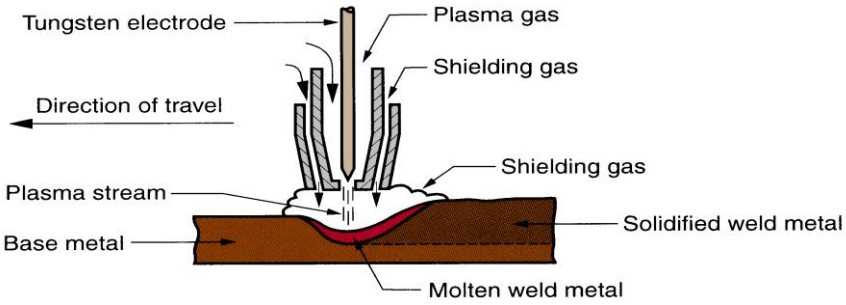
Types of Welding III

Plasma Arc Welding (PAW)

Special form of GTAW in which a constricted plasma arc is directed at weld area

- Tungsten electrode is contained in a nozzle that focuses a high velocity stream of inert gas (argon) into arc region to form a high velocity, intensely hot plasma arc stream
- Temperatures in PAW reach 28,000°C (50,000°F), due to constriction of arc, producing a plasma jet of small diameter and very high energy density



Resistance Welding (RW)

A group of fusion welding processes that use a combination of heat and pressure to accomplish coalescence

- Heat generated by electrical resistance to current flow at junction to be welded
- Principal RW process is resistance spot welding (RSW)

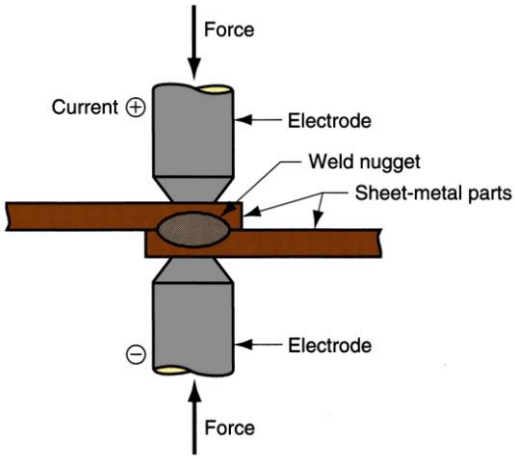


Fig: Resistance welding, showing the components in spot welding, the main process in the RW group.

Components in Resistance Spot Welding

- Parts to be welded (usually sheet metal)
- Two opposing electrodes
- Means of applying pressure to squeeze parts between electrodes
- Power supply from which a controlled current can be applied for a specified time duration

Advantages

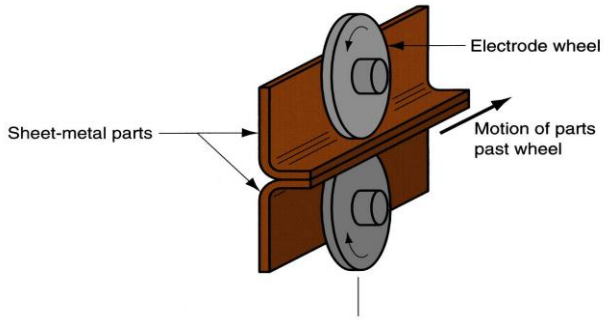
- No filler metal required

- High production rates possible
- Lends itself to mechanization and automation
- Lower operator skill level than for arc welding
- Good repeatability and reliability

Disadvantages

- High initial equipment cost
- Limited to lap joints for most RW processes

Resistance Seam Welding



Electron Beam Welding (EBW)

Fusion welding process in which heat for welding is provided by a highly-focused, high-intensity stream of electrons striking work surface

- Electron beam gun operates at:
  - High voltage (e.g., 10 to 150 kV typical) to accelerate electrons
  - Beam currents are low (measured in milliamps)
- Power in EBW not exceptional, but power density is

Advantages

- High-quality welds, deep and narrow profiles
- Limited heat affected zone, low thermal distortion
- High welding speeds
- No flux or shielding gases needed

Disadvantages

- High equipment cost
- Precise joint preparation & alignment required
- Vacuum chamber required
- Safety concern: EBW generates x-rays

Laser Beam Welding (LBW)

Fusion welding process in which coalescence is achieved by energy of a highly concentrated, coherent light beam focused on joint

- Laser = "light amplification by stimulated emission of radiation"
- LBW normally performed with shielding gases to prevent oxidation

- Filler metal not usually added
- High power density in small area, so LBW often used for small parts

Comparison: LBW vs. EBW

- No vacuum chamber required for LBW
- No x-rays emitted in LBW
- Laser beams can be focused and directed by optical lenses and mirrors
- LBW not capable of the deep welds and high depth-to-width ratios of EBW
    - Maximum LBW depth = ~ 19 mm (3/4 in), whereas EBW depths = 50 mm (2 in)

Source : http://nprcet.org/e%20content/mech/MT.pdf