Spot Welding

Instrumental technique

Soumabha Bag
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Introduction:

- Welding is a fabrication or sculptural process that joins materials, usually metals, by causing coalescence.

- This is in contrast with soldering and brazing, which involve melting a lower-melting-point material between the workpieces to form a bond between them, without melting the workpieces.

- Welding often done by melting the workpieces and adding a filler material to form a pool of molten material that cools to become a strong joint, with pressure sometimes used in conjunction with heat, to produce the weld.

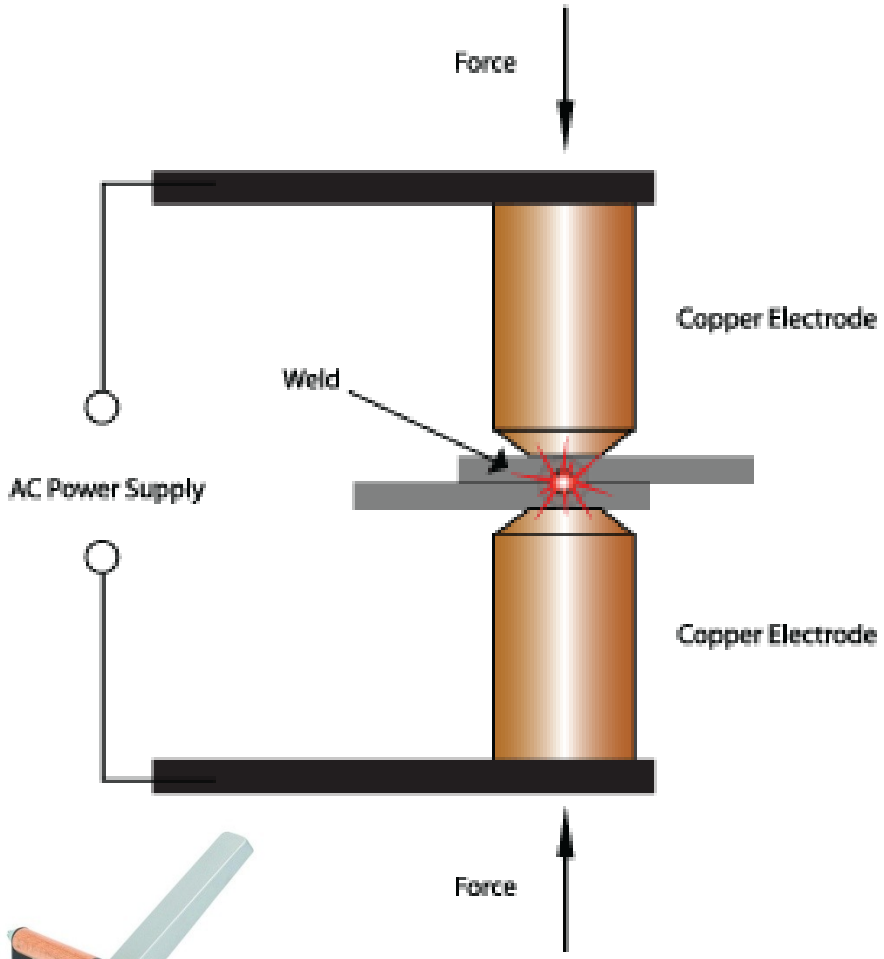
- Many different energy sources can be used for welding, including a gas flame, an electric arc, a laser, an electron beam, friction, and ultrasound.

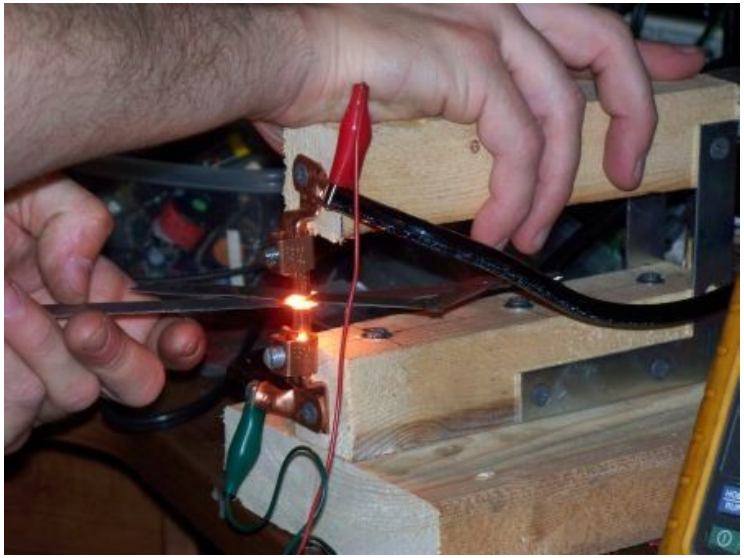
- Welding technology advanced quickly during the early 20th century during World War I and World War II.

- Spot welding is a process in which contacting metal surfaces are joined by the heat obtained from **resistance** to electric current.

http://en.wikipedia.org/wiki/Spot_welding

Schematic presentation:





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http://en.wikipedia.org/wiki/Spot_welding

Scientific details:

- The amount of heat (energy) delivered to the spot is determined by the resistance between the electrodes and the amperage and duration of the current.

- The amount of energy is chosen to match the sheet's material properties, its thickness, and type of electrodes.

- Applying too little energy won't melt the metal or will make a poor weld.

- Applying too much energy will melt too much metal, eject molten material, and make a hole rather than a weld.

- Energy delivered to the spot can be controlled to produce reliable welds.

http://en.wikipedia.org/wiki/Spot_welding

Process:

Step 1: Work-pieces are held together under pressure exerted by electrodes.
Step 2: Then The current from the electrodes is applied briefly.
Step 3: After that the current is removed but the electrodes remain in place for the material to cool.

- Typically the sheets are in the 0.5 to 3 mm (0.020 to 0.12 in) 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 and form the weld.

- The important feature of spot welding is a lot of energy can be delivered to the spot in a very short time (approximately ten milliseconds). That permits the welding to occur without excessive heating to the remainder of the sheet.

Tool style:

- The electrodes generally are made of a low resistance alloy, usually copper.

- These are designed in many different shapes and sizes depending on the application needed.

- Radius style electrodes are used for high heat applications.

- Electrodes with a truncated tip for high pressure.

Electrical requirement:

The basic spot welder consists of a **power supply**, an energy storage unit (e.g., a capacitor bank), a **switch**, a **welding transformer**, and the **welding electrodes**.

Effects:

It hardens the material, cause it to warp, reduce the material's fatigue strength, and may stretch the material as well as anneal it.
The physical effects of spot welding include internal cracking, surface cracks and a bad appearance.

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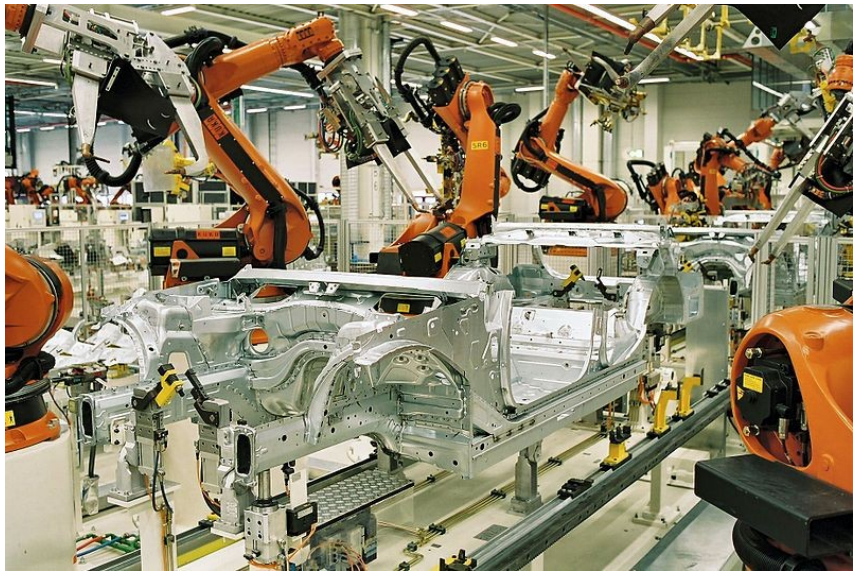
Application:

- Spot welding is typically used when welding particular types of sheet metal.

- It can be easily identified on many sheet metal goods, such as metal buckets.

- Spot welding is used heavily in the automobile manufacturing industry, where it is used almost universally to weld the sheet metal to form a car.

- It is also used is in the orthodontist's clinic, where small scale spot welding equipment is used when resizing metal "molar bands" used in orthodontics.



BMW plant in Leipzig, Germany where spot welding robots are used to make car bodies.

- It is used in spot welding straps to nickel-cadmium or nickel-metal-hydride cells to make batteries where cells are joined by spot welding thin nickel straps to the battery terminals.

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Thank you