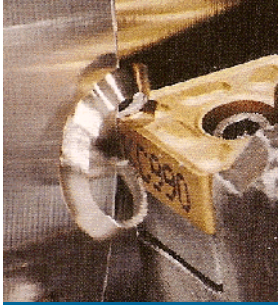


welding





Welding

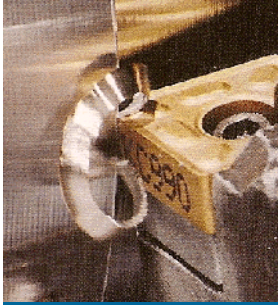
Welding is metallurgical fusion process, where part to be joined by the application of heat and pressure.

- It is used to join the two different parts.
- It is commonly used in the industries.
- **Advantages.**
 - It is used for repair work.
 - Strength of joint is good.
 - They have high corrosion resistance.
 - Welding is used for fluid tight joints.
 - Different types of joints can be done.
 - Welding is economical and cost efficient.



Two Categories of Welding Processes

- Fusion welding - coalescence is accomplished by melting the two parts to be joined, in some cases adding filler metal to the joint
 - Examples: arc welding, resistance spot welding, oxyfuel gas welding
- Solid state welding - heat and/or pressure are used to achieve coalescence, but no melting of base metals occurs and no filler metal is added
 - Examples: forge welding, diffusion welding, friction welding



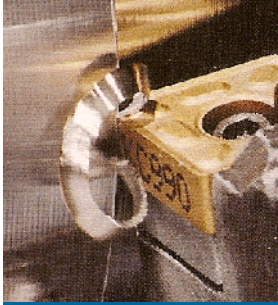
Welding

- **Disadvantages.**

- **It produce harmful radiations.**
- **It produce internal stresses distortion and change in micro structure in welding region.**
- **Previous badge preparation requires.**
- **Require skilled operator.**

- **Applications.**

- **Automobile parts.**
- **Aircraft and ship construction.**
- **Machine frames.**
- **Pipelines.**
- **Tanks and vessels.**



Welding classifications

Fig. 4.1.1. The same can be stated as follows ;

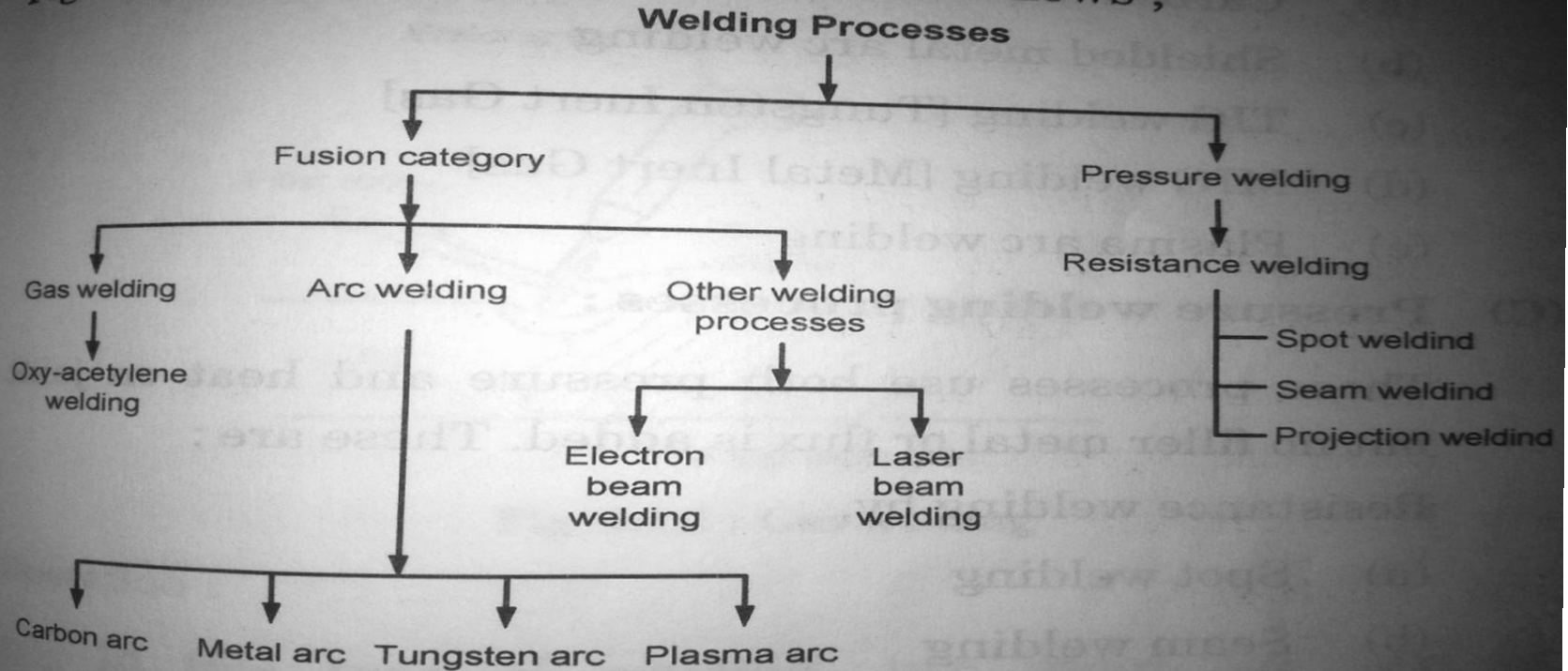
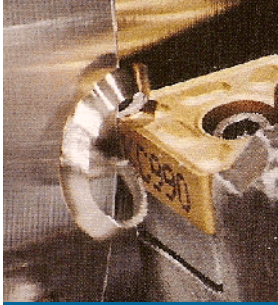
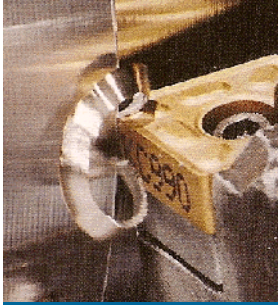


Fig 4.1.1 : Classification of welding processes



Welding Classification

- Gas arc welding.
 1. Oxyacetylene welding.
 2. Pressure gas welding.
- Arc welding.
 1. Carbon arc welding.
 2. Shielded metal arc welding.
 3. TIG welding.
 4. MIG welding.
 5. Plasma arc welding



Welding classification

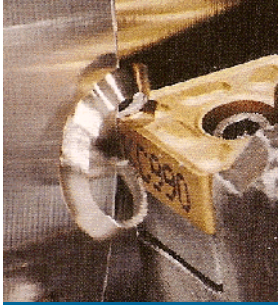
- Pressure welding process

Process requires both heat and pressure for joining. It does not require filler metal.

1. Spot welding.
2. Seam welding.
3. Projection welding.

- Other fusion process.

1. Electron beam welding.
2. Laser beam welding.

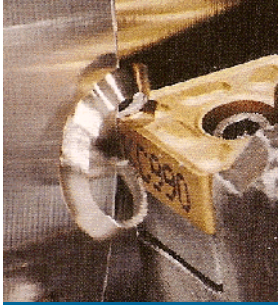


Acetylene gas welding

- In this process oxygen and acetylene gas is used for welding process.
- It rises the temperature of metal above melting point.
- Filler material is used for joining.

Operation

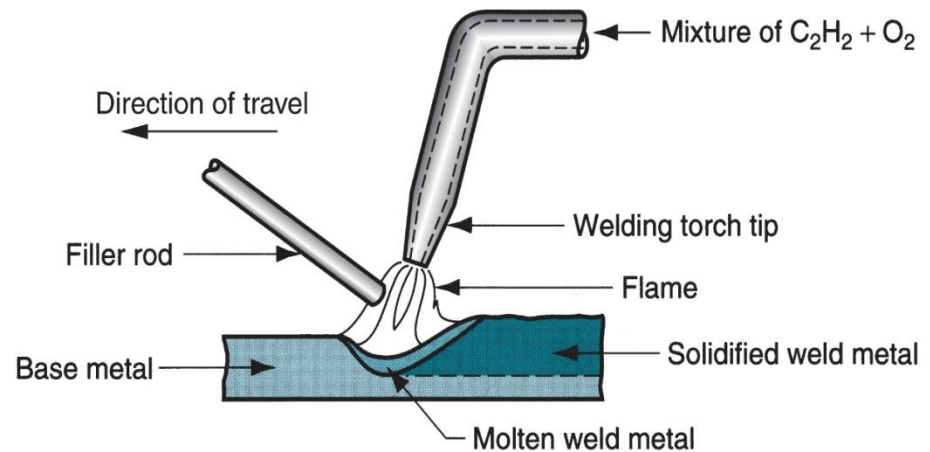
- In this process oxygen and acetylene is used for the welding.
- Oxygen supports the combustion and acetylene gas generate high temp.
- Operation starts with placing the part together which is to be join.
- Oxyacetylene flame heat the metal temp produced is about 3200°C.
- Filler metal is added to the join which join the parts by melting it self.
- filler material is copper coated steel, carbon steel.

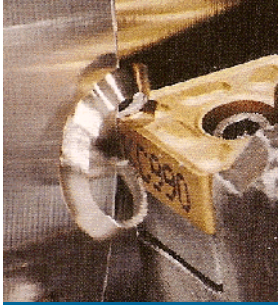


WELDING PROCESSES

- **Advantages.**
- It is used for all types of joints.
- Oxyacetylene flame can be easily controlled.
- Suitable for thin metal sheets.
- Equipment is portable & versatile.

- **Limitations.**
- Method is slower.
- Distortion of workpiece is more.





Types of flames

- **Natural flame.**

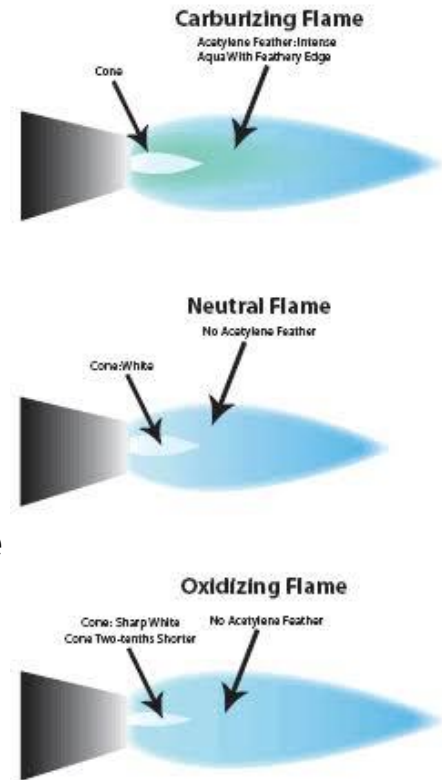
1. All gas is burn
2. gives 100% heat.
3. Ideal flame used in gas welding.

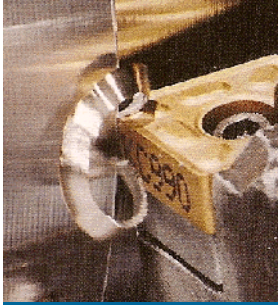
- **Reducing flame.**

1. It consist of inner core intermediate feather and outer flame.
2. It is also called as carburising flame.
3. strong reduction in higher zone due to high amount of acetylene

- **Oxidizing flame.**

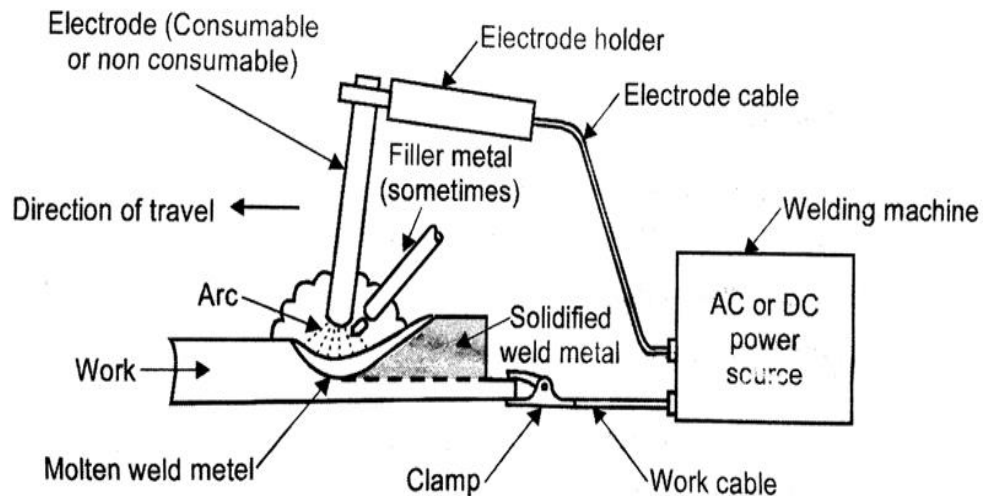
1. It contain more oxygen than any other flame.
2. This is used for oxidizing metal like brass,Zink etc.
3. It is similar to natural flame.

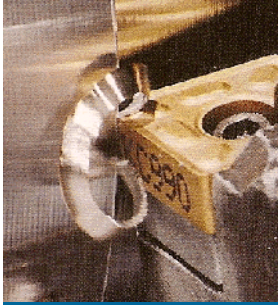




Arc welding

- In this process heat generation takes place by an electric arc.
- Both work piece and electrode is connected to different terminals of AC or DC supply.
- small gap bet work piece and electrode arc is generated.
- It produces temp about 3600°C .
- It having following types.
 1. Carbon Arc welding.
 2. Shielded metal arc welding.
 3. Gas shielded arc welding.
 4. Plasma arc welding.





Shielded metal arc welding

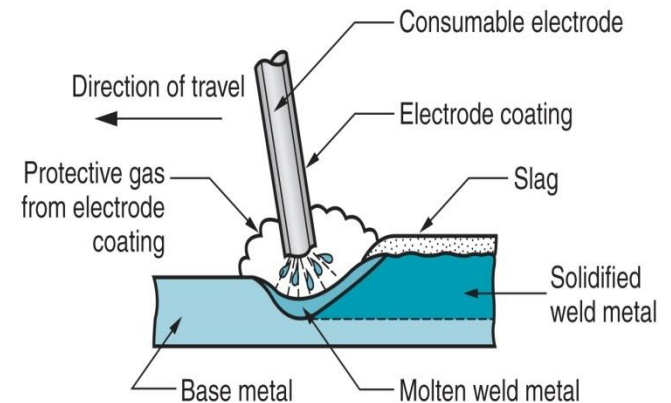
- In this electric arc is used for the welding purpose.
- flux coated electrode is used for the welding.
- flux gives stability to protection to weld metal.
- during welding electrode is melt and serve as filler material.
- flux over the electrode is also get melt to form coating over the weld material.

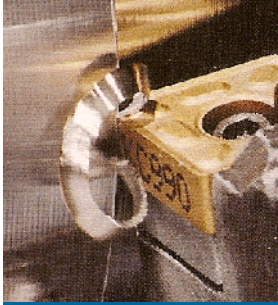
- **Advantages.**

- Simple process.
- welding equipment's are portable and less costly.
- Metal and alloy can be welded.
- Applicable in any position.

- **Disadvantages.**

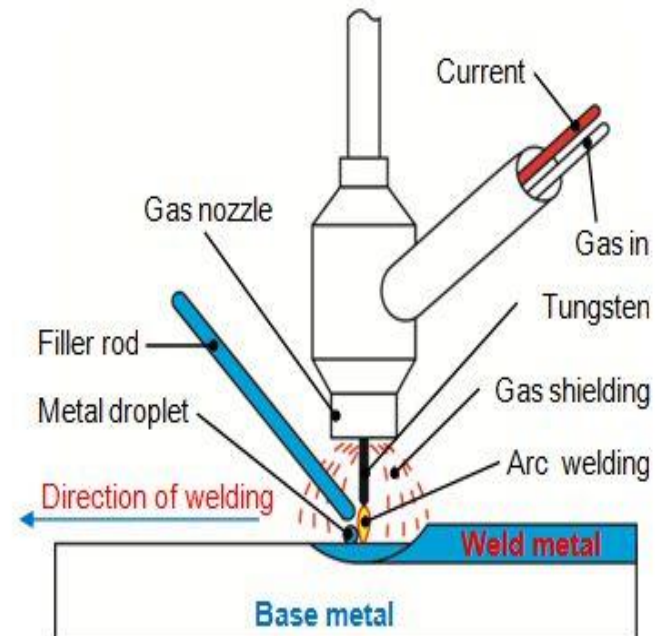
- Automatic welding is difficult because of short electrode.
- Process is slow.
- Welding defects are more during replacement of electrode.

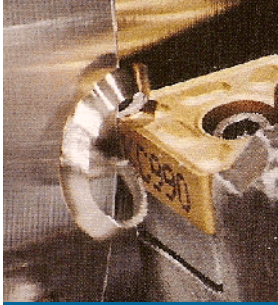




Tungsten inert gas welding(TIG)

- It is also called as gas tungsten arc welding.
- inert gas is act as shield and keep contaminant away from welded metal.
- Electrode does not melt during welding.it is non consumable electrode.
- filler material added separately.
- Inert gas used is argon.
- **Advantages.**
- Slag free operation due to absence of flux.
- different materials can be welded.
- no cleaning requires.
- **Disadvantages.**
- Equipment cost is high.
- slow process.
- Filler material requires



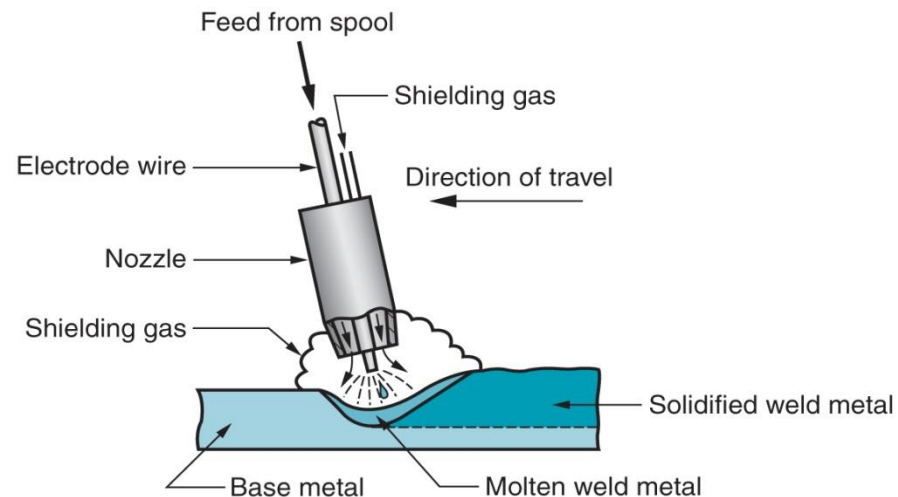


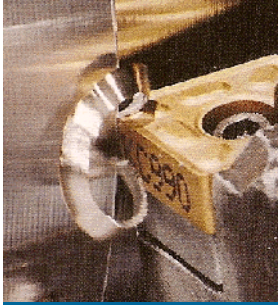
Metal inert gas welding (MIG)

- It is also known as Gas metal arc welding (GMAW).
- In this process weld joint is produced by heating the metal with electric arc.
- The filling wire is continuously feed from wire reel at constant rate.
- wire is feed though the rollers at constant rate.
- Instead of flux ineart gas is supplied through welding torch.
- welding torch is connected to cylinder of unwary gas like argon

Advantages.

- slag inclusion are not occurs.
- Continuous feed makes process faster.
- Less skilled operator is required.
- thick sheets can be welded.



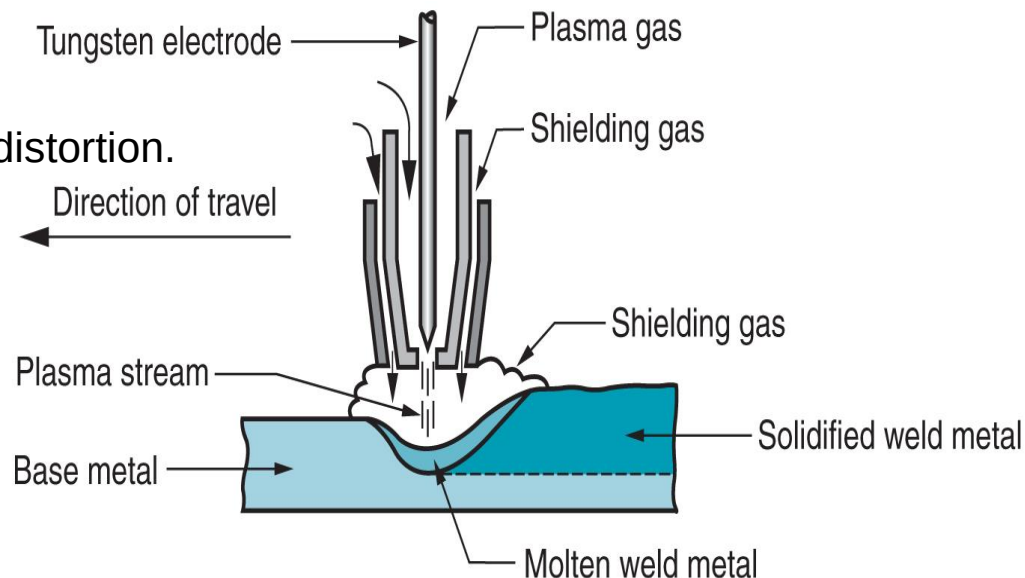


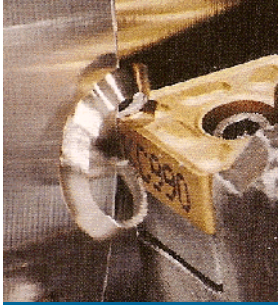
Plasma arc welding

- Plasma is heated ionized gas enable it to conduct electric current.
- Plasma arc is narrow restricted electric arc passes through water cooler orifice.
- It consist of non consumable tungsten electrode and shielding gas like argon.
- Argon gas flows through the orifice to form plasma.
- the temperature of plasma is about 10000°C.

- **Advantages.**

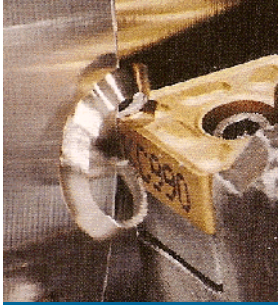
- Weld uniform throughout.
- greater depth of welding with less distortion.
- proper control on heat.
- metal disposition rate is high.





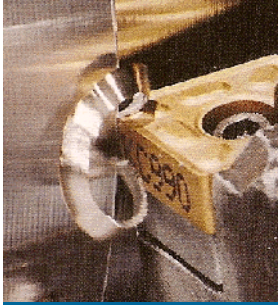
Plasma arc welding

- Limitations.
- Welding equipments are expensive.
- frequent replacement of nozzle.
- Applications
- Stainless steel welding.
- Nickel alloy in aero plane.
- Aluminium or graphite nozzles for rocket



Resistance welding

- In these process heat and pressure is applied on joint.
- No additional filler or flux material required.
- joint is obtained by means of electrical resistance.
- During process heavy current about 15000A is passed over joint with limited area for short time.
- Heavy current heat joint up to plastic state.
- due to high pressure metal get fused and forms joint.
- Heat generated is given as bellow $H = CI^2Rt$
- It is classified as
 1. Spot Welding
 2. Seam Welding
 3. Projection welding
 4. Upset Welding

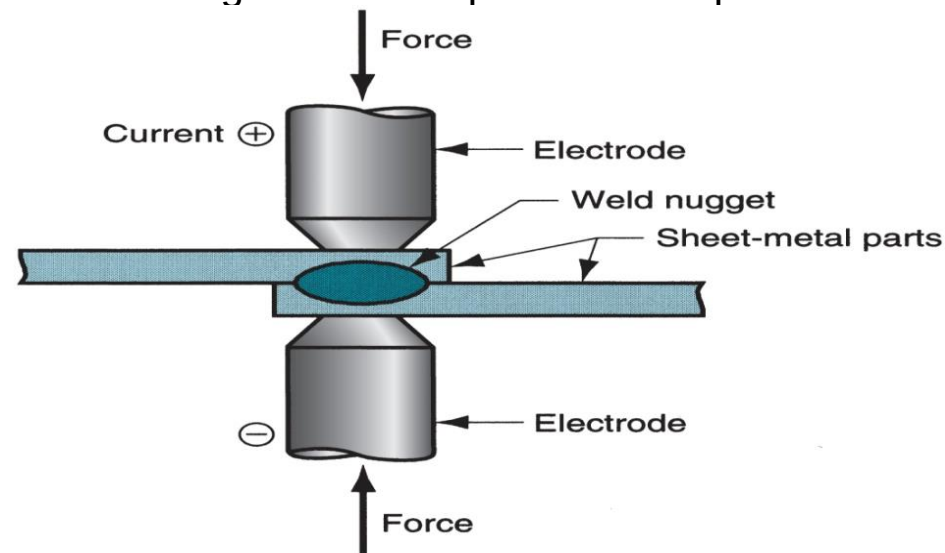


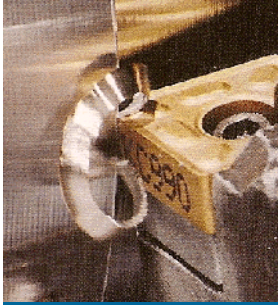
Spot Welding

- It is first type of resistance welding and widely used for lap joint of thin metal sheet.
- It consists of two electrodes in which bottom electrode is fixed and upper is used for apply pressure.
- Sheets to be weld are kept in the two electrode .
- The pressure is applied over the sheets and current is passed through it so that they get weld.
- Welding is done due to high current is passed through the metal plates which produce heat.

■ Applications

- For mass production.
- For Ferrous and Non ferrous metals.
- Used to weld sheets of 10mm thick



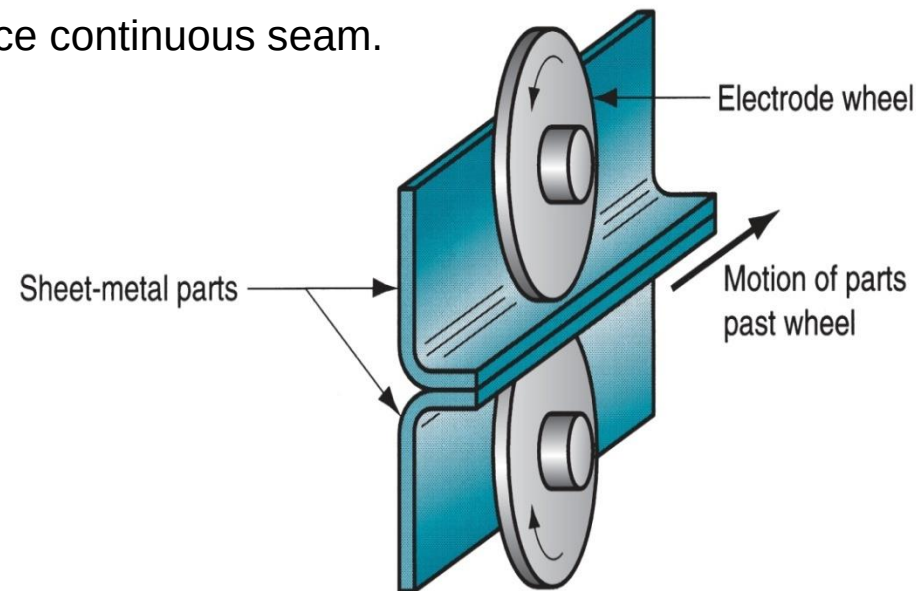


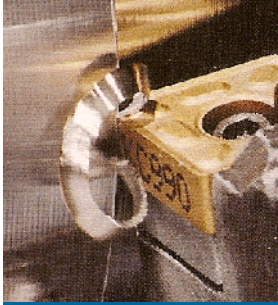
Seam Welding

- It is used for special purpose
- In this process disk type electrodes are used.
- It is used to produce continuous type of welding between two sheets.
- Disk are made up of copper and current is applied through it
- Current is applied in pulse form with proper time interval
- Disks are rotate continuously so that metal sheets moves forward.
- Current can be regulated by timer to produce continuous seam.

- **Applications.**

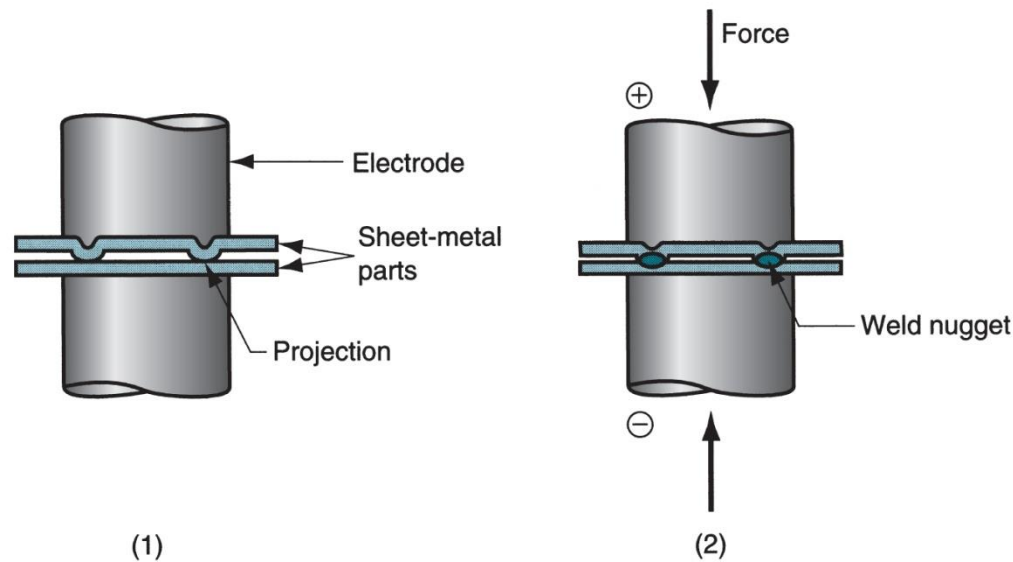
- For gas or water tight joints
- To manufacture seam welded pipes





Projection Welding

- It is modification of spot welding.
- In this type one of the sheet is provided with projections and other is plane.
- These projections are in circular form.
- Their diameter is equal to thickness of plate.
- Current and pressure is get concentrated at projection areas during process.
- During this process sheets to welded are kept between electrodes which made of copper.
- Pressure is applied by upper movable electrode and lower is fixed.
- By passing current these projections are get melted and welding is done.



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