**Arc welding**

Uses an electric arc to coalesce metals

Arc welding is the most common method of welding metals

Electricity travels from electrode to base metal to ground

**Arc welding Equipments**

- A welding generator (D.C.) or Transformer (A.C.)
- Two cables- one for work and one for electrode
- Electrode holder
- Electrode
- Protective shield
- Gloves
- Wire brush
- Chipping hammer
- Goggles

**Advantages**

- Most efficient way to join metals
- Lowest-cost joining method
- Affords lighter weight through better utilization of materials
- Joins all commercial metals
- Provides design flexibility

**Disadvantages**

- Manually applied, therefore high labor cost.
- Need high energy causing danger
- Not convenient for disassembly.
- Defects are hard to detect at joints.
GAS WELDING

- Sound weld is obtained by selecting proper size of flame, filler material and method of moving torch
- The temperature generated during the process is 33000c.
- When the metal is fused, oxygen from the atmosphere and the torch combines with molten metal and forms oxides, results defective weld
- Fluxes are added to the welded metal to remove oxides
- Common fluxes used are made of sodium, potassium, Lithium and borax.
- Flux can be applied as paste, powder, liquid, solid coating or gas.

GAS WELDING EQUIPMENT

1. Gas Cylinders
   - Pressure
   - Oxygen – 125 kg/cm²
   - Acetylene – 16 kg/cm²
2. Regulators
   - Working pressure of oxygen 1 kg/cm²
   - Working pressure of acetylene 0.15 kg/cm²
   - Working pressure varies depends upon the thickness of the work pieces welded.
3. Pressure Gauges
4. Hoses
5. Welding torch
6. Check valve
7. Non return valve

Types of Flames

- Oxygen is turned on, flame immediately changes into a long white inner area (Feather) surrounded by a transparent blue envelope is called **Carburizing flame** (30000c)
- Addition of little more oxygen give a bright whitish cone surrounded by the transparent blue envelope is called **Neutral flame** (It has a balance of fuel gas and oxygen) (32000c)
- Used for welding steels, aluminium, copper and cast iron
- If more oxygen is added, the cone becomes darker and more pointed, while the envelope becomes shorter and more fierce is called **Oxidizing flame**
- Has the highest temperature about 34000c
- Used for welding brass and brazing operation
Three basic types of oxyacetylene flames used in oxyfuel-gas welding and cutting operations:
(a) neutral flame; (b) oxidizing flame; (c) carburizing, or reducing flame.

**Fusion welding processes**
- **Definition:** Fusion Welding is defined as melting together and coalescing materials by means of heat
- Energy is supplied by thermal or electrical means
- Fusion welds made without filler metals are known as autogenous welds

**Filler Metals:**
- Additional material to weld the weld zone
- Available as rod or wire
- They can be used bare or coated with flux
- The purpose of the flux is to retard the

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