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Effect of Welding Current on Resistance Spot Welding Process for IFHS

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A B S T R A C T

The present work aims is to experimental investigate the effect of welding current onIFHS for nugget formation. Initially, pilot experiments has been conducted to identify the range of welding current for the IFHS steel sheet. After that the set of combination of remaining process parameters has been developed. By using the above, set of input process parameters, main experiment has been conducted. Metallography process has been applied for the evaluate the structure of nugget size

Keywords:RSW, Welding Current,Nugget Size, IFHS

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. 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.

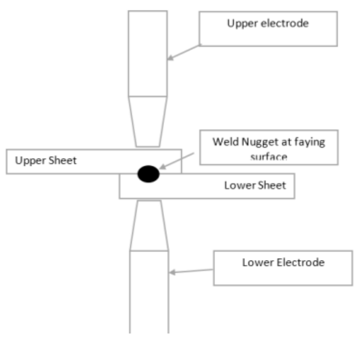

Figure 1 Schematic of resistance spot welding process

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].

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.Boriwal et al [3] determined the effect of input process parameters of weld bonded joints on the dissimilar metal sheet. They used 304 L austenite stainless steel sheet and low carbon steel sheet for the experimentation. They applied the adhesive between the faying surfaces of the steel sheet. Equal amount of adhesive was applied over it.In this study, interstitial free high strength steel sheet has been used to perform the effect of input process parameters on the quality of spot welded joints

2. Experimentation process

In this research work, the range and level of input process parameters has been identified by using the pilot experiments. Pilot experiments is a systematic process to investigate the level and range of process parameters for a defined material. In this experiments, only one variable vary at one time and reaming variables keep constant.Full Factorial (FFD) Design matrix has been developed to crate the set of combination of input process parameters of resistance spot welding process. Table 1 shown the design matrix for experimentation. Resistance spot welder machine has been used for the analysis purpose. Table 1shown the range and the level of input process parameters for the design of experiments. Based on Table 1 27 set of all possible combination of input process parameters has been developed for the main experimentation

Table 1 Range and its level

Levels	Welding current (kA)	Weld cycle (ms)	Electrode pressure (kg/cm2)
Low	6.5	180	2
Medium	7.5	240	3
High	9	300	4

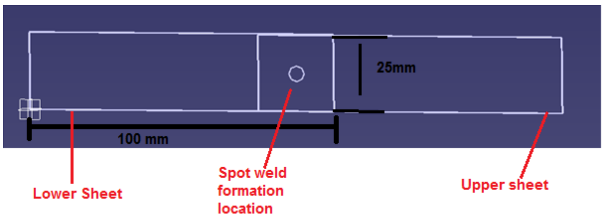

Figure 2 Schematic of spot welded joint

3. Results and Discussion

The based on the design of experiment, the spot welded experiments has been developed. Total 27 set of experiments has been conducted and each set has repeated three time to take average value of nugget size. Because of due to environment effect and machine factor those are uncontrollable. So that the average value give output close response. Figure 2 shown the effect of welding current on nugget size. Weld time and electrode pressure has been keep constant at each level of welding process parameters. It has been observed that increasing the welding current form 6.5 kA to 9.0 kA increases the nugget size from 1.87 mm to 6.59 mm. It is due to increasing the molten metal volume of base metal as increasing the welding current form 6.5 kA to 9.0 kA results, increase the size of nugget size.

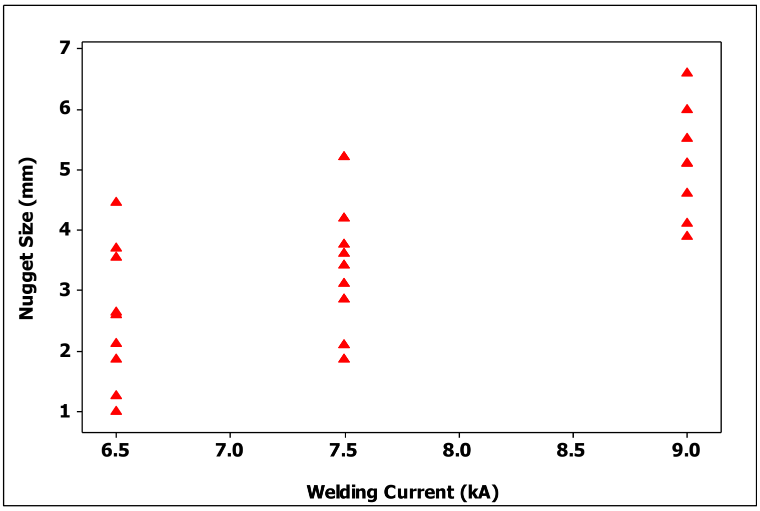

Figure 3Effect of welding current on nugget size

Microstructure of Nugget Size of spot welded joint

Three different type of zone has been observed from the microstructure analysis
Nugget Size
Heat affected zone (HAZ)
Base Material (IFHS)

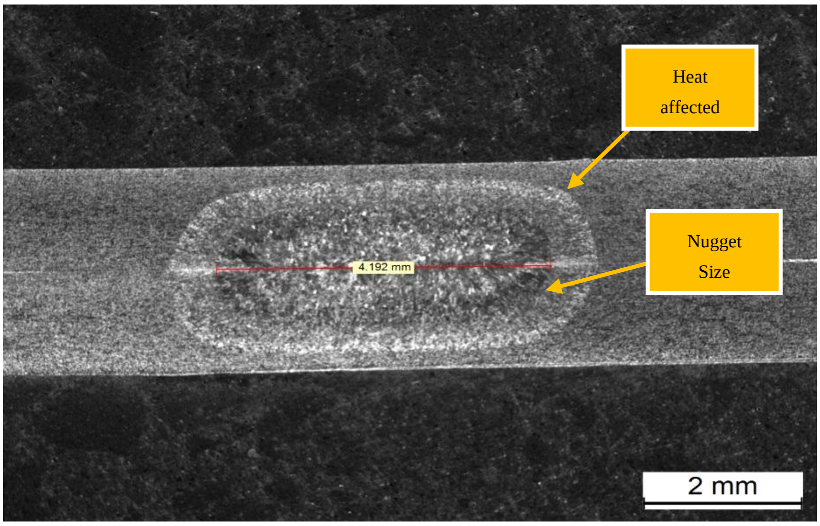

Figure 4 Microstructure of spot welded joint of IFHS

Conclusion

The following conclusion has been draw for the results of nugget size of spot welded joints of IFHS

Increasing the welding current form 6.5 kA to 9 kA, increases the nugget size. Below the 6.5 kA no nugget formation occurs and above 9 kA, expulsion of molten metal starts.Increasing the weld time increases the nugget formation.

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