected by wire feed rate, open circuit voltage, nozzle-to-plate distance, welding speed and work piece thicknessMohammed B et al. [9] they combined the box bhenken design technique with the response surface methodology to optimization of the photo catalytic mıneralızatıon of C.I. basıc red 46 dye from aqueous solutıon. They have selected the input process parameters i.e. initial concentration of the dye, flow rate, and UV intensity on mineralization effectiveness.

Conclusions

The following conclusion has been drawn from the literature review

Welding current, weld time and electrode pressure is most important process parameter to produce quality of weld joints. Welding current increasing increases the weld strength and weld structure. Similarly, weld time performed for the quality of joint. But as increasing theelectrode pressure decreases the strength and structureof joint

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