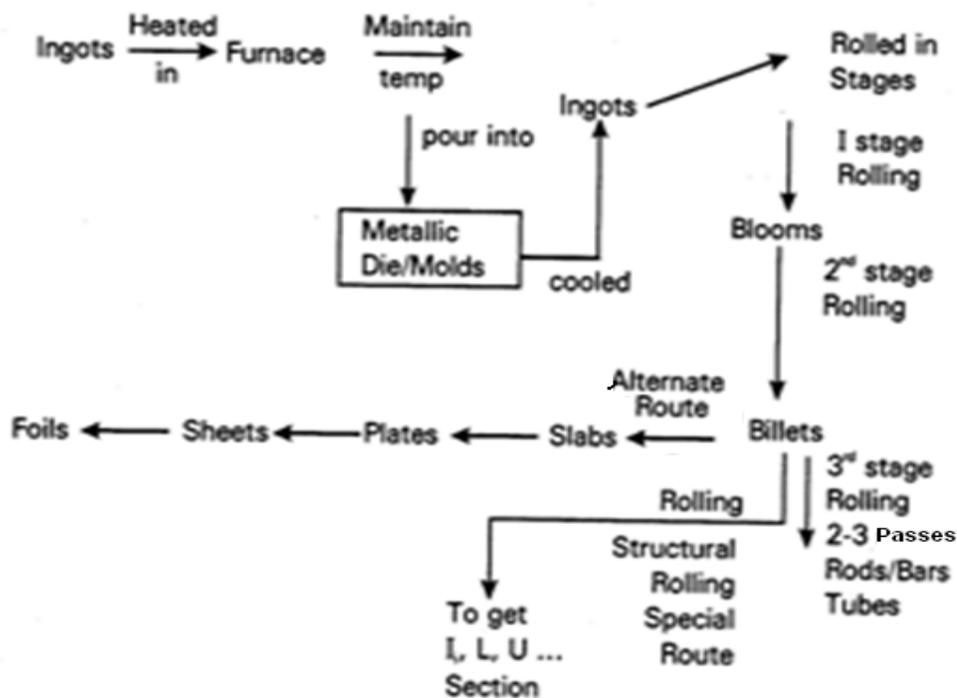


## ROLLING AND STEPS IN ROLLING

The workpiece is subjected to compressive forces and is deformed plastically. The cross section decreases and length gets elongated whereas the total volume remains constant. It is the main metal working process and offers itself to mass production. Close control of the final product is possible.

Rotating rolls will squeeze the workpiece inducing direct compressive stress in it. Friction dominates the process. Rolling of workpiece can be carried out in hot or cold condition. Components produced through rolling have higher mechanical properties than cast products. Slabs, Sheets, Bars, Rods, Structural components like I, U, L etc., in long lengths can be produced easily.

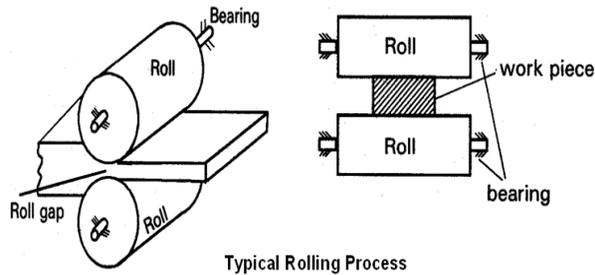


**Flow chart for Rolling Process**

### Steps in Rolling Process

The starting raw material in rolling is the ingot which is obtained by using a metal die. Ingot will have a length of about 1 meter and a cross section of 100x100mm or 250x250mm etc.,. Ingot may have any geometrical cross section.

The details of Ingot production are: \*Prepare molten metal in a furnace.  
 \*Pour clean well prepared molten metal with correct temperature into a metal die cavity and allow it to cool.  
 \*Take out the solid metal.\* This solid metal is referred to as Ingot or Ingot casting.\*The Ingot is then passed through the rolls to get the next set of products blooms, billets, bars, slabs, plates, sheets or Structural components. The same is shown in the flow chart.



### Classification of Rolling Process

Rolling Process can be classified either  
 i) based on the temperature of the metal during rolling or  
 ii) based on the arrangement of the rolls and their number or  
 iii) based on the Products rolled.

#### i) based on the temperature:

Rolling can be classified as Hot Rolling or Cold Rolling. Hot rolling is carried out above RCT and cold rolling is carried out below RCT.

Hot rolling is used to convert ingots to blooms and blooms to billets to slabs to plates, billets to bars, billets to structural shapes.

It is used for heavy or thick sections.

Surface finish will be poor but the mechanical properties will be uniform.

Cold rolling is used for converting small sections plates to sheets to foils or bars to wires. Good surface finish is obtained with enhanced properties.

#### ii) Based on Roll arrangement

The minimum number of rolls required for rolling to take place is two and the higher end is dictated by the amount of reduction required, type of metal being rolled, configuration of the product etc.,

The rolls are cylindrical shaped may be plain or may have grooves cut on it.

The arrangement of rolls could be:

2 high roll mill- two rolls are used here.

\*3 high roll mill- three rolls are used here.

\*4 high roll mill- four rolls are used here.

\*Cluster roll mill- a number of rolls are used  
in conjunction.

\*Planetary roll mill- rolls are arrangement in  
the form of planetary movement.

Tandem roll mill- continuous arrangement  
of rolls are used for continuous rolling.

\*Sendzmer roll mill-similar to a cluster mill  
but large number of rolls are used.  
Greatest reduction in the material  
is obtained.

\*All these arrangement are discussed below:

The term "mill" is generally used while referring to while referring to the type of rolling process.

It signifies the station involving the arrangement of rolls contributing for rolling and type of rolling operation carried out.

The term "high" signifies that the rolls are placed above the ground level.

As already discussed the starting raw material is the ingot. Ingot is rolled to blooms-billets-rods-wires in the first route. In the second route Ingot-bloom-slab-plate-sheet-foil is obtained. In the third route Ingot-bloom-structural configuration like I,U,V etc, is obtained.