WELDING

Welding is a fabrication method in which two or more parts are fused together using heat, pressure, or both, resulting in a join as the parts cool. Welding is primarily employed on metals and thermoplastics, although it can also be used on wood. A weldment is the term used to describe a fully welded junction.

Some materials necessitate the use of specific methods and techniques. A number are classified as 'unweldable,' a phrase not commonly encountered in dictionaries yet useful and descriptive in engineering.

The portions that are linked are referred to as parent material. The material used to assist create the joint is known as filler or consumable. These materials may be referred to as parent plate or pipe, filler wire, consumable electrode (for arc welding), and so on.

Consumables are often chosen to be identical in composition to the parent material, resulting in a homogeneous weld; but, in some cases, such as when welding brittle cast irons, a filler with a radically different composition and, consequently, characteristics is utilized. These welds are said to as heterogeneous.

TERMINOLOGY:

Parent metal

The parent metal can be connected or surfaced using welding, brazing, or other methods.

Filler metal

Filler metal is introduced during welding, brazing, or surfacing processes.

Weld Metal

All metal melted during the welding process and retained within the weld.

The Heat impacted Zone (HAZ) refers to the section of the parent metal that is metallurgically impacted but not melted during welding or thermal cutting.

In fusion welding, the fusion line is the boundary between the weld metal and the heat-affected zone (HAZ). This is not a conventional term for a weld joint.

Weld Zone

The Weld Zone includes the weld metal and the HAZ.

Weld Face

The surface of a fusion weld that is exposed on the side from whence it was formed.

Weld Root Zone

Weld Root Zone is located on the side of the first run away from the welder.

Weld toe

Weld toe refers to the boundary between a weld face and parent metal, or between runs. This is a crucial aspect of a weld because toes are high stress concentration locations that are frequently used as starting points for various types of cracks (for example, fatigue cracks and cold cracks).

To avoid stress concentration, toes should integrate nicely into the parent metal surface.

Excess weld

Weld metal outside the plane, attaching the toes. Other nonstandard titles for this characteristic include reinforcement and overfill.

Layer

Layer is a weld metal stratum made up of many runs.

Runpass

The metal melted or deposited during a single passage of an electrode, torch, or blowpipe.

TYPES OF WELDING :

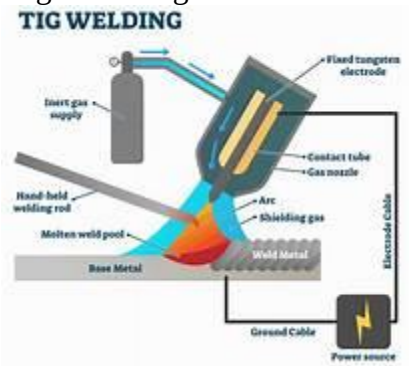
1. **MIG Welding**

   MIG welding refers to metal inert gas welding. This MIG welding procedure is also known as gas metal arc welding (GMAW), or wire welding.

   In this method of welding, a thin wire serves as the electrode, feeding from a spool attached to a gun through a flexible tube and exiting the nozzle of the welding gun or torch. When you pull the welding gun's trigger, the wire is fed constantly.

2. **TIG Welding**

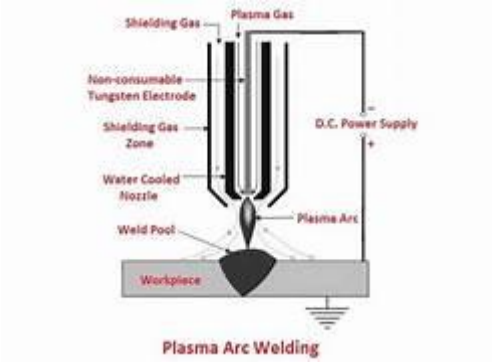
   TIG welding is an abbreviation for tungsten inert gas arc welding, commonly known as GTAW by the American Welding Society. This welding procedure is also known as gas welding.



   TIG welding uses a tungsten electrode because it has a high melting point. When the tig weld electrode becomes hot but does not melt, we say it is not consumable. Non-consumable electrodes do not indicate they do not endure forever; rather, they do not melt and become part of the weld.

3. **Plasma Arc Welding**

Plasma arc welding (PAW) is an arc welding technology that uses heat created by a compressed arc between a tungsten non-consumable electrode and a workpiece (transferred arc process) or a water-cooled constricting nozzle (non-transferred arc process).

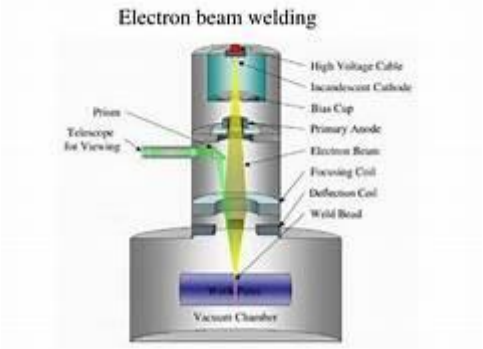


Plasma Arc Welding

The plasma is a gaseous mixture of positive ions, electrons, and neutral gas molecules. The transferred arc technique generates high-energy density plasma jets that can be used to weld and cut ceramics, copper alloys, steels, aluminum, nickel alloys, and titanium alloys.

4. **Electron beam Welding**

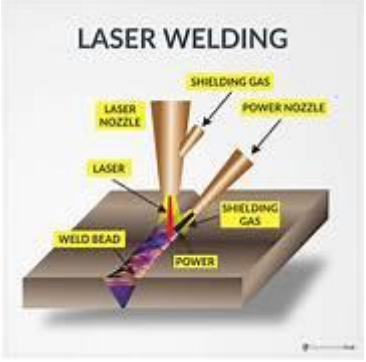
Electron beam welding is a welding technique that uses the heat generated by a beam of high-energy electrons. When electrons strike the workpiece, their kinetic energy is transformed into thermal energy, which heats the metal and allows the workpiece's edges to be linked, resulting in a weld after freezing.



EBM is also a liquid-state welding method. Metal-to-metal joints are formed in a liquid or molten state. It is sometimes referred to be a welding technique since it accepts electron kinetic energy to unite two metal workpieces.

5. **Laser Beam Welding**

Laser Beam Welding (LBW) is a welding technique in which heat is generated by a high-energy laser beam directed at the workpiece. The laser beam heats and melts the ends of the workpiece, resulting in a junction.

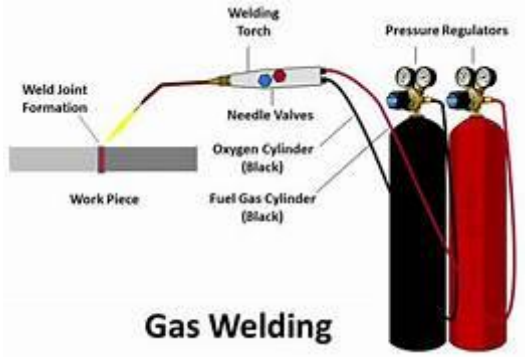


Laser welding (LBM) creates the junction as a series of overlapping spot welds or as a

continuous weld. Laser welding is used in the electronics, communications, and aerospace industries to produce medical and scientific equipment with small components.

6. **Gas Welding**

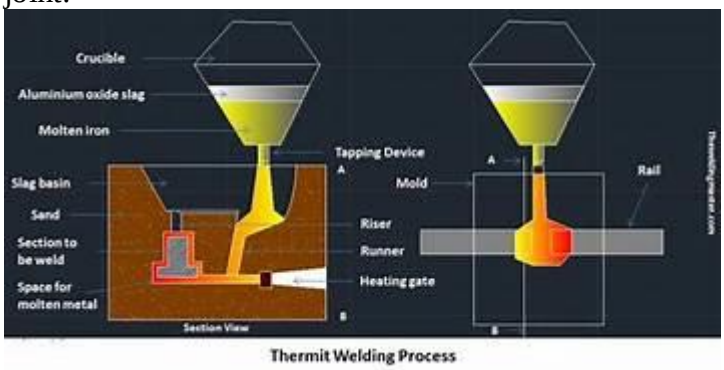
Gas welding is conducted by melting the sides or surfaces joined by a gas flame and allowing the molten metal to flow together, resulting in a solid continuous junction when cooled.



Oxygen-acetylene mixtures are utilized more frequently than others and play an important role in the welding industry. The temperature of the oxy-acetylene flame in its hottest section is around 3200°C, whereas the temperature of the oxy-hydrogen flame is around 1900°C.

7. **Thermit Welding**

Thermit welding employs heat from an exothermic reaction to create cohesion between two metals. Excessive heat melts the metal and exerts it on the appropriate joint surfaces, and when cooled, the liquid metal solidifies to form a solid welding joint.

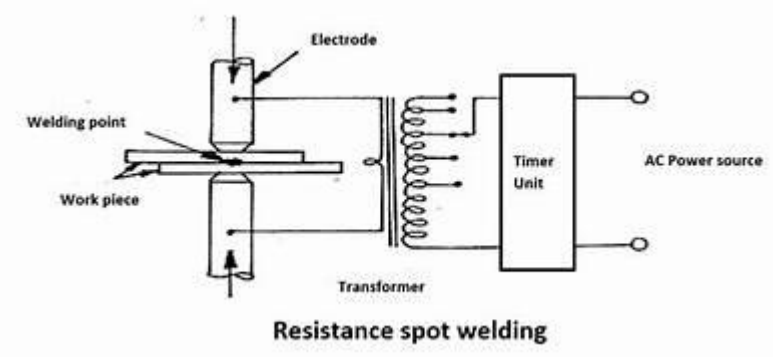


Thermit Welding Process

It is a simple way for combining like and different metals. This welding procedure does not require a power supply and just heats the thermite to 1300 °C. It connects railroads, pipelines, and thick steel pieces.

8. **Resistance Welding**

Resistance welding is a metal joining procedure that involves passing pressure and current through the metal region to be connected over an extended period of time. It is believed to be an efficient welding procedure because it emits no pollutants and uses little power.



Resistance spot welding

Spot welding uses two electrodes, with the point producing heat and fusion when cooled. The primary benefit of resistance welding is that no additional material is required to establish the bond, making the procedure extremely cost-effective.