



ME 333

Manufacturing Processes II



Chapter 8

Pipe and Tube Manufacturing

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Pipe & Tube Manufacturing

Manuf. Method

Welded

- Butt or electric welding of cold forged or rolled sheet

Seamless

- Extrusion
- Continuous casting
- Centrifugal casting
- Piercing (Mannesmann, Stiefel, Ehrhardt)
- Röckner
- Spinning
- Swaging

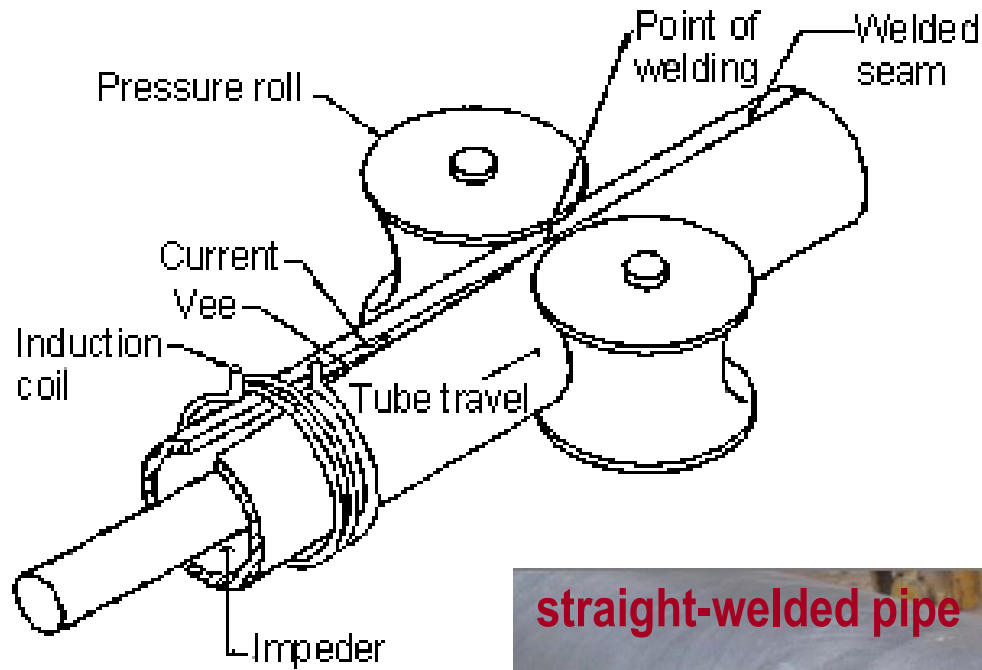
Area of Use

Low & Medium Pressure Applications

- Pipeline constructions
- General purpose

High Temp. & High Pressure Applications

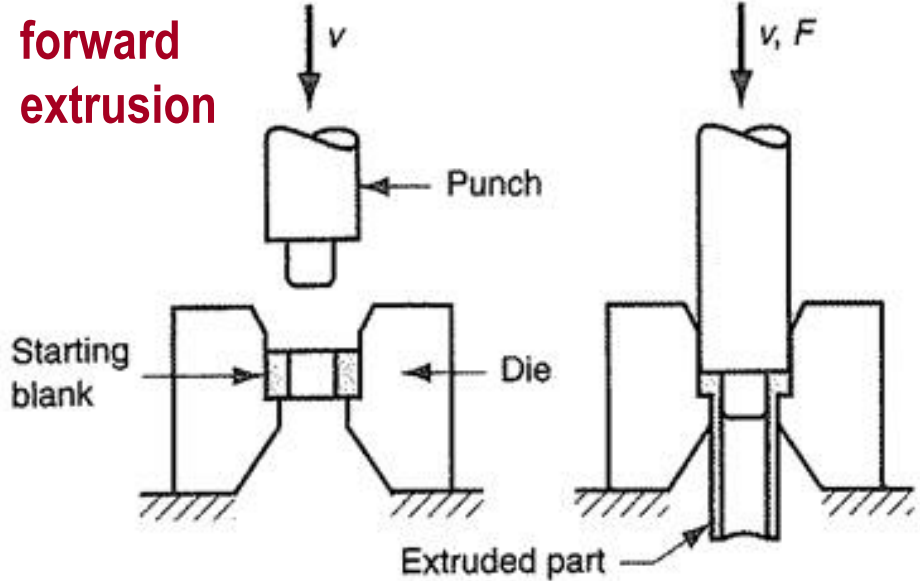
- Hydraulic equipment
- Boiler pipes



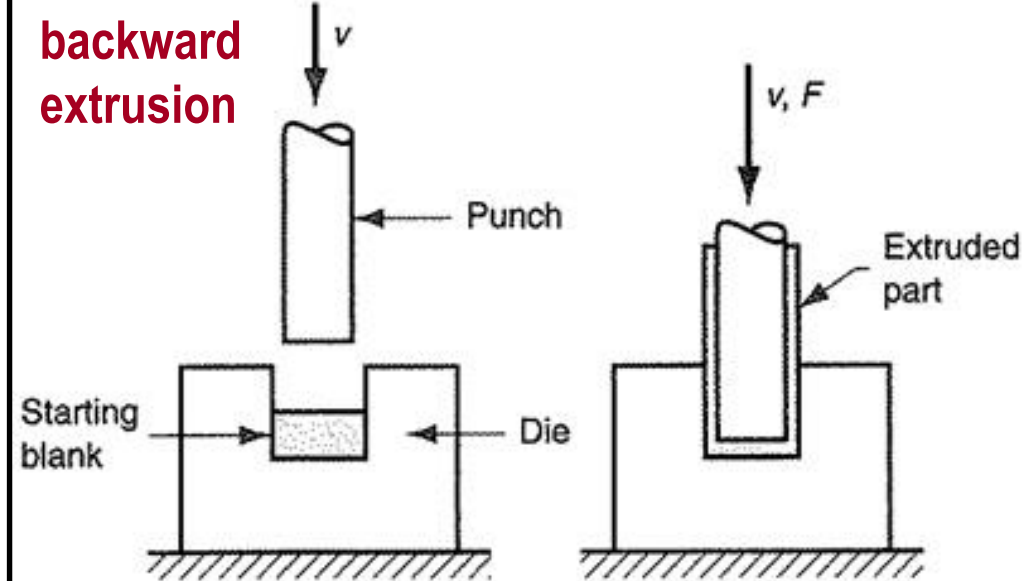
spiral-welded pipe



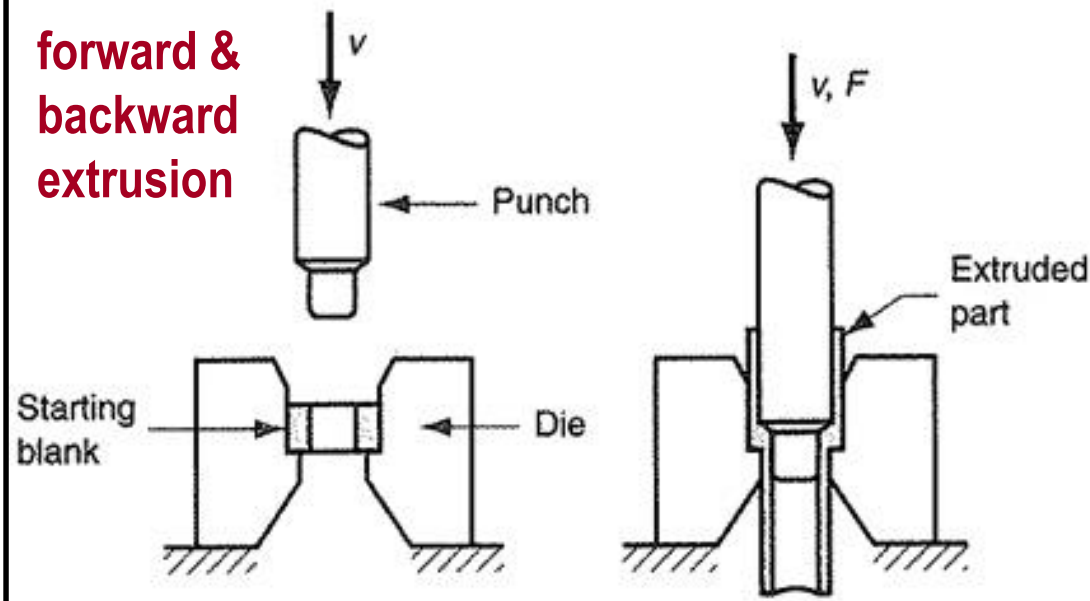
forward extrusion

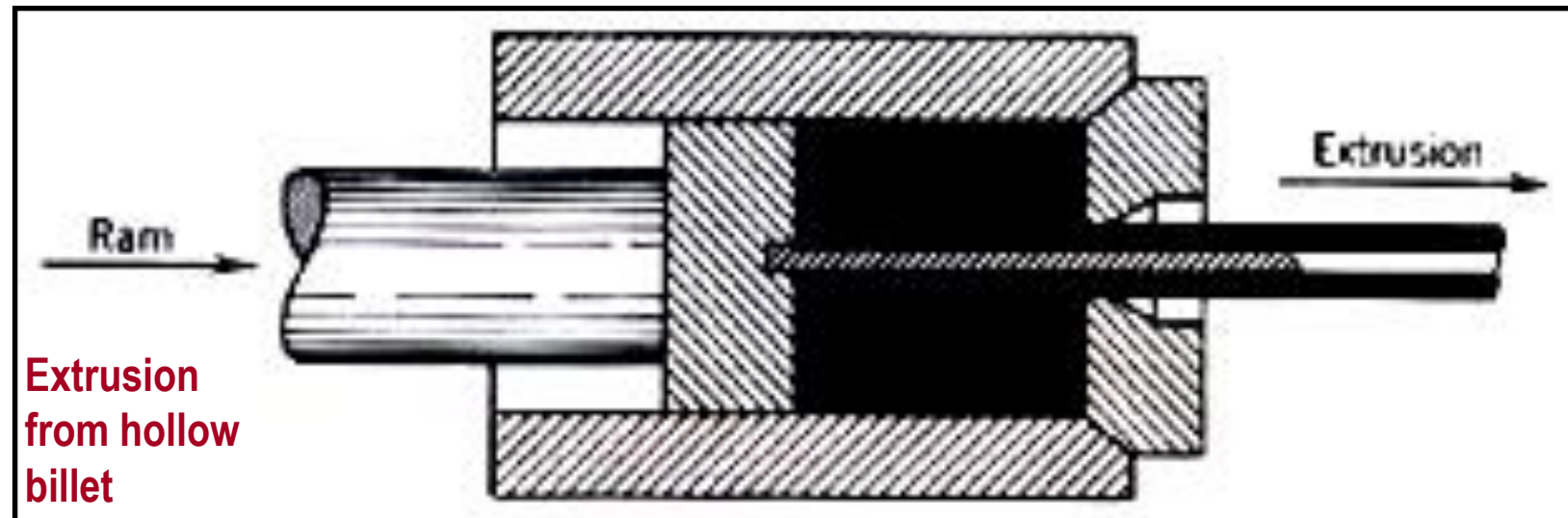
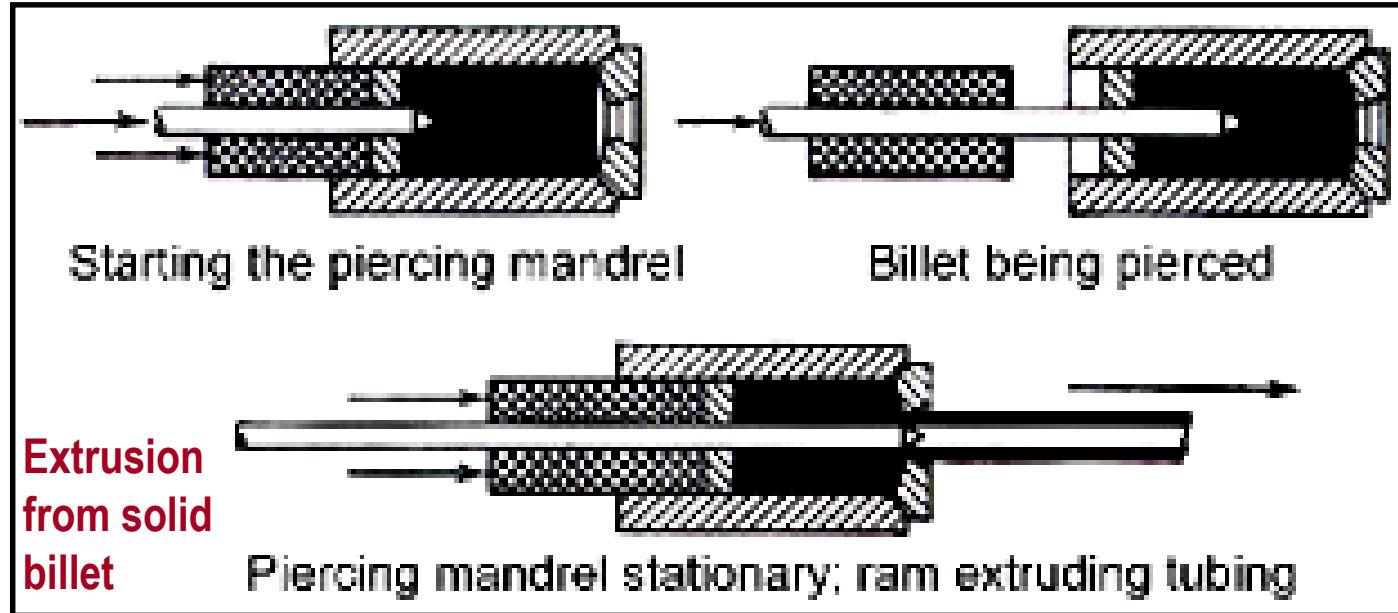


backward extrusion



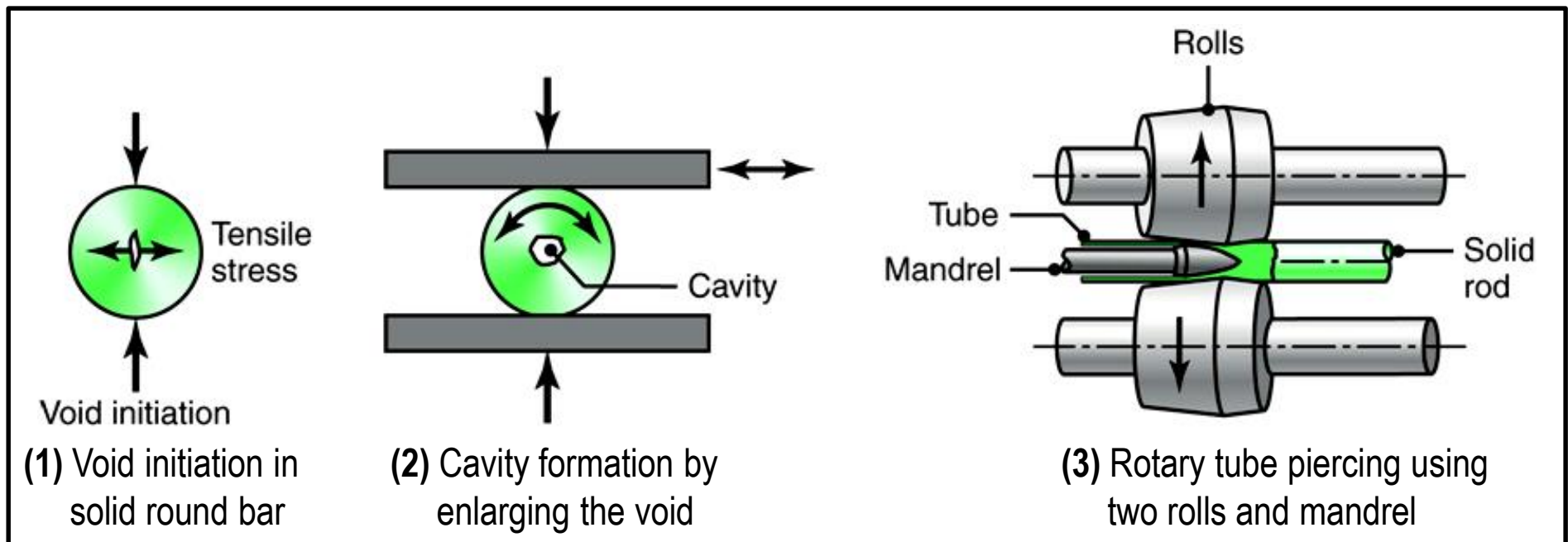
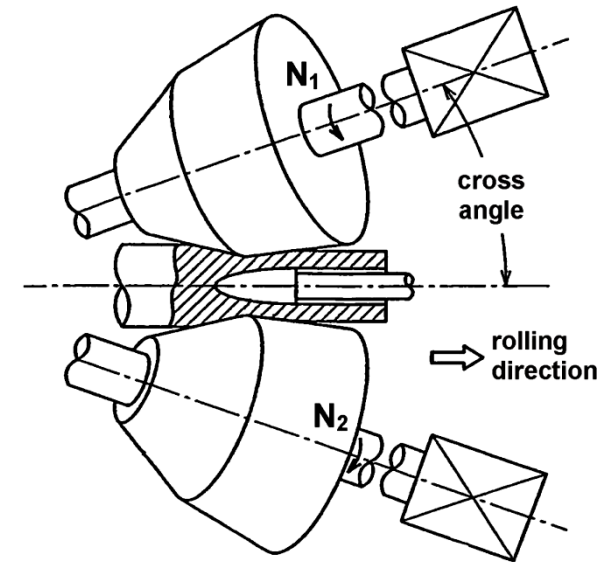
forward & backward extrusion





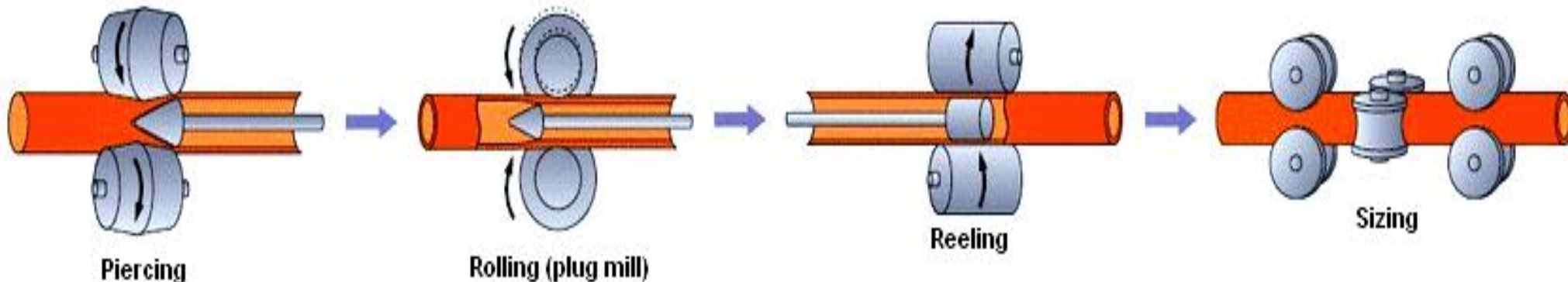


- Rotary tube piercing process is **the starting stage for seamless pipe and tube manufacturing**.
- It is about making a void at the core of a **solid round bar (max. Ø12")** by applying compressive and tensile forces in reverse directions, and enlarging it between two rolls.
- Rotational speeds of rolls are not equal: $N_1 \neq N_2$
- Cross angle is **about 6°**.

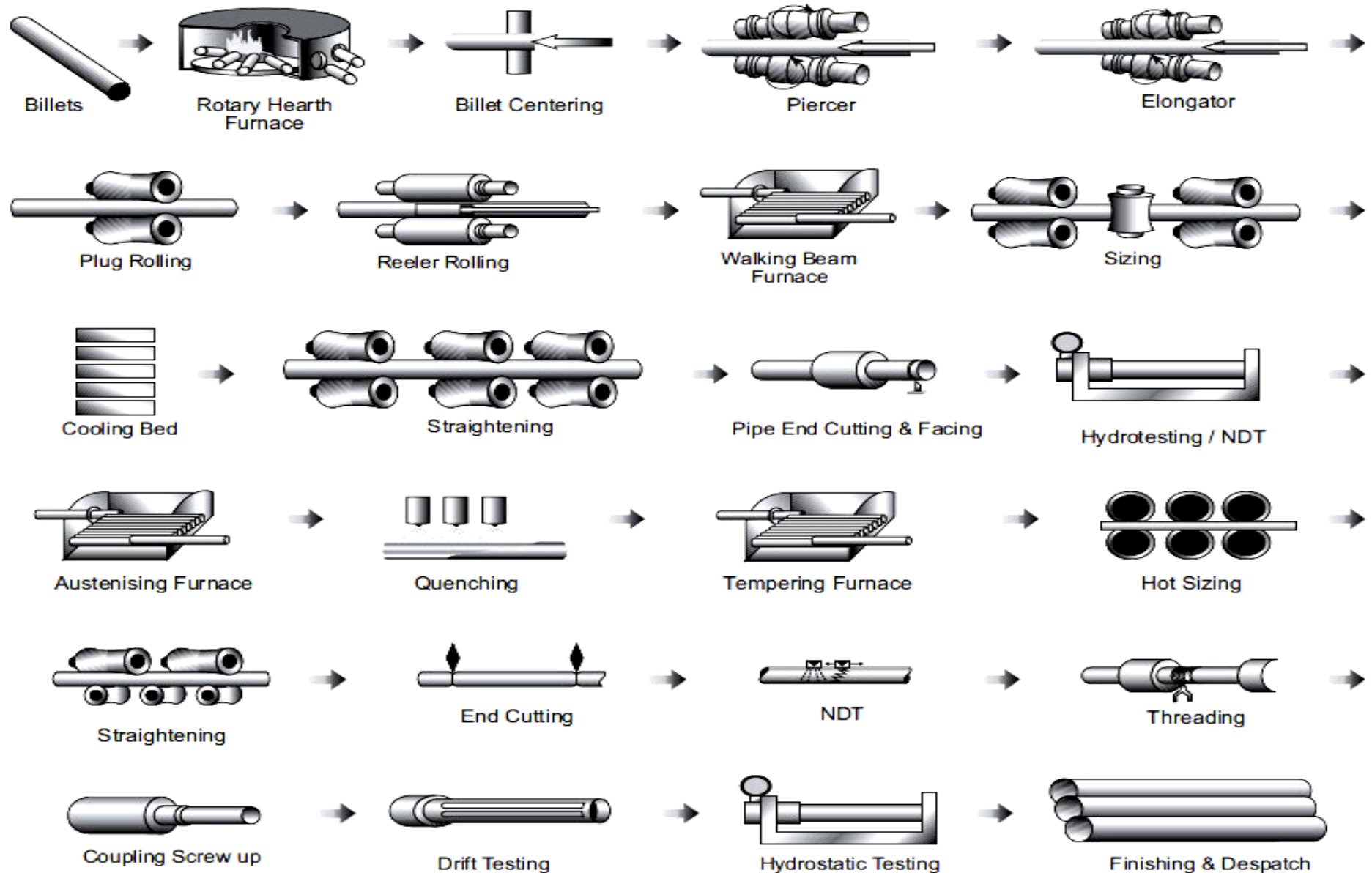


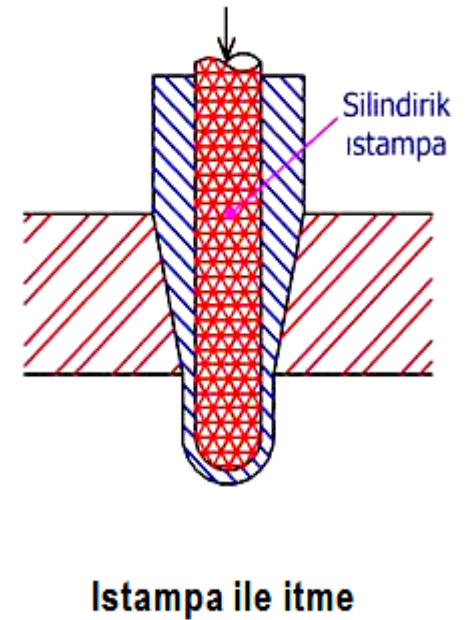
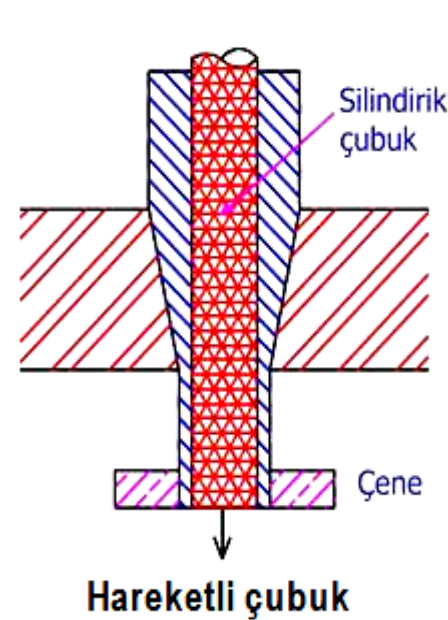
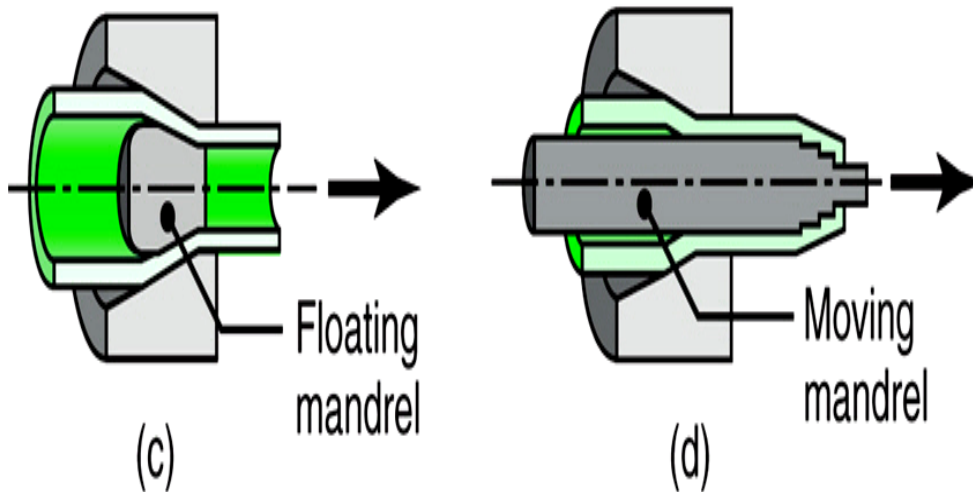
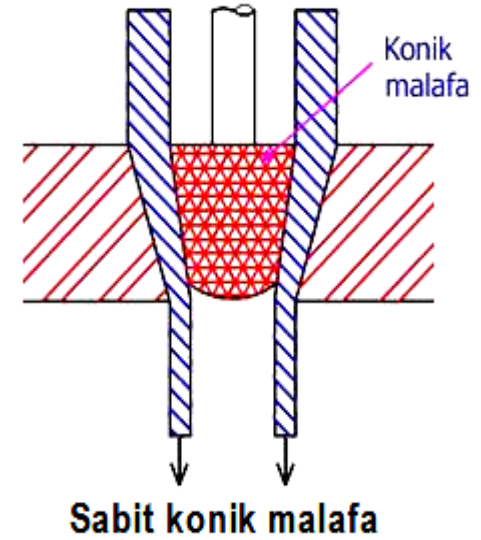
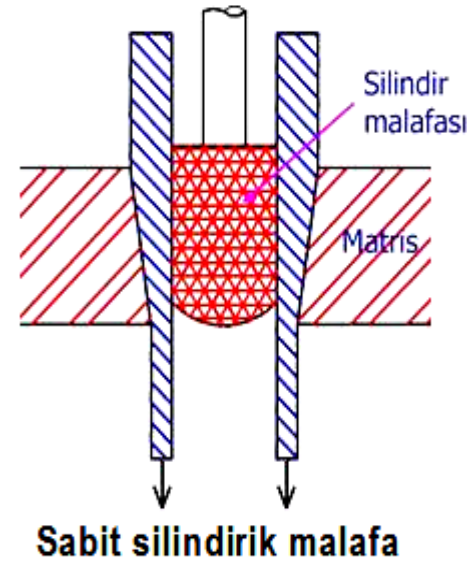
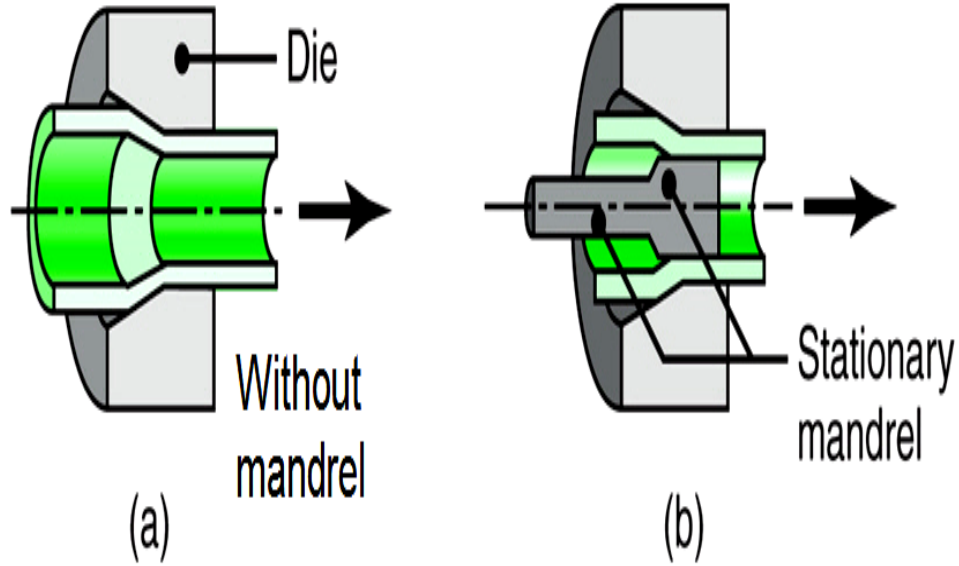


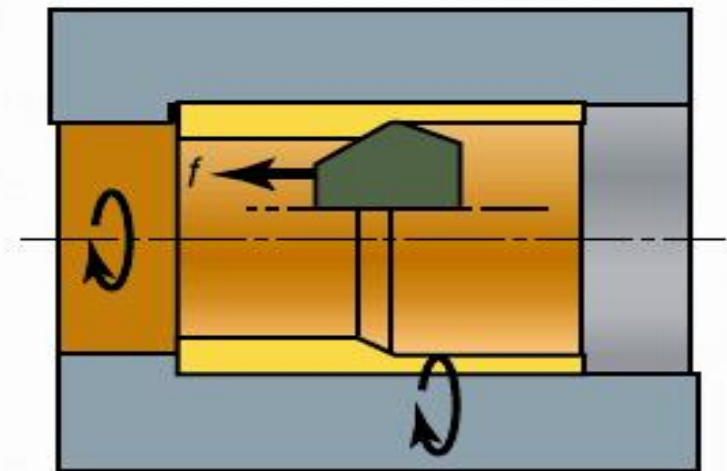
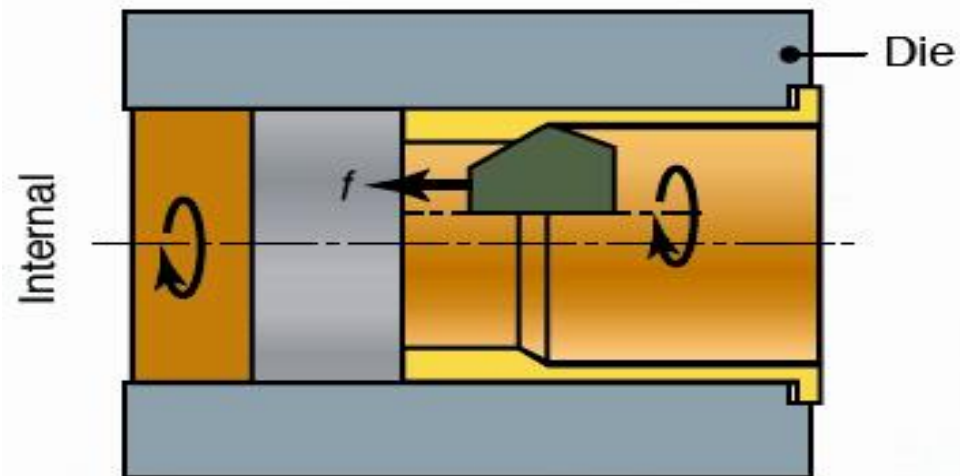
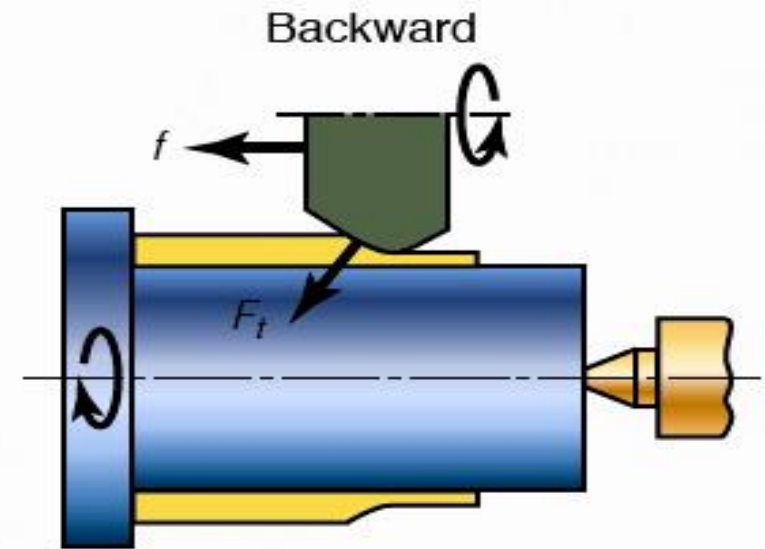
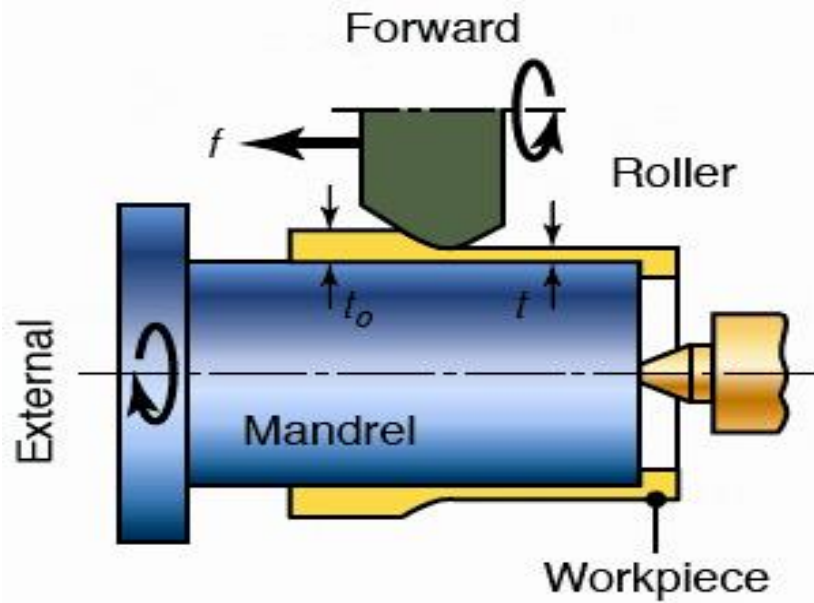
- This is a standard process for making **large quantities of thin-wall stainless steel tube or pipe** of uniform size and roundness throughout its entire length:
- 1. Piercing:** The billet is pierced in two hot rotary piercers for the greater reduction.
 - 2. Plugging:** The pierced billet is placed in a plug-mill to reduce diameter by rotating the tube over a mandrel.
 - 3. Reeling:** Having some ovality, the tube is inserted between rolls of reelers that provide for dimensional correction and burnish inside and outside diameters of the tube.
 - 4. Sizing:** Finally, after reheating, the tube reenters a reeler and sizing rollers to provide for greater dimensional uniformity.

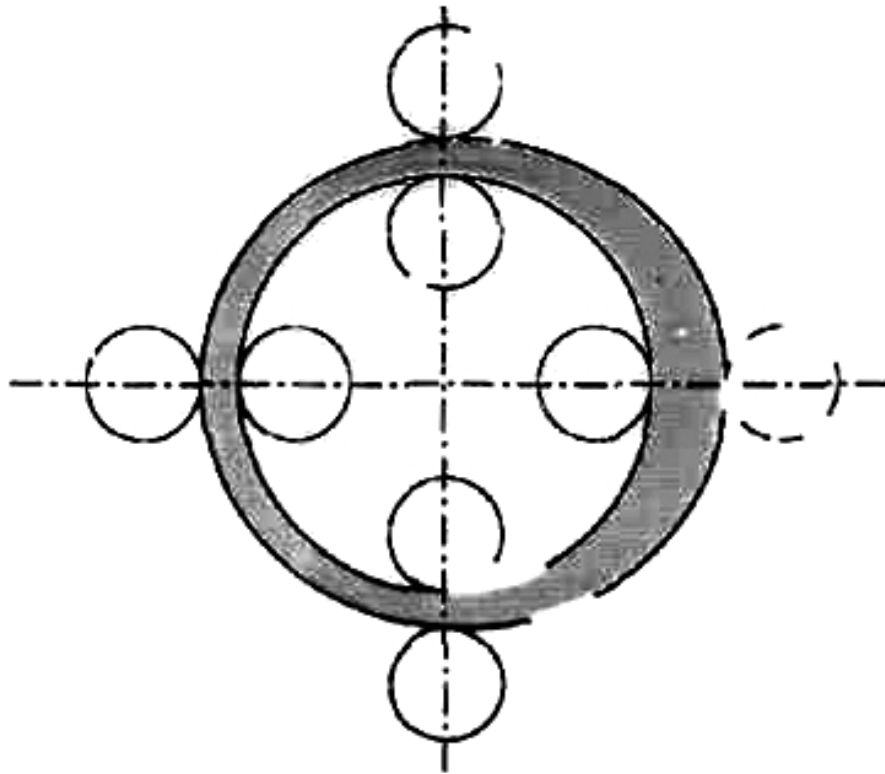


Plug-Mill Process (Mannesmann Method)



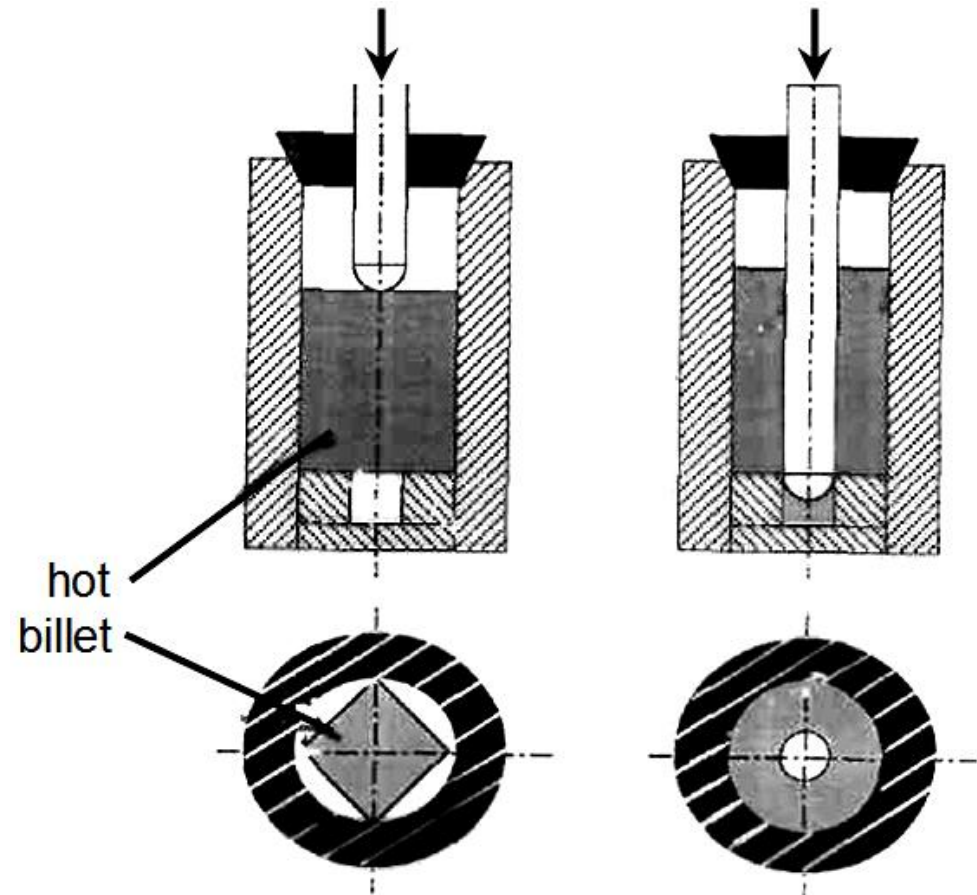






Röckner Method

Used for increasing the inner diameter of thin-walled tubes by means of helical motion of rollers ($\varnothing 800$ to $\varnothing 1800$ mm).



Ehrhardt Method

Pressing into a hot billet with a punch to enlarge the billet up to die walls (the inner diameter of tube is punch diameter).