

Resistance Spot Welding

Process Summary

Resistance spot welding (RSW) is a welding process in which contacting metal surfaces are joined together by the heat generated from the resistance heating at the interfaces. Work-pieces, normally sheet materials, are held together under pressure exerted by electrodes. Typically, the sheets are in the 0.5 to 3 mm thickness range. The process uses two shaped copper alloy electrodes to concentrate welding current into a small "spot" and to simultaneously clamp the sheets together. Forcing a large current through the spot will melt the metal at the welding interface and form the weld.

Process Advantages

The main advantages of RSW include:

1. No filler material required.
2. Same equipment capable for different materials and stacks.
3. Ability to join with lubricants and adhesives;
4. Easy for automation and process monitoring;
5. Short cycle time, 1-2 s;
6. Good joint strengths.

HVM capability

The HVM Catapult RSW capability is located at WMG, the University of Warwick, with an ABB robot mounted ARO gun with Matuschek controller. Details of the specifications are given in the table below. The system is a medium frequency DC welding system with an automatic electrode buffering system specially designed for welding aluminium structures. This system is currently used for welding aluminium body-in-white (BIW) structures with adaptive control.

Table 1 Specifications of RSW systems

RSW system	
Electrodes	Water cooled
Maximum current	53 kA
Maximum clamping force	8000 N
'C' frame depth	Large (~650 mm)

Typical applications

The most common application of RSW is in automotive industry. RSW is widely used for joining steel BIW structures in automotive. For joining aluminium structures, RSW has some difficulty due to the high thermal and electrical conductivity of aluminium. Aluminium alloys can react with the copper electrode to form intermetallics on the electrode tips, which will deteriorate electrode quality. However, with the development of the controlling technology and electrode buffering system, nowadays, it can also be used to join lightweight aluminium structures. Adhesive can be used together with RSW to produce sealed structures.

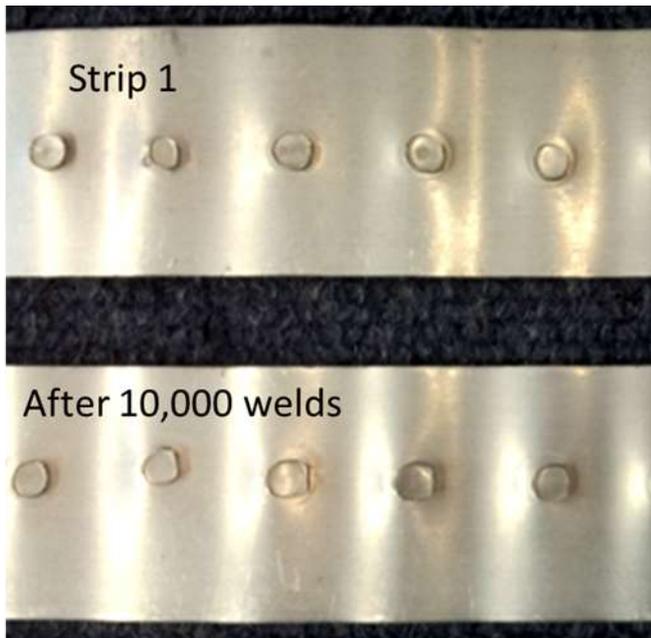


Figure 1 The nuggets of RSW welded aluminium strips showing joint consistence with the automatic electrode buffing.



Figure 2 WMG RSW welding system.

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