

# **MEM 3501**

# **Welding Technology**

# **1**

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# Manufacturing Processes

- Casting
- Plastic deformation (forming)
- Machining
- Powder metallurgy
- Welding

# What is welding?

Welding is a manufacturing process that provides homogeneous bond between two or more pieces of metal, where the strength of the welded joint exceeds the strength of the base pieces of metal. It can be performed with heat, with or without filler metal, and with or without pressure.

# What is welding?

Welding is a common process for joining metals using a large variety of applications. Welding occurs in several locations, from outdoors settings on rural farms and construction sites to inside locations, such as factories and job shops.

At the simplest level, welding involves the use of four components: the metals, a heat source, filler metal, and some kind of shield from the air. The metals are heated to their melting point while being shielded from the air, and then a filler metal is added to the heated area to produce a single piece of metal.

# Why welding?

- Welding is more economical and is much faster process as compared to other processes.
- Welding, if properly controlled results permanent joints having strengths equal or more than base metal.
- Large numbers of metals and alloys both similar and dissimilar can be joined by welding
- General welding equipment is not very costly.

# Why welding?

- Portable welding equipments can be easily made available.
- Welding permits considerable freedom in design.
- Welding can join welding jobs through spots, as continuous pressure tight seams, end to end and in a number of other configurations.
- Welding can also be mechanized.

# Disadvantages of the welding

- It results in residual stress and distortion of the workpieces.
- Welded joint may need stress relieving and heat treatment.
- Welding may give out harmful radiations, fumes and spatter.
- Jigs and fixtures may also be needed to hold and position the parts to be welded.

# Disadvantages of the welding

- Edges preparation of the welding jobs are required before welding.
- Skilled welder is required for production of good welding.
- Heat input generated during welding produces metallurgical changes as the structure of the welded joints is not same as that of the parent metal.



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**WELDING**

**Welding  
Metallurgy**

**Welding  
Technology**

# Welding Metallurgy

## Solification of Metals and Alloys

- Homogenous and Heterogenous Solidification
- Growth Types (Planar, Cellular, Coloumnar, Equiaxed, Dendritic)

## Effect of Heat Treatments

- Normalising
- Stress Relief Annealing
- Tempering
- Precipitation Hardening
- Recrystalliation

# Welding Technology

## Fusion Welding

- Oxy-acetylene Welding
- Shielded Metal Arc Welding
- TIG Welding
- MIG Welding
- MAG Welding
- Submerged Arc Welding
- Plasma Arc Welding
- Electron Beam Welding
- Laser Beam Welding

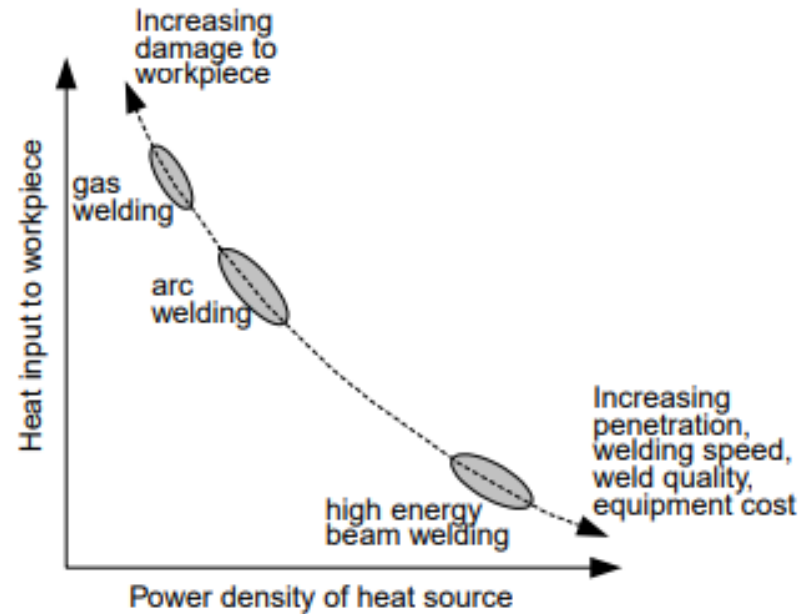
## Resistance Welding

- Spot
- Seam
- Projection

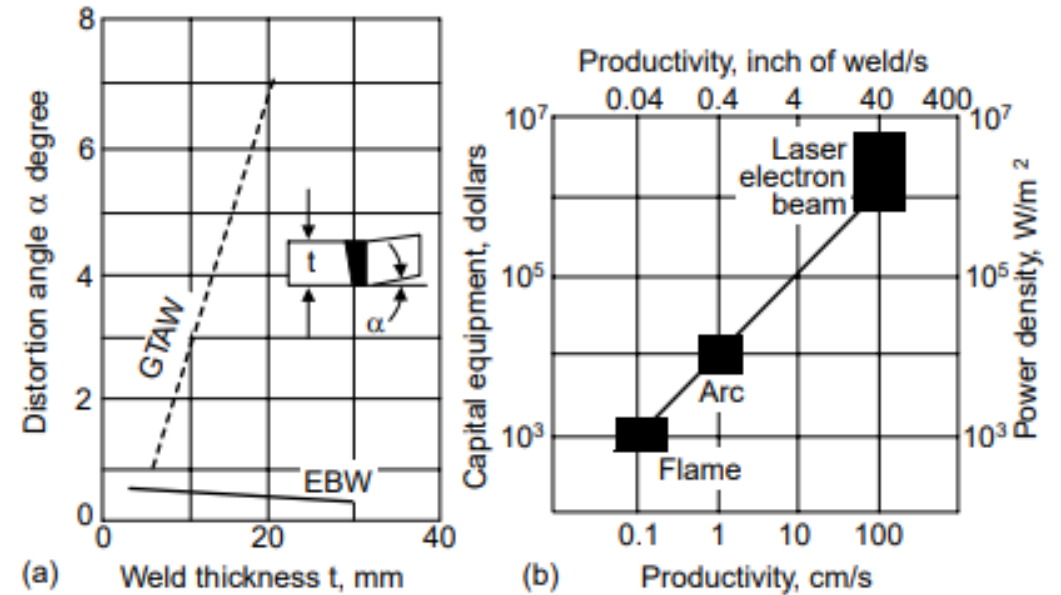
## Solid State Welding

- Diffusion Welding
- Friction Welding

# Welding Methods



Variation of heat input to the workpiece with power density of the heat

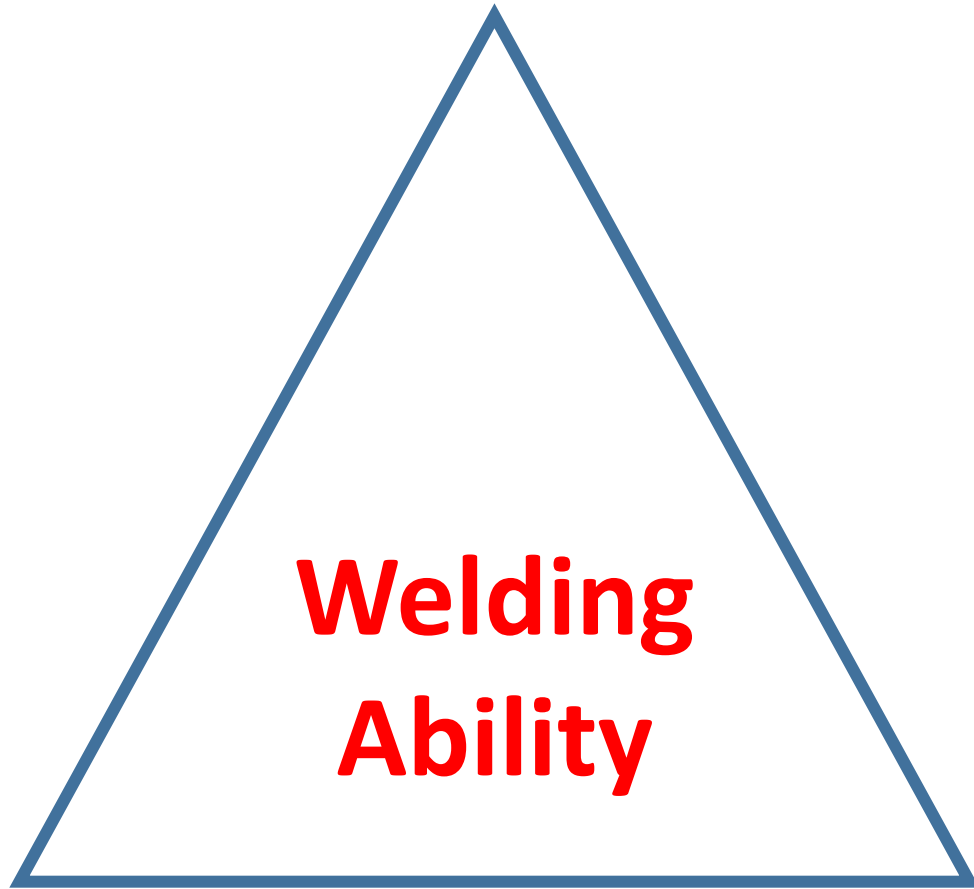


Material

**Welding  
Ability**

Method

Construction



## Material Properties

(Chemical composition, grain size etc.)



## Welding Parameters

(Method, voltage, current etc.)



## Microstructure



## Mechanical Properties