

DEFORMATION IN EXTRUSION

Pressure required in extrusion depends on the way the metal flows in the container & extrusion die. The metal flow is mainly determined by conditions of lubrication.

Deformation in Extrusion Process

The defects in extrusion are related to the way in which metal deforms during extrusion.

(1) Homogeneous Deformation: (with less friction)

Fig a) indicates homogeneous deformation in direct extrusion.

Fig. Different Grid Patterns During Deformation in Extrusion

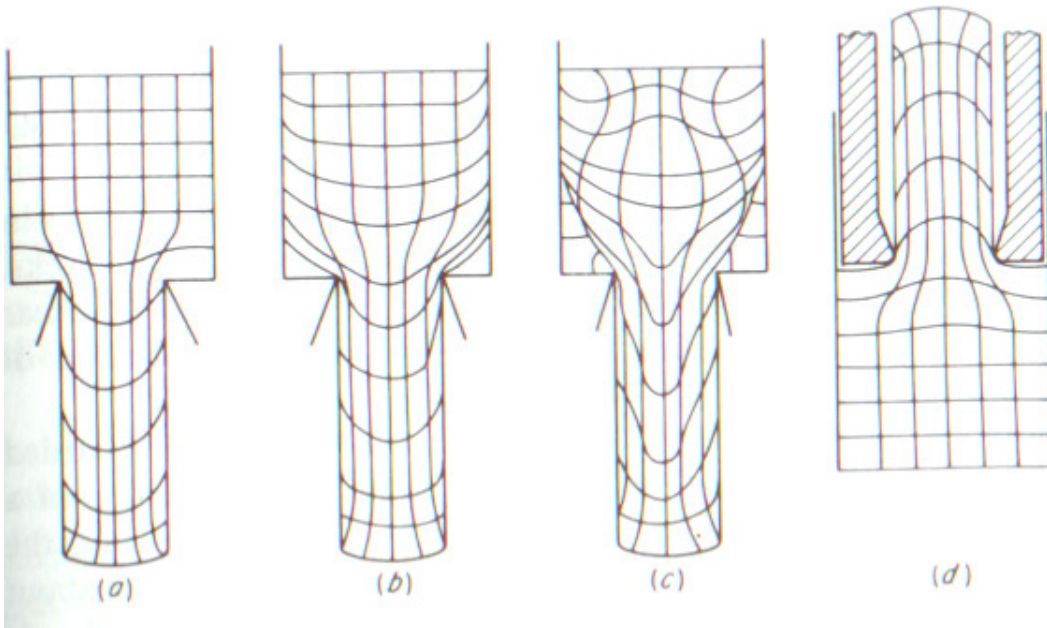


Fig d) shows homogeneous deformation in indirect extrusion.

The following conditions are favorable for homogeneous deformation:

- i) Low container friction
- ii) Well lubricated billet
- iii) Hydrostatic extrusion conditions
- iv) Indirect extrusion process.

Characteristics of homogeneous deformation:

The deformation is more uniform until close to the die entrance where metal flow is restricted.

(2) Deformation with more friction between billet and container wall

Fig (b) above indicates increased container wall friction.

- This is indicated by severe distortion of grid pattern at the corners of the die due to a “dead zone.”

- The dead zone consists of stagnant metal which does not undergo any deformation.
- The grid elements at the centre of the billet undergo pure elongation into the extruded rod.
- The grid elements near the sides of the billet undergo shear deformation
- The shear deformation requires additional energy called “redundant work”. This work is not related to metal working from billet to extruded product.

(3) Deformation with very high friction

Fig (c) above indicates the condition of high friction at the container – billet interface.

- The metal flow is concentrated towards the centre.
- An internal shear plane develops due to high friction.
- This situation also exists when the billet surface is chilled by a cold container. This is because, at low temperature of the billet at the sides, the flow stress increases compared to the flow stress at the central portion of the billet
- Under such sticking conditions between the billet and container, a shear zone is formed along which the metal separates internally.
- In this condition, extruded product contains clean new metal and outer surface of billet remains in the container.

Source : http://elearningatria.files.wordpress.com/2013/10/mp3_unit6_extrusion_final.pdf