SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore-35

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19MET202 – MANUFACTURING TECHNOLOGY

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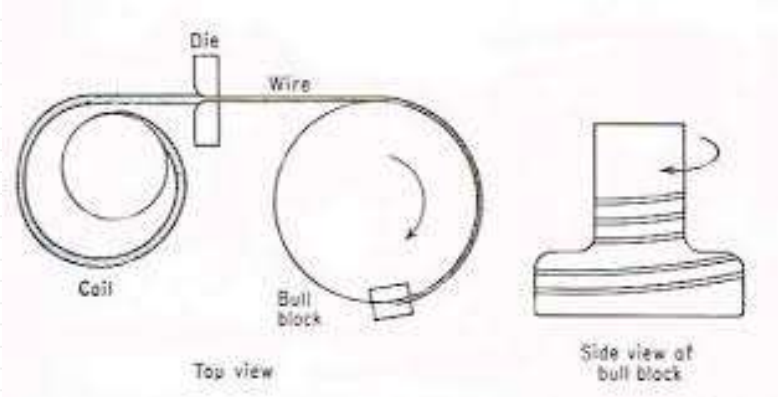
MET202, UNIT-2, LESSON-6

DRAWING PROCESSES –TUBE, WIRE - DEFECTS



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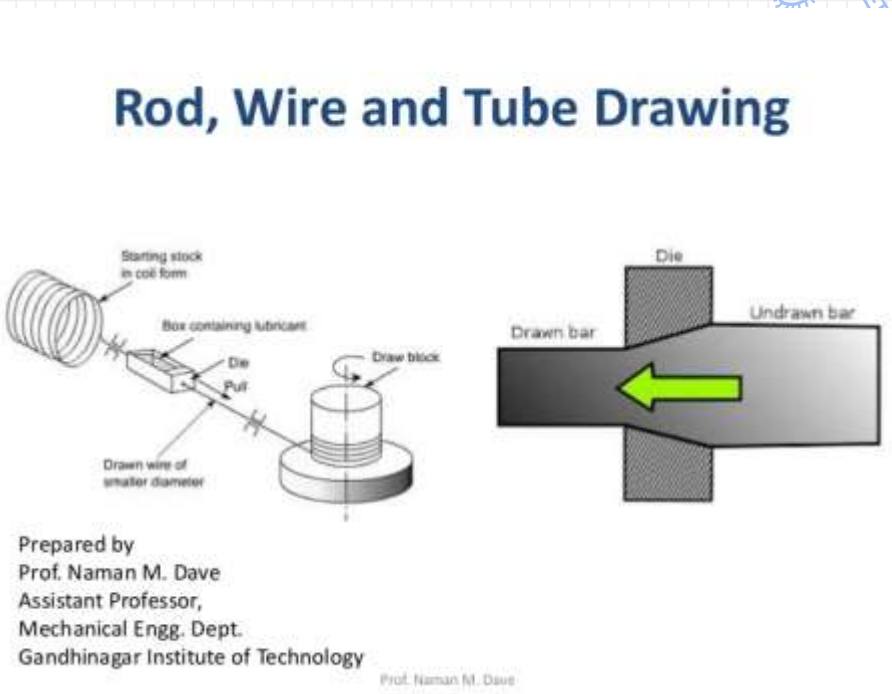
DRAWING PROCESSES

Introduction to Drawing

- Drawing is a cold working process in which the work piece is pulled through a tapered hole in a die so as to reduce its diameter.
- Accurate Dimensions ,specified cross-section and clean and excellent quality of surface to work.
- Appreciably increases strength and hardness of metal.
- Steels, copper alloys, and aluminium alloys are common materials that are drawn



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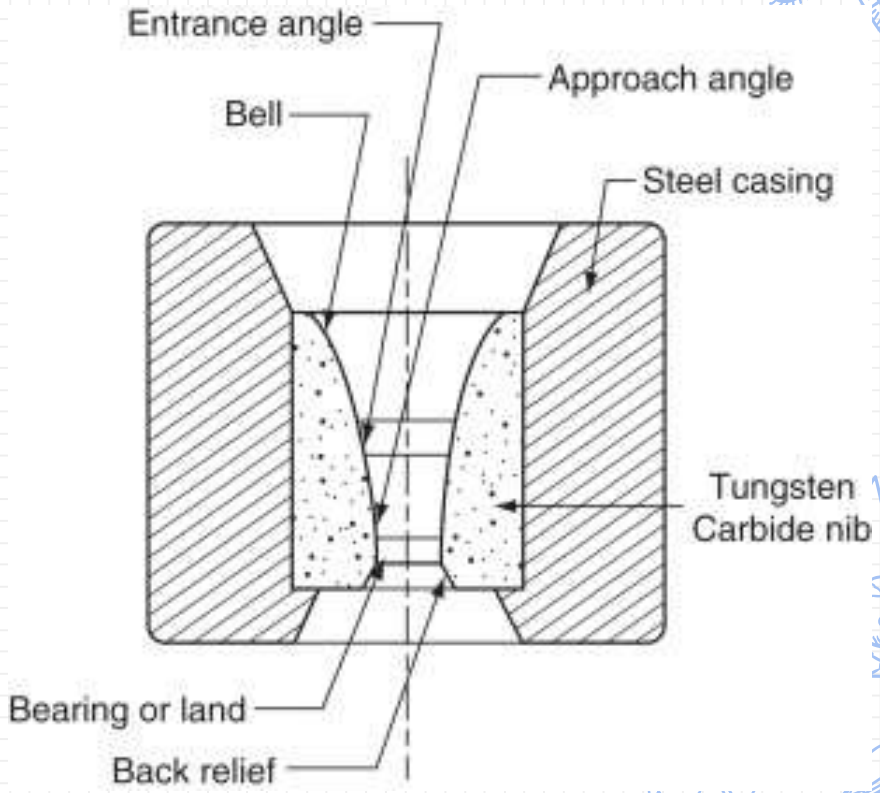
DRAWING PROCESSES

- The starting materials for drawing are in the form of rolled or extruded rods , rolled sections
- Large quantities of wires, rods, tubes and other sections are produced by drawing process
- Material should have high ductility and good tensile strength
- Reduction of the diameter through plastic deformation while the volume remains the same.



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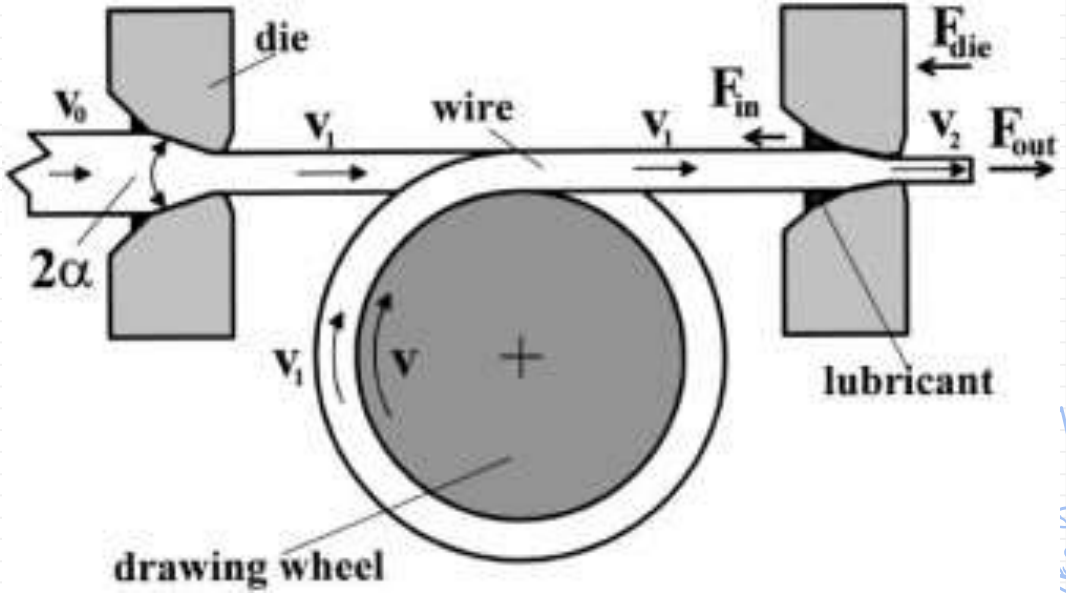
WIRE DRAWING

- **Wire Drawing:**
- In a typical wire drawing
- operation, one end of the
- wire is reduced and passed
- through the opening of the
- die, gripped and pulled to
- reduce its diameter.
- By successive drawing
- operation through dies of
- reducing diameter wires can be reduced to very small diameters.



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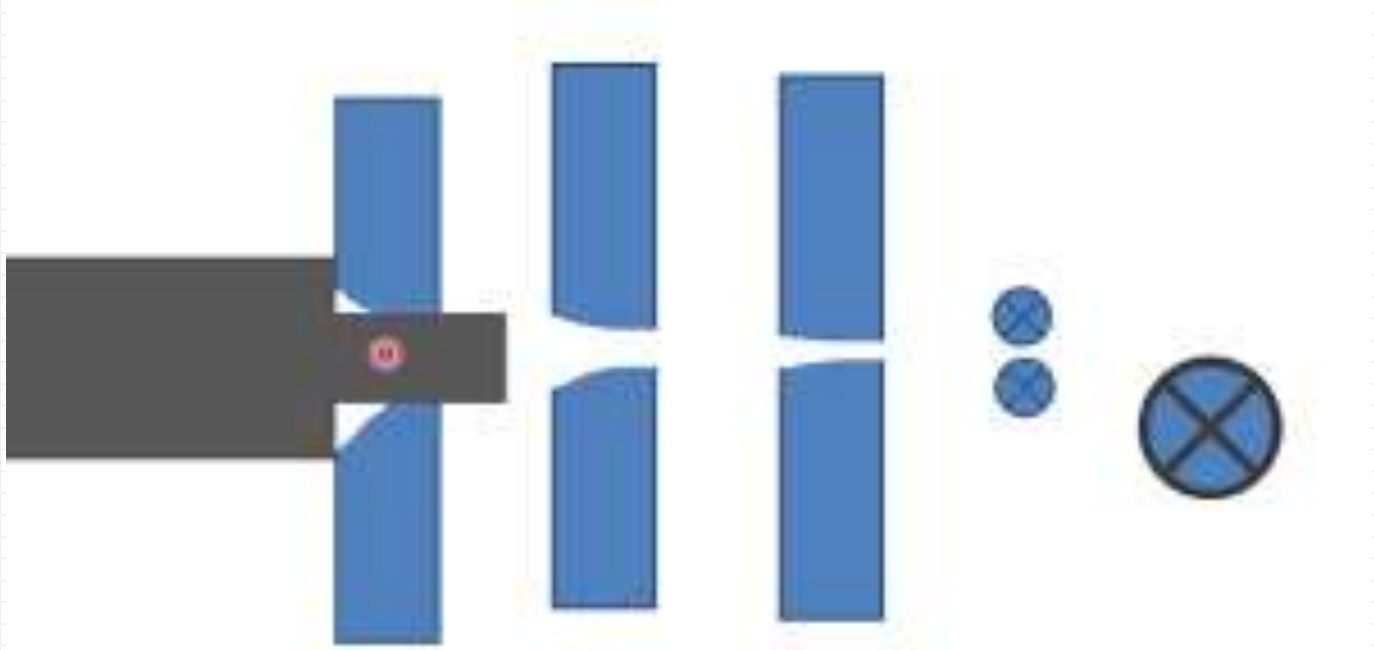
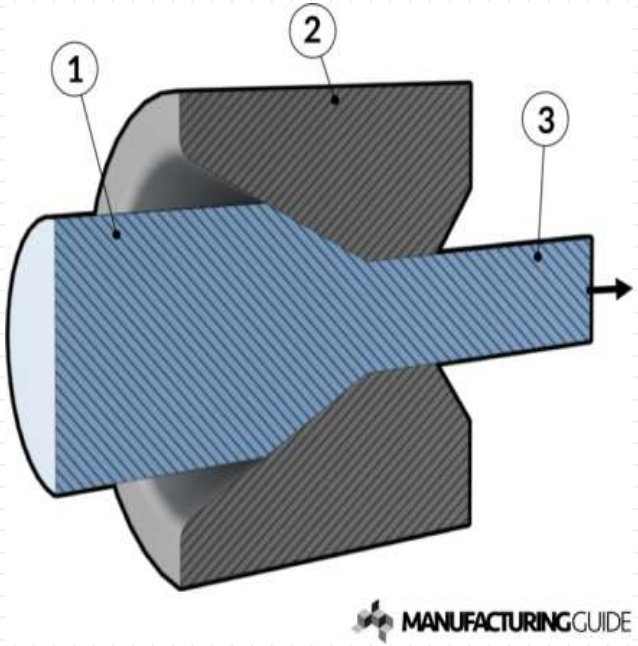


WIRE DRAWING

- **The process**

The work piece [1] in this case is a thin rod or coil must first be cleaned and coated with a lubricant and the front end must be beveled to make it easier to pull through the mold [2]. The work piece may be preheated. The work piece is fed into the mold which has an angled inner side so the work piece is more easily pulled through. The work piece is drawn through the mold so that its sectional area decreases, usually between 15-45% so that a wire [3] is created.



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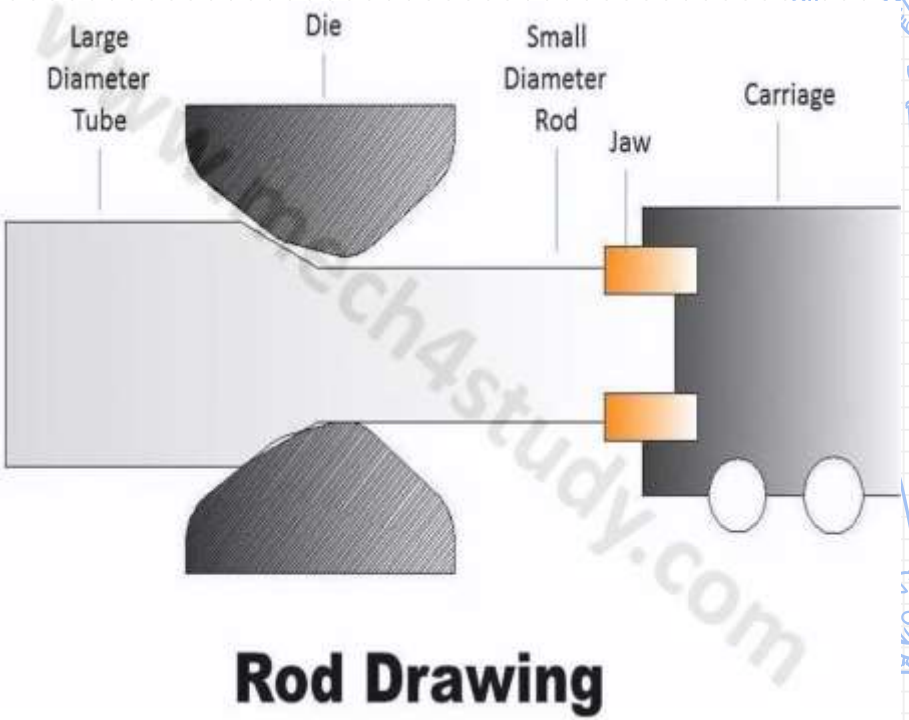
ROD DRAWING

- **Rod Drawing:**
- □ Rods -relatively larger diameter
- products.
- □ Wires- smaller diameter products,
- usually <10 mm
- □ In rod drawing the product must
- remain straight
- □ Due to the size of the work, rod and bar drawing involves much more finite lengths of material than wire drawing.
- □ Chain Draw bench are used for
- drawing operation



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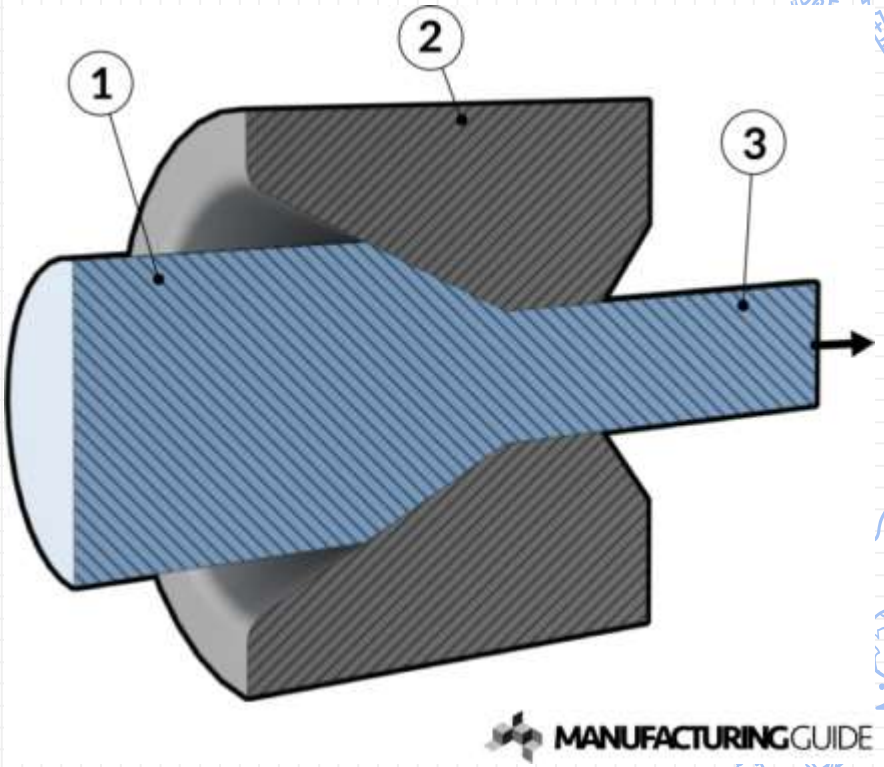
ROD DRAWING

- **Process:**
- The work piece [1] in the form of a bar stock is cleaned and coated with a lubricant before processing. One end which is chamfered is inserted through the form [2] and by a pulling force, the entire rod is drawn through the mold and reduces and changes the rods cross sectional area [3]. Ordinarily a reduction of cross-sectional area of about 50% is achieved.



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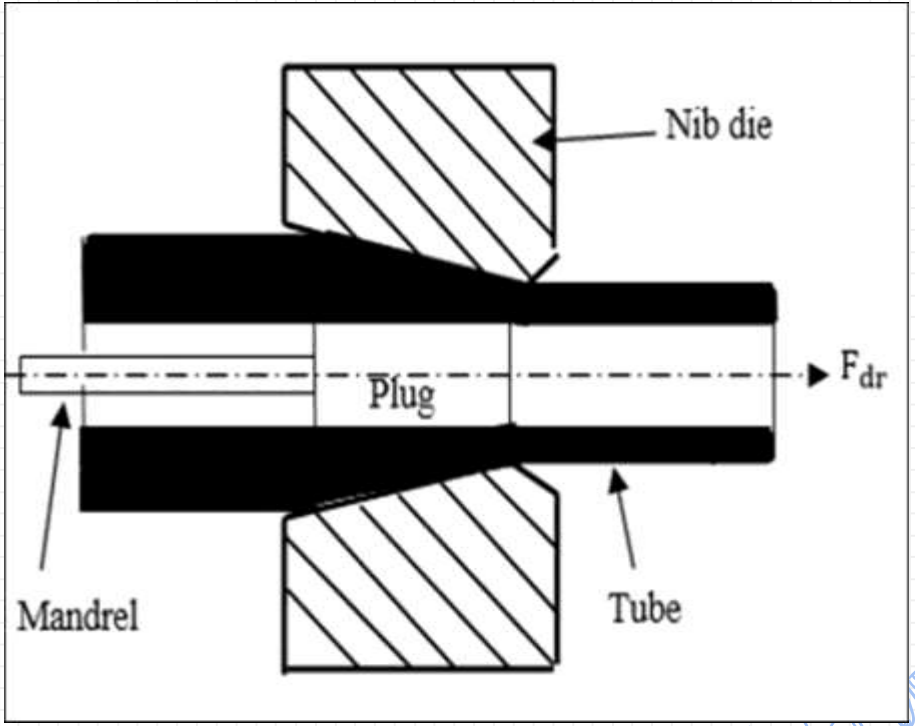
TUBE DRAWING

Tube Drawing

- Tube drawing involves reducing the cross section and wall thickness through a draw die.
- The cross section can be circular, square, hexagonal or in any shapes.
- This process produces high-quality **tubing** with precise dimensions, good surface finish, and the added strength of cold working.



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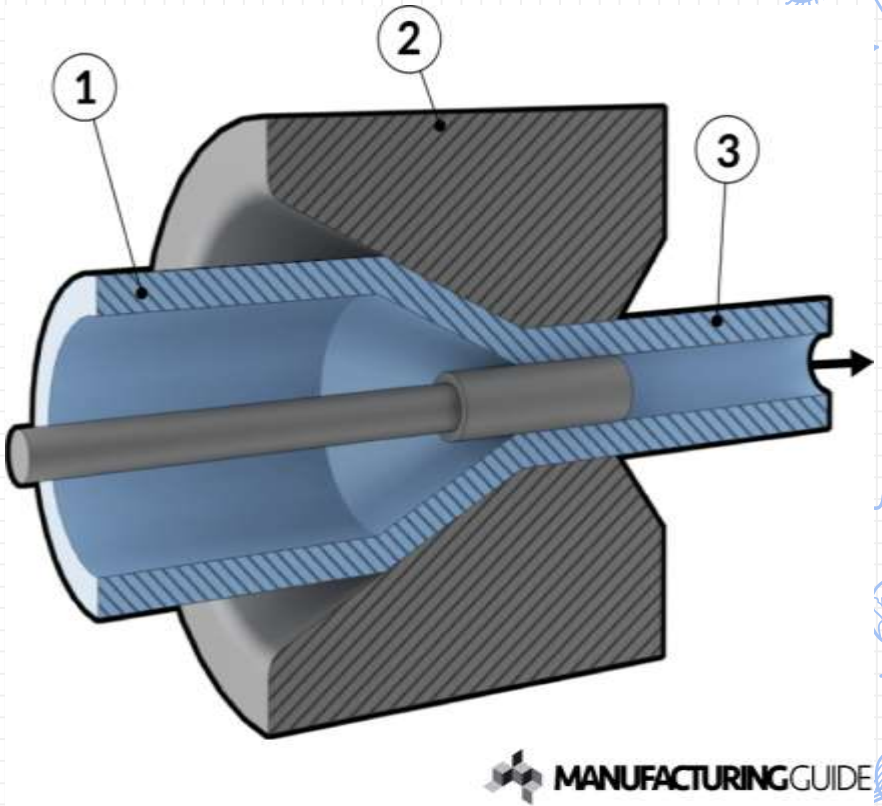
TUBE DRAWING

- **The process**
- The work piece [1] in the form of a tube blank is cleaned and coated with a lubricant before processing. One end which is chamfered is inserted through the form [2] and by a pulling force, the entire tube through the mold and reduces and changes the tube cross sectional area [3]. A fixed core control the internal cross section. Ordinarily a reduction of cross-sectional area of about 50% is achieved.



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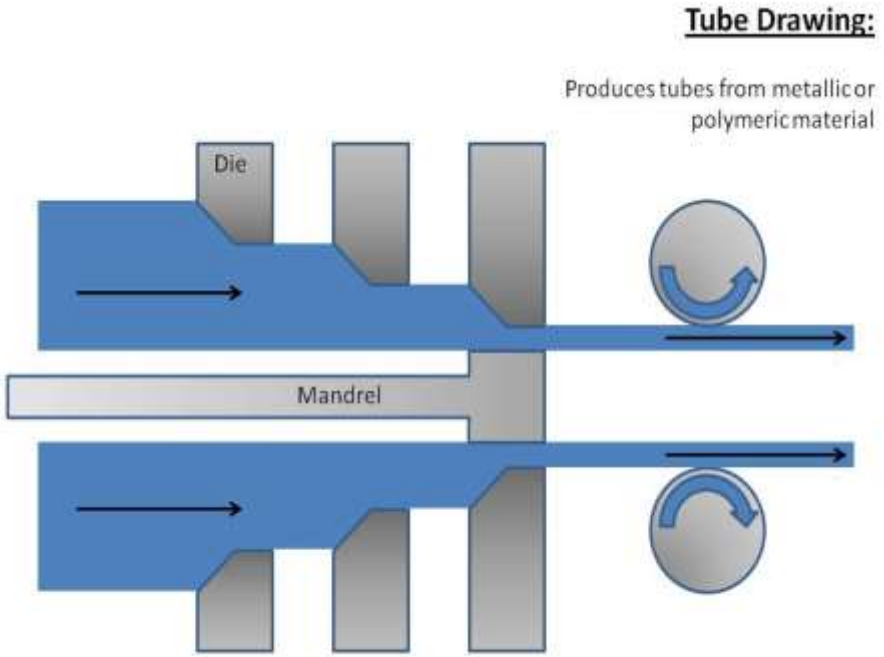
TUBE DRAWING

Purpose of tube Drawing

- To regulate the outer diameter and the inner diameter
- To regulate outer diameter and to have good surface finish on the inner diameter
- To carryout a heavy reduction in thickness of tube



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LUBRICATION

- **Lubrication for drawing**
- Proper lubrication is essential in order to improve die life, reduce drawing forces, reduce temperature, and to improve surface finish.
- These can be of three types
- Wet drawing lubrication
- Dry drawing lubrication
- coating
- **Types of Lubricants**
- Oil
- Copper Sulphate Solution

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DIE MATERIAL

- **Die Materials**
- □ Steel and carbides
- □ Chromium plated steel
- □ Titanium nitride coated carbide
- □ Diamond

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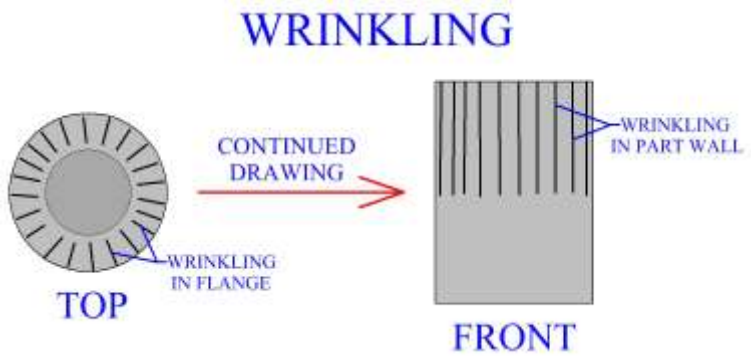
DEFECTS IN DRAWING PROCESS

Defects that occur in metal drawing manufacture are similar to those that occur while manufacturing by extrusion. Controlling metal flow is essential in preventing defects. Mold characteristics and friction play a critical roll in the process.

Internal Cracking: Internal breakage may occur in drawn products, particularly along the centerline. This is due to improper metal flow creating high internal stresses. Causes may be high die angles or low friction.



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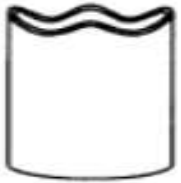
DEFECTS IN DRAWING PROCESS

Surface Defect: A wide variety of surface defects can be observed in metal drawing manufacture. Seams, scratches and cracks are all possible defects on the surface of drawn product. Excessive force on the surface of the work during the drawing operation, (such as from friction), can be the cause of breakage. Also, many metal drawing operations form at very high speeds, sufficiently designed entry and exit zones need to be provided in order to avoid damage to the work material from the die.

DEFECTS IN DRAWING PROCESS

- Tearing
  - High tensile stresses that cause thinning and failure of the metal in the cup wall.
  - If the die has a sharp corner radius.
- Earring
  - When the material is anisotropic
    - Varying properties in different directions.
- Surface scratches
  - If the punch and die are not smooth
  - If the lubrication of the process is poor.

(c)



(d)

(e)

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ASSESSMENT

1. Which of the following types of stresses is applied during the process of rod or tube drawing?
   a) Shear
   b) Direct compressive
   c) Tensile
   d) In-direct compressive
2. Which of the following processes of metal forming is widely used for making the raw material for the manufacturing of bolts?
   a) Rolling
   b) Forging
   c) Wire drawing
   d) Rod drawing

ASSESSMENT

3. In rod drawing process, the final output is coiled on a large metallic form roll.
a) True
b) False

4. Over drawing of the metallic rod can cause poor surface finish of the product.
a) True
b) False

5. In general, no any lubrication is required during the process of rod or bar drawing.
a) True
b) False

THANK YOU