Resistance seam welding

Description

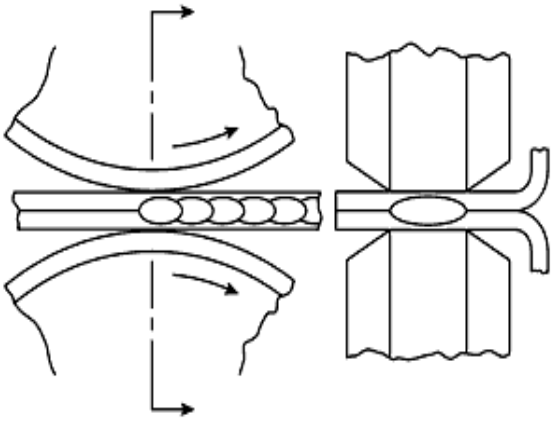
The seam welding process is an adaptation of resistance spot welding and involves making a series of overlapping spot welds by means of rotating copper alloy wheel electrodes to form a continuous leak tight joint. The electrodes are not opened between spots. The electrode wheels apply a constant force to the work pieces and rotate at a controlled speed. The welding current is normally pulsed to give a series of discrete spots, but may be continuous for certain high speed applications where gaps could otherwise occur between individual spots. Seam welding equipment is normally fixed and the components being welded are manipulated between the wheels. The process may be automated; see below.

Conventional wide wheel seam welding

Current status

There are a number of process variants for specific applications:
Wide wheel seam

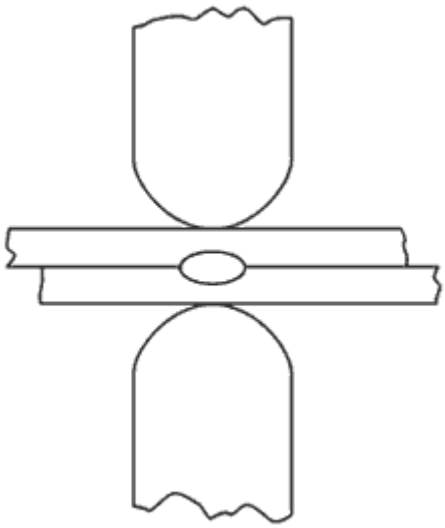
- Wheel contact width normally 5 $\sqrt{}$ t mm flat (where t is single sheet thickness in mm).
- General purpose welding (domestic radiators up to about 6 m/min).



Wide wheel seam

Narrow wheel seam

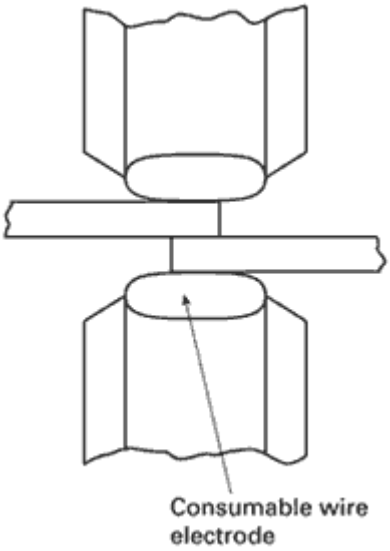
- Wheel contact shape typically 6mm radius.
- Knurl drive on wheel edge with contact surface continuously planished.
- Controls electrode contamination when welding coated steels, such as for vehicle fuel tanks.



Narrow weld seam

Consumable wire seam welding

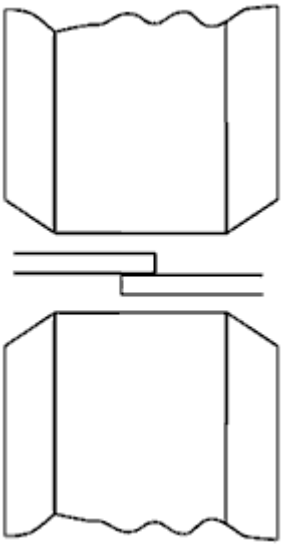
- Shaped, consumable copper wire fed between the wheels and sheets to be joined to give consistent clean contact.
- Used for welding coated steels such as tin cans and vehicle fuel tanks.



Consumable wire seam

Mash seam welding

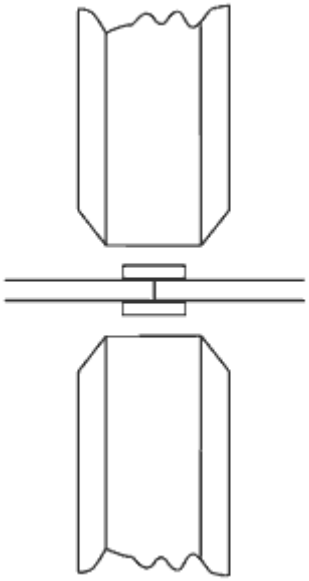
- Narrow overlap of sheet edges, which are partly crushed together during welding.
- High speed welding of tin cans and drums (0.2mm tinplate up to 100m/min).
- Wide wheel or consumable wire processes used.



Mash seam welding

Foil butt seam welding

- Foil welded on to each side of the butted edges of the sheets to be joined.
- Typically 4mm wide stainless steel foil used to preserve corrosion resistance on coated steel.
- Virtually flush finish with no crevice and used to produce wide panels.



Foil butt seam welding

Important Issues

The main issues concerning seam welding are in weld quality control and welding speeds.

- High speed welding of coated steels is of particular importance in manufacture of tin cans. Specialist consumable wire seam welding machines are used. Quality monitors have been developed for these applications and welding speeds up to about 100m/min are possible. Steels with alternative coatings to tin, for canning applications, present difficulties due to their high surface resistance.
- Weld quality is controlled mainly by tight process control together with periodic testing of samples. Factors such as material and pressing quality, and alignment of the electrodes to the material, are critical to achieve high speed, quality welding, for example in coated steels for fuel tanks.

Benefits

Seam welding enables high welding speeds to be obtained compared with many other techniques, but can be limited by component shape and wheel access.

Risks

There are some limitations on material weldability but attention to correct setting up and good process control can solve most production problems. The main hazards are: (i) the risk of crushing fingers or hands; and (ii) burns or eye damage from splash metal. Little fume is produced but may need attention when welding coated steels or when oils or organic materials are present.

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