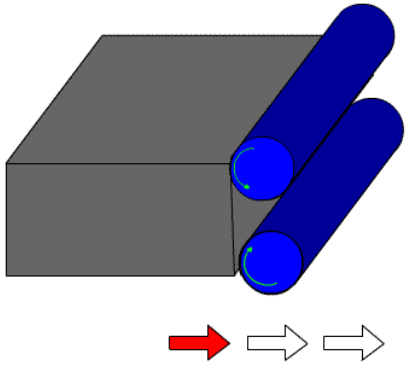
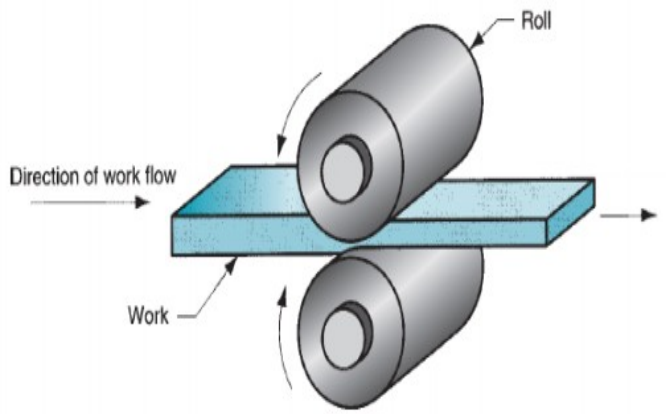
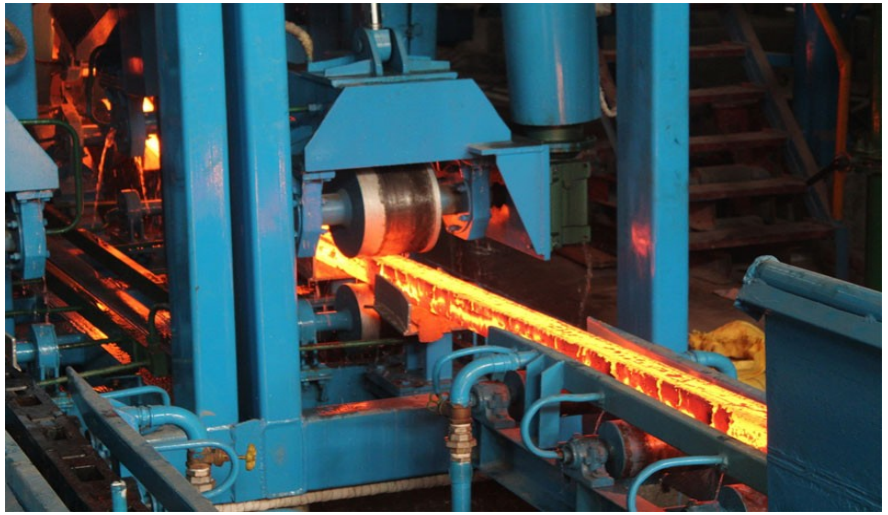
ROLLING

- Rolling is a process where the metal is compressed between two rotating rolls for reducing its cross-sectional area.
- It is one of the most widely used of all the metal-working processes, because of its higher productivity and low cost.
- Rolling would be able to produce components having constant cross section throughout its length. Many shapes such as I, T, L, and channel sections are possible, but not very complex shapes.
- Rolling is normally a hot working process unless specifically mentioned as cold rolling.



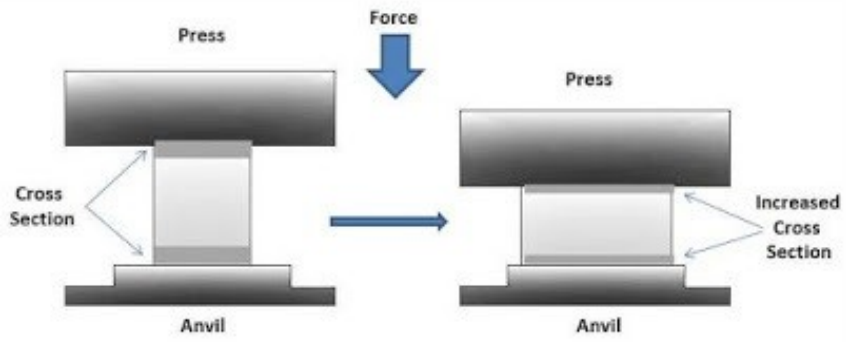




FORGING

Upsetting

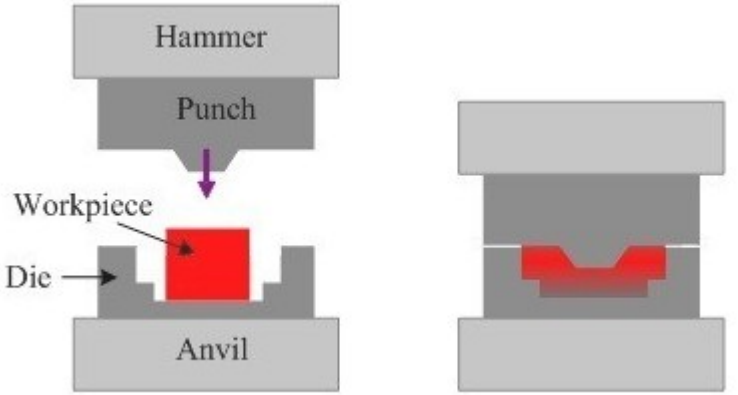
- This is applied to increase the cross-sectional area of the stock at the expense of its length. To achieve the upsetting, force is applied in a direction parallel to the length axis.



Forging Types

- There are four types of forging methods, which are generally used.

Smith Forging - This is the traditional forging operation done openly or in open dies by the village blacksmith or modern shop floor by manual hammering or by power hammers.

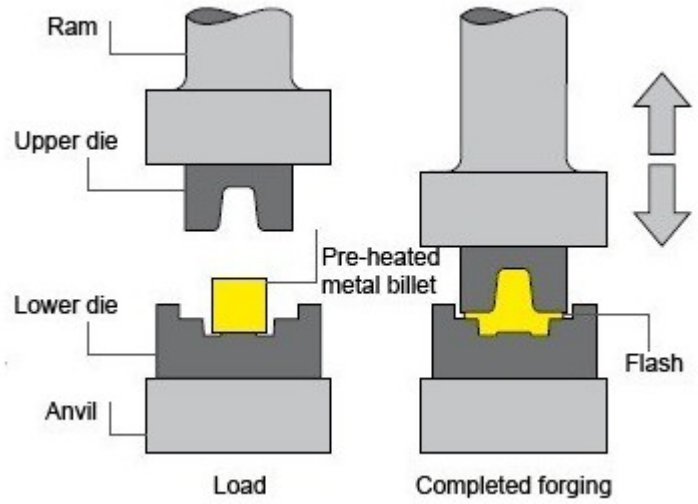


Drop Forging - This is the operation done in closed impression dies by means of the drop hammers. Here the force for shaping the component is applied in a series of blows.

FORGING

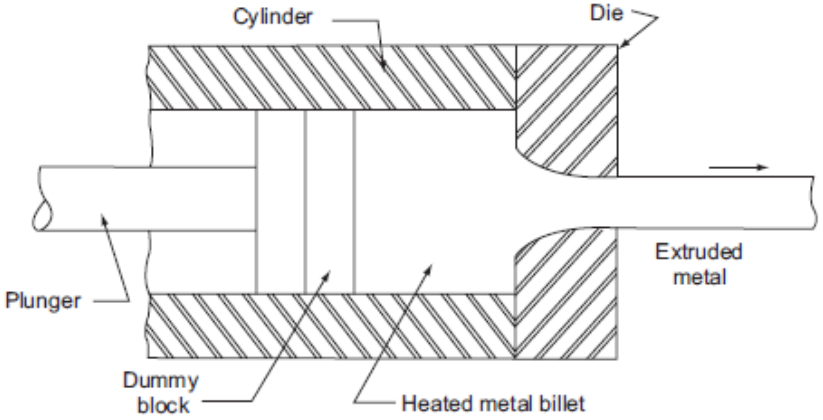
Press Forging - Similar to drop forging, the press forging is also done in closed-impression dies with the exception that the force is a continuous squeezing type applied by the hydraulic presses.

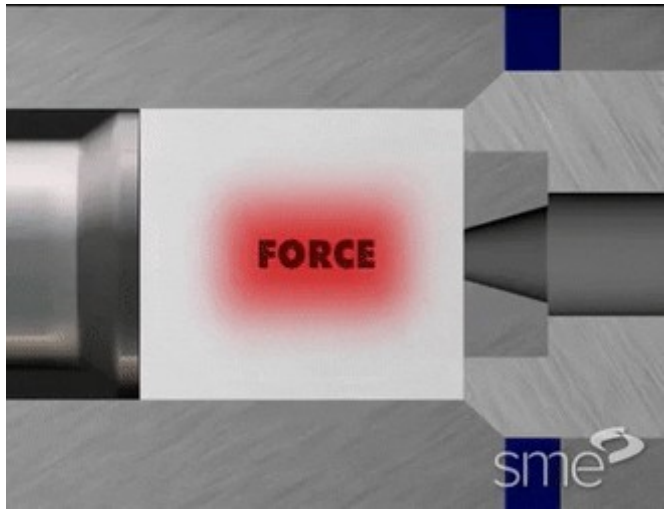
Machine Forging - Unlike the drop or press forging where the material is drawn out, in machine forging, the material is only upset to get the desired shape.



EXTRUSION

- Extrusion is the process of confining the metal in a closed cavity and then allowing it to flow from only one opening so that the metal will take the shape of the opening.
- The equipment consists of a cylinder or container into which the heated metal billet is loaded.
- On one end of the container, the die plate with the necessary opening is fixed. From the other end, a plunger or ram compresses the metal billet against the container walls and the die plate, thus forcing it to flow through the die opening, acquiring the shape of the opening.
- The extruded metal is then carried by the metal handling system as it comes out of the die.





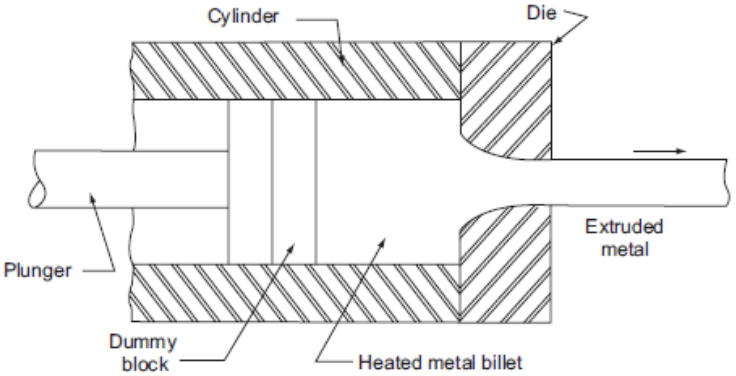
FORWARD EXTRUSION

- The process represented in Fig. is called the forward extrusion, signifying the flow of metal in the forward direction, i.e. the same as that of the ram.

- In forward extrusion, the problem of friction is prevalent because of the relative motion between the heated metal billet and the cylinder walls. This is particularly severe in the case of steels because of their higher extrusion temperatures.

- To reduce this friction, lubricants are to be used. The problem of lubrication gets compounded at the higher operating temperatures. Molten glass is generally used for extruding steels. This stays in liquid form at the operating temperature and provides necessary heat insulation to the hot metal billet in addition to lubrication.

- To reduce the damage to equipment, extrusion is finished quickly and the cylinder is cooled before further extrusion.



BACKWARD EXTRUSION

- In order to completely overcome the friction, the backward extrusion, as shown in Fig. is used.
- In this, the metal is confined fully by the cylinder. The ram which houses the die, also compresses the metal against the container, forcing it to flow backwards through the die in the hollow plunger or ram.
- It is termed backward because of the opposite direction of the flow of metal to that of ram movement.
- Thus, the billet in the container remains stationary and hence no friction.
- Though advantageous, this process is not extensively used because of the problem of handling extruding metal coming out through the moving ram.