UNIT-IV

JOINING PROCESSES

INTRODUCTION

What is Welding?

The process of joining similar metals by the application of heat is called “Welding”.

Classification of Welding process

According to source of energy employed

- Fusion welding
- Plastic welding

1. **Fusion welding**

- The metal at the joint is heated to a molten state and then it is allowed to solidify.
- Pressure is not applied so it is called as non-pressure welding.

2.Plastic welding:

- The metal parts are heated to a plastic state and are pressed together to make joint. Hence known as Pressure welding.

- There is no filler materials required.

- **3. Resistance Welding**
  1. Spot Welding
  2. Seam Welding
  3. Projection Welding
  4. Resistance Butt Welding
  5. Flash Butt Welding
  6. Percussion Welding
  7. High Frequency Resistance Welding
  8. High Frequency Induction Welding

Resistance Welding

Working principle:

The parts to be joined are heated to plastic state by their **resistance to the flow of electric current** and **mechanical pressure** is applied to complete the weld.

Working procedure:

- There are **two copper electrodes** in a circuit of low resistance.
- The **metal parts** to be welded are placed **between the electrodes**.
- When **current is passed** through the electrodes ,the **electrical resistance** at the metal joints **becomes very high.**
- The metals are brought to **red-hot plastic condition.**
- Now **mechanical pressure is applied** to complete the weld.

- The heat generated in the weld may be expressed by

$$\mathbf{Q = I^2RT}$$

Where, Q = heat

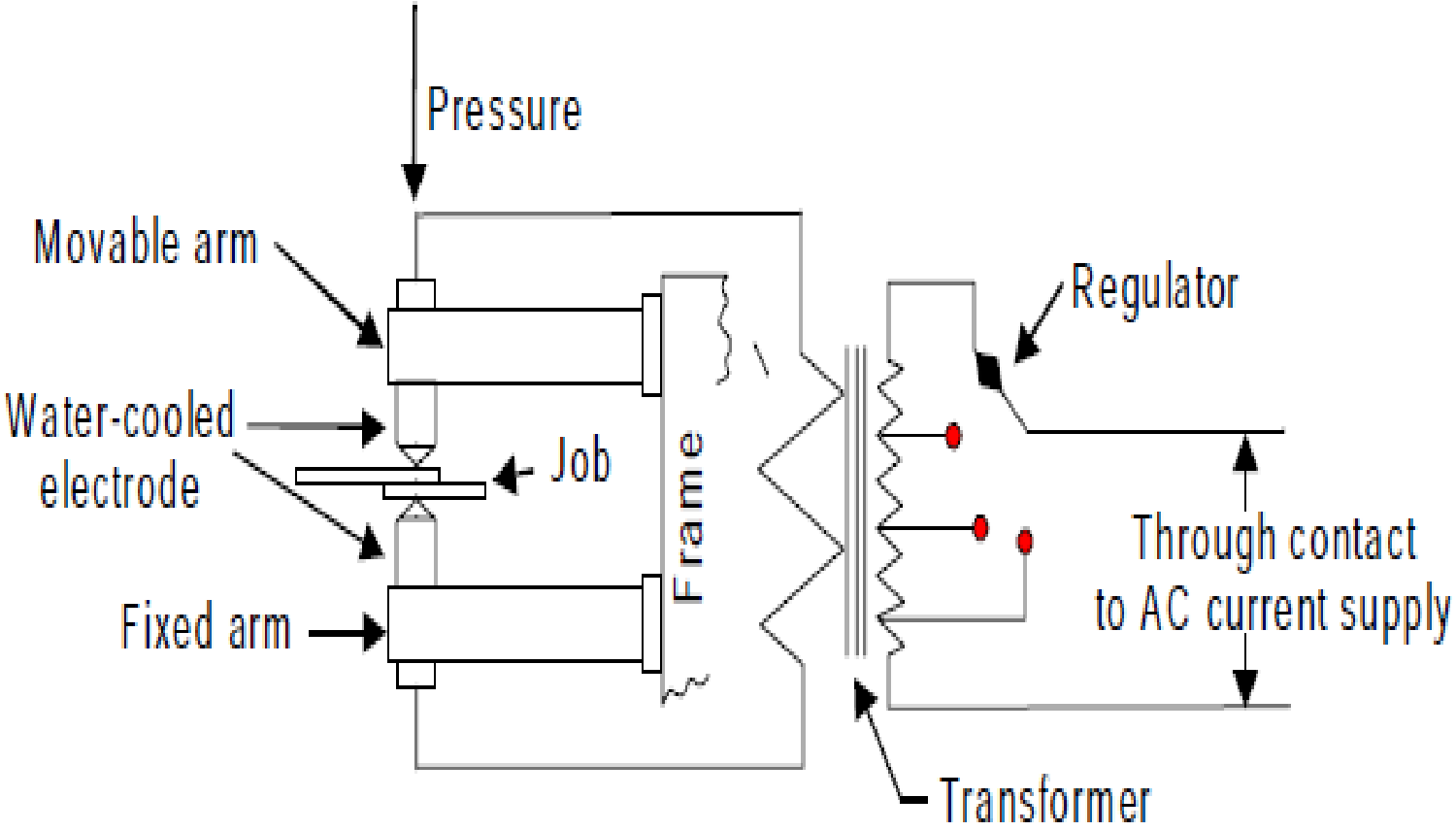
I = Current in amps

R = Resistance of the assembly

T = Time of current flow

- The **heat developed** by the current is **proportional to the electric resistance** of the weld.

Resistance welding



- A.C with suitable transformer is used for the power supply.
- **4 to 12 volts** is used dependent on the composition, area and thickness of the metal to be welded.
- The power supply ranges from **6 to 18KW per cm^3 area used**.

Advantages of RW:

1.High speed welding

2.Easily automated

3. Suitable for high rate production

4.Economical

Disadvantages:

1.Initial equipment costs

2. Lower tensile and fatigue strengths

3. Lap joints add weight and material

Applications of Resistance welding:

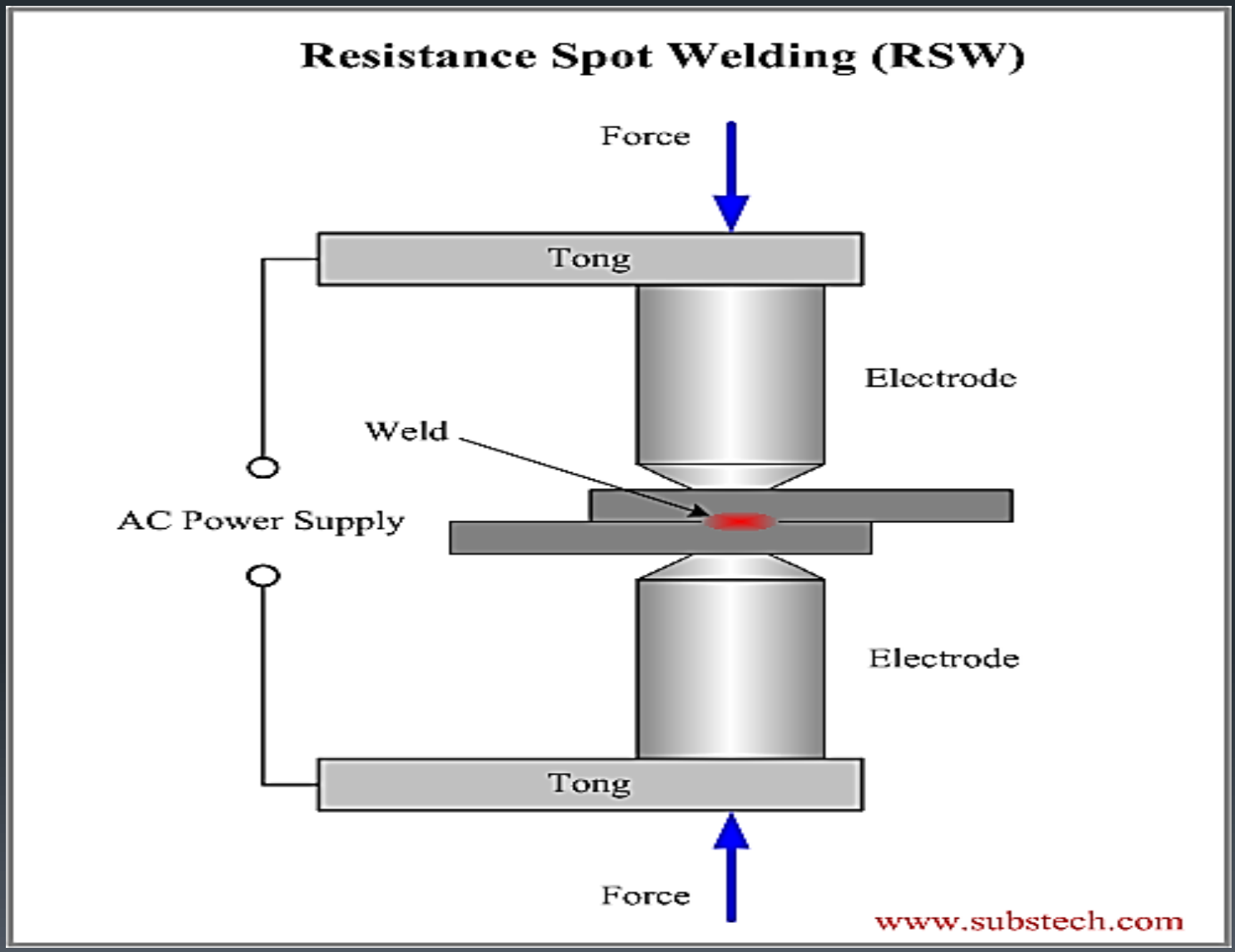
- Automotive / auto suppliers
- Electrical / electronics
- Aerospace / air plane
- Train carriage / rail
- Radiator / container
- Domestic hardware
- Medical instruments
- Nuclear equipment
- Food and drink
- Other metal processing industries.

Types of resistance welding

1. Spot – welding
2. Butt – welding
3. Seam welding
4. Projection welding
5. Stud welding
6. Percussion Butt - welding

1. Spot – welding

- Spot welding is used for making lab joints.
- By using this method, metal sheets from 0.025 mm to 1.25 mm thickness can be easily welded.
- The metal pieces are assembled and placed between two copper electrodes and then current is passed.
- Then the electrodes are pressed against the metal pieces by mechanical or hydraulic pressure.


Resistance Spot Welding (RSW)
Force
Tong
Electrode
Weld
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Tong
Force
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- The electrode pressure can be in the range of up to 2 KN.
- Electrodes are cooled with water during operation to prevent overheating.
- Spot welding can be done on metal strips upto 12 mm thick .
- It is used for fabricating all types of sheet metal structure where mechanical strength rather than water or air tightness is required.

3. Seam welding

- Seam welding is used to produce continuous joint between two overlapping pieces of sheet metal.
- The work pieces are placed between two rotating wheel electrodes when electric current is passed through the electrodes.
- High heat is produced on the work pieces between the wheels.

it speeds up the welding process.