

# **Mechanical Working of Metals or Metal Forming Processes**

**Lecture By:**

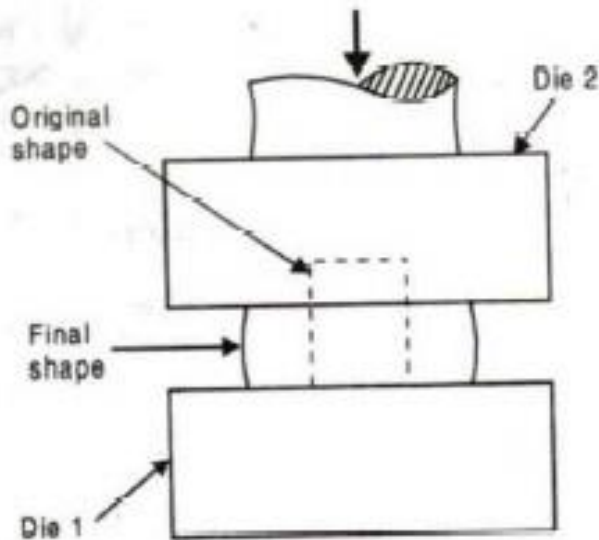
**M K PODDAR**

**Asst. Professor**

**ME Dept., SIT Sitamarhi**

**Personal Web: [www.ajourneywithtime.weebly.com](http://www.ajourneywithtime.weebly.com)**

**Mail Id: [hodmesit2018@gmail.com](mailto:hodmesit2018@gmail.com)**



**Metal forming or mechanical working** is a process of intentional deformation of metals for shaping the metals into required shape or form by plastic deformation with application of external forces. In these processes the metals are given a required shape, size, dimensions and properties without any significant amount of wastage of material. The plastic deformation takes place once the forces are applied beyond the yield point stress. The figure shows the process of metal working, a metal block shown by dashed lines is given required shape by application of external force using Die-1 & Die-2 and the final shape obtained is shown by solid lines

### Objectives of metal forming:

- To refine grain structure
- To induce the directional properties into the material
- To achieve high dimensional accuracy
- To improve mechanical properties of the metal

Under the action of heat and the force, when the atom reach a certain higher energy level, the new crystals start forming

**Re-crystallization** is the process of formation of new grains or crystal structure and the temperature at which the old crystal structure is destroyed and formation of new crystal structure is complete, is known as **Re-crystallization Temperature**.

**Classification:** The metal forming processes/ operations can be classified, depending upon the temperature, into Hot and Cold working processes. A comparison of hot working and cold working is presented below.

# Hot Working:

Metal working above recrystallization temperature is called hot working. Examples: Rolling, forging, extrusion, sheet metal operation, wire & tube drawing etc.

## Advantages:

- No strain hardening
- Less force required to achieve necessary deformation
- Continuously reform the grains in metal working
- Rate of production is higher

## Disadvantages:

- Rise to scaling of the surface as a result surface finish is poor
- dimensional accuracy in hot working is difficult to achieve
- Difficult to handle hot work

# Cold working

Metal working below recrystallization temperature is called cold working. Example: wire and tube drawing, blanking, punching etc.

## Advantage:

- Cold working increases the strength and hardness of the material due to strain hardening
- Good surface finish is obtained
- Better dimensional accuracy is achieved
- Easy to handle cold work

## Disadvantage:

- Stress required to cause deformation is much higher
- Material gets strain hardened, maximum amount of deformation is limited so rate of production is lower

# Type Metal Forming Processes

- Forging
- Rolling
- Wire drawing
- Deep drawing
- Extrusion
- Sheet metal operations