

Joining of metals

Joining by soldering:

Soldering is a process of joining two metals by using another low temperature metal alloy. The metal used for the joining purpose is called solder.

Soldering is widely used for sheet metal work and in radio and television work for joining wires.

Advantages

1. Joining cost is low
2. Equipment is very simple and cheap
3. Good sealing in fabrication as compared to other processes like rivet, spot weld and bolts
4. Due to low operating temperature the properties of base metal are not affected

Disadvantage

1. Joints formed are weak.

Joining by brazing:

The process of joining two metal surfaces by heating and adding a non-ferrous alloy with melting

point above 400°C is known as **brazing process**.

Brazing is used for electrical items, radiators, heat exchangers, pipes & pipe fittings and tool tips.

Advantages

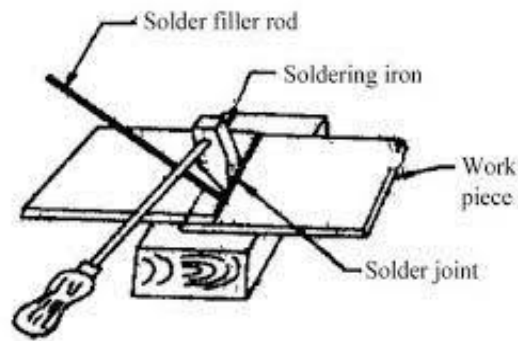
1. It is useful for joining dissimilar metals.
2. Thin sections can be easily joined.
3. Good finish is obtained on joint.
4. Less skill is required.
5. Cost of operation is less as compared to other welding processes.

Disadvantages

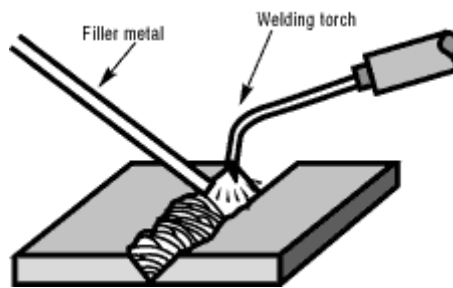
1. Low strength.
2. Not applicable for hardened steel and aluminum alloys.

Different between soldering and brazing:

1. Filler metal has the melting point above 400°C. 1. Filler metal has the melting point below 400°C.
2. More stable joints can be made. 2. Less stable joints can be made.
3. High pressure and temperature do not affect the joint. 3. Joints are affected by high temperature and pressure.
4. Equipment cost is more. 4. Equipment cost is very low.



Soldering process



Brazing process

Welding

Welding: is a process of joining two similar or dissimilar metals with the help of heat or pressure or by some other means. The cost of welding is very less as compared to other processes and forms a strong joint.

The following are the main key features of welding:

1. The welding structures are normally lighter than riveted or bolted structures.
2. The welding joints provide maximum efficiency, which is not possible in other type of joints.
3. A welded joint has a great strength.
4. The welding provides very rigid joints.
5. The process of welding takes less time than other type of joints.

Classification of welding processes:

The welding is divided into following two groups.

1. **Forge or Pressure Welding** (Under pressure without additional filler metal)

- (a) Friction welding
- (b) Electric resistance welding
- (c) Blacksmiths forge welding
- (d) Cold pressure welding

2. Fusion or non-pressure welding (With additional filler material)

- (a) Gas welding (Heat created by Gas)
- (b) Electric arc welding (Heat created by electrically)
- (c) Thermite welding (Heat created by chemical Reaction)

1. Forge welding

Is a solid –state welding process that joins two pieces of metal by heating them to a high temperature and then hammering them together. This process is used for joined similar and dissimilar metals. Manual forge welding has been largely replaced although automated forge welding is common manufacturing process.



Forge welding process

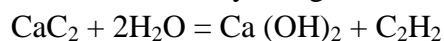
2. Gas welding

Gas welding is the process in which a gas flame is used to raise the temperature of the metals to be joined. The metals are heated up to melting. The metal flows and on cooling it solidifies. A filler metal may be added to the flowing molten metal to fill up cavity made during the end preparation.

Many combinations of gases are used in gas welding. But the most common of these is oxygen and acetylene.

- **Oxy-acetylene welding:**

The process of oxy-acetylene welding can be used for almost all metals and alloys for engineering purposes. A high temperature flame (3200°C) can be produced by this method. The acetylene gas can be obtained from this equation.



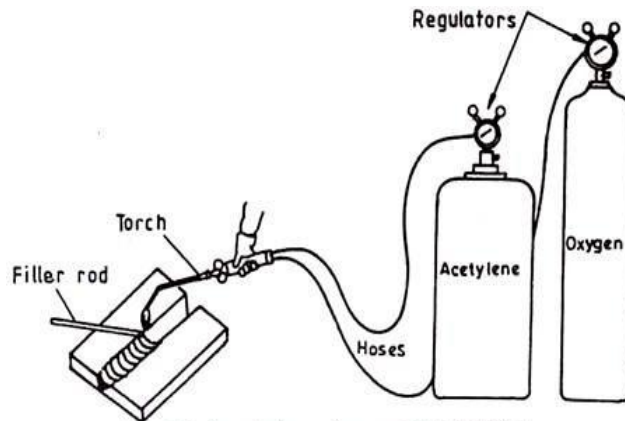


Fig. 2-49 A standard setup for oxy-acetylene welding.

Gas welding

Applications

Oxy-acetylene welding is particularly used for sheet metal work. All the metals can be welded with proper filler metals. Same equipment may be used for cutting purposes.

Advantages of Oxy-acetylene Welding

The main advantages of oxy-acetylene welding are given below:

1. Equipment is cheap as compared to other welding process.
2. It can be used for welding of all types of metals.
3. Maintenance of equipment is very less.
4. It can be used for cutting of metals of small thickness.
5. It is specially used for sheet metal work.

Disadvantages

1. It takes long time for heating the job as compared to the arc welding.
2. The heat affected area is more.
4. Gases are expensive and difficult to store.

Gas welding techniques:

There are two types of gas welding techniques:

1. Left ward welding
2. Right ward welding

1. Left Ward Welding: In this welding the tip of the torch is held at 60 to 70°C to the plates. And the filler rod is inclined at 30 to 40°C in opposite direction.

2. Right Ward Welding: In right ward welding the torch is kept at 40 to 50°C to the job to be welded. Torch is moved towards right.

Gas welding two types

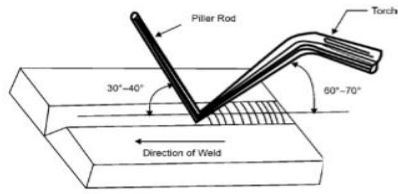


Fig. 7.4: Leftward Welding

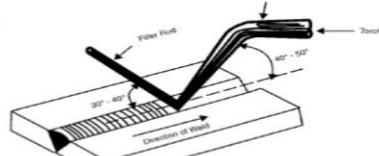


Fig. 7.5: Rightward Welding

Gas welding techniques