UNIT V

LATHE

Basic Civil and Mechanical Engineering

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MANUFACTURING PROCESS

- It is a process which involves the conversion of raw materials into desired product.

- **METHODS INVOLVED**

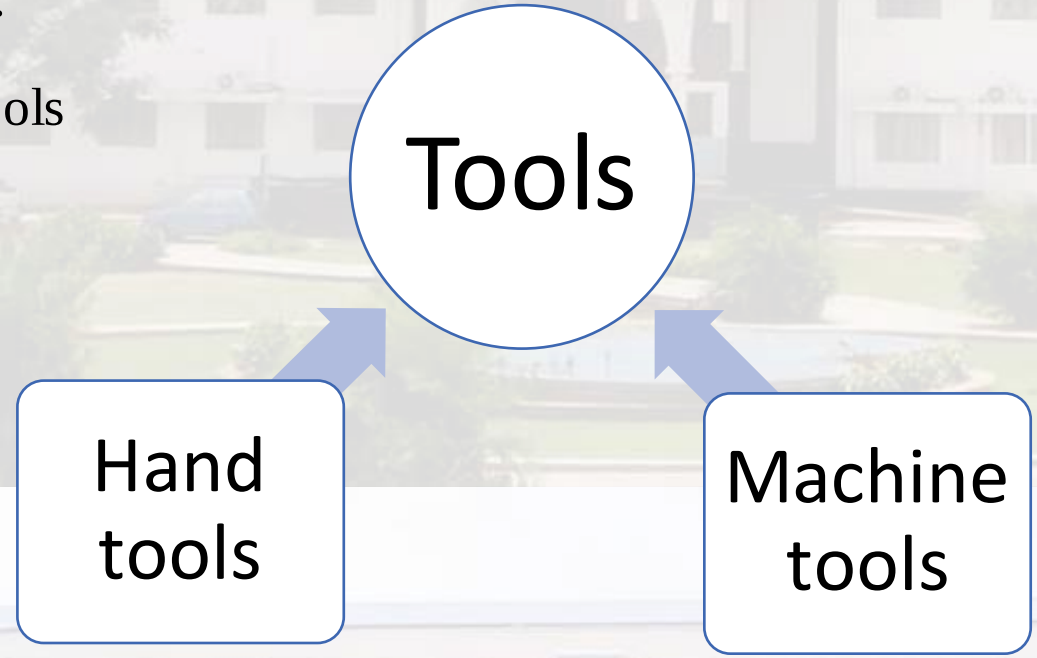
  - ❖ Material removal
  - ❖ Assembly or joining process
  - ❖ Finishing process

MATERIAL REMOVAL OPERATION

- It involves removal of extra material from the given material to obtain required dimension of product.
- Material removal can be in small scale or large scale
  - ❖ Small scale – Fitting, Craftwork etc
  - ❖ Large scale – Industrial Products.

TOOL

- A tool is a device use to carry out various manufacturing operation.
  - Hand tools.
  - Machine tools



TOOL

- Hand Tools

Tools which are used manually by human effort.

- ✓ Files
- ✓ Hacksaw

- Machine Tools
  - ✓ Defined as power driven machine which accomplishes the cutting operation or machining operations

LATHE

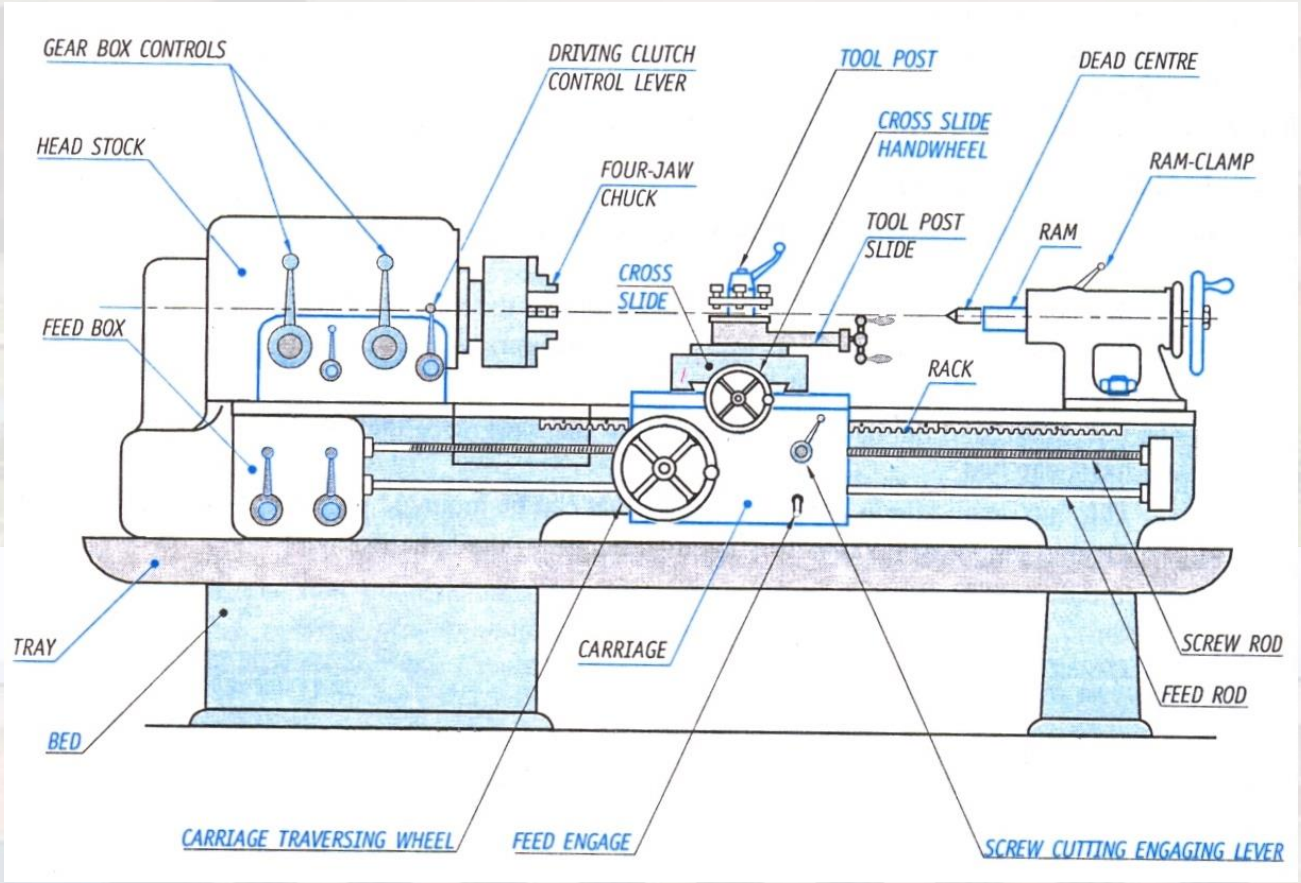
- A lathe is machine tool employed generally to produce circular objects.
- Operations
  - ❖ Drilling
  - ❖ Grinding
  - ❖ Shaping
  - ❖ Milling

CLASSIFICATION OF LATHE

- Engine lathe or Center Lathe
- Speed lathe
- Turret lathe
- Capstan lathe
- Automatic lathe
- Computer numerically controlled lathe.

LATHE PRINCIPLE OF WORKING

- A lathe works on the principle that "**a cutting tool can remove chips from the rotating work pieces to produce circular objects".**



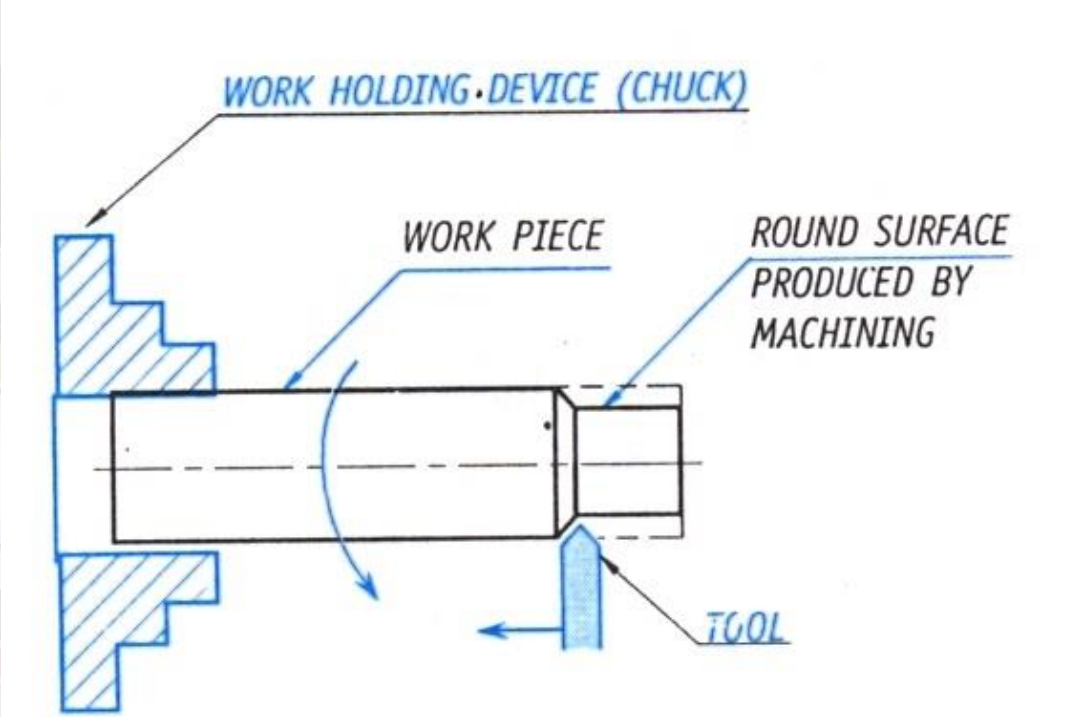
LATHE PRINCIPLE OF WORKING

CHUCK

- Figure shows a work holding device known as chuck and is rotated a very high speed.

- A V-shaped cutting tool is held against the work piece.

- When the tool is moved parallel to axis of work piece material is removed.



MAJOR COMPONENTS

- **Bed**
  - ✓ It is the foundation part of lathe and supports all its parts.
  - ✓ Top of bed has a guide way which is machined to precision.
- **Head stock**
  - ✓ Main spindle projects out from headstock.
  - ✓ Housing comprises of feed gear box and cone pulley.
  - ✓ Rigidly mounted on bed.
- **Saddle**
  - ❖ H shaped casting that slides over the outer set of guide ways
  - ❖ Serves as base for cross slide.

MAJOR COMPONENTS

- **Compound rest**
  - Mounted on top of cross slide and supports the tool post.
  - It can be swiveled at an angle to perform taper turning operation.
- **Tool post**
  - ➢ It is used to clamp the tool holder in position.
- **Apron**
  - ❑ It is the part which is fitted saddle, facing operator.
  - ❑ It houses levers, hand wheels mechanism for manual and automatic movement of carriage assembly.
- **Main drive**
  - ▪ It is an electric motor which drives the spindle through transmission system.

MAJOR COMPONENTS

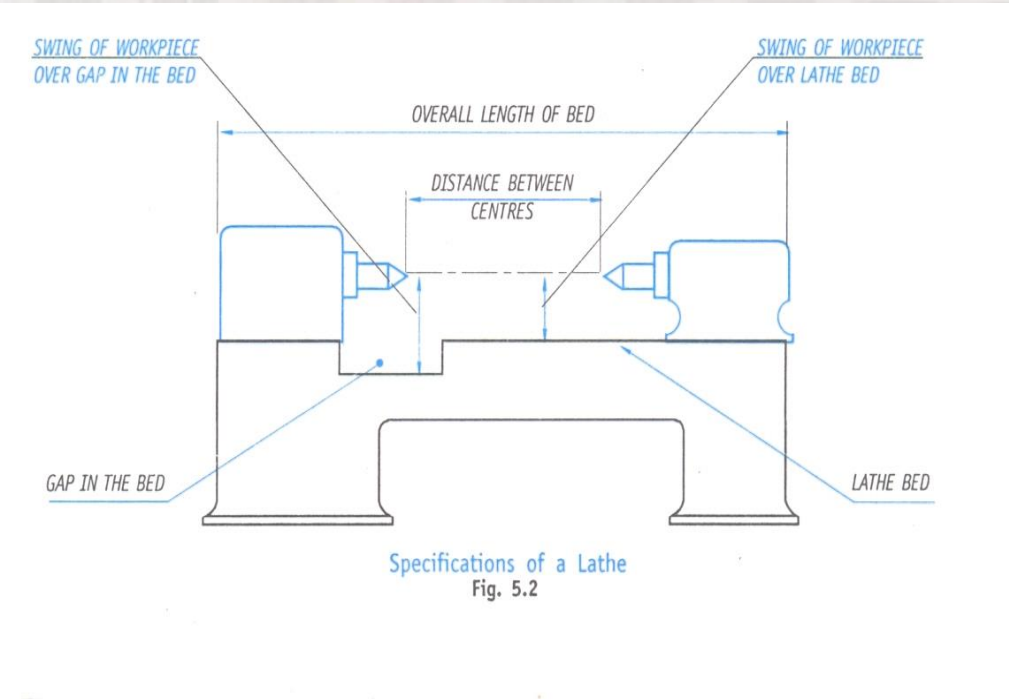
- **Lead screw**

❖It is a rod which runs longitudinally in front of lathe bed.

❖The rotation of lead screw moves the carriage to and fro longitudinally during thread cutting operation.

LATHE SPECIFICATIONS

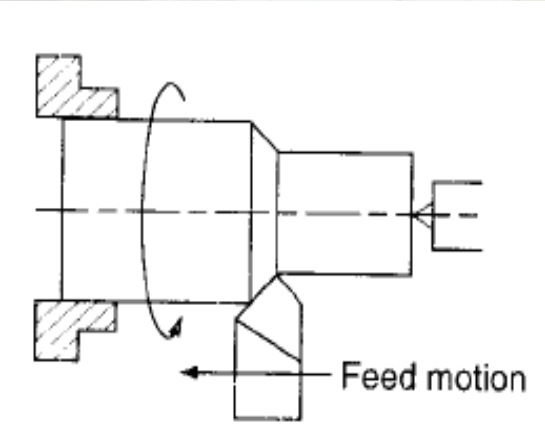
- Maximum diameter of the workpiece that can be revolved over the lathe bed.
- Maximum diameter and width of the workpiece that can revolve over gap in bed.
- Maximum length of workpiece that can be mounted between centers.
- Overall length of the bed.



Specifications of a Lathe
Fig. 5.2

LATHE OPERATIONS

- **TURNING**
  - ✓ It is an operation in which the workpiece is reduced to the cylindrical section of required diameter.
  - ✓ Operation is carried out with a single point cutting tool.
  - ✓ Work piece is supported between the two centers permit rotation of workpiece.
  - ✓ Tool is fed perpendicular to the axis of workpiece to a known depth and then moved parallel to axis of work.



LATHE OPERATIONS

Facing

- ✓ An operation performed on lathe to generate flat surface.
- ✓ Direction of feed is perpendicular to the axis of the lathe.
- ✓ Length of the work should not be extended more than 1.5 times the diameter of the work piece.

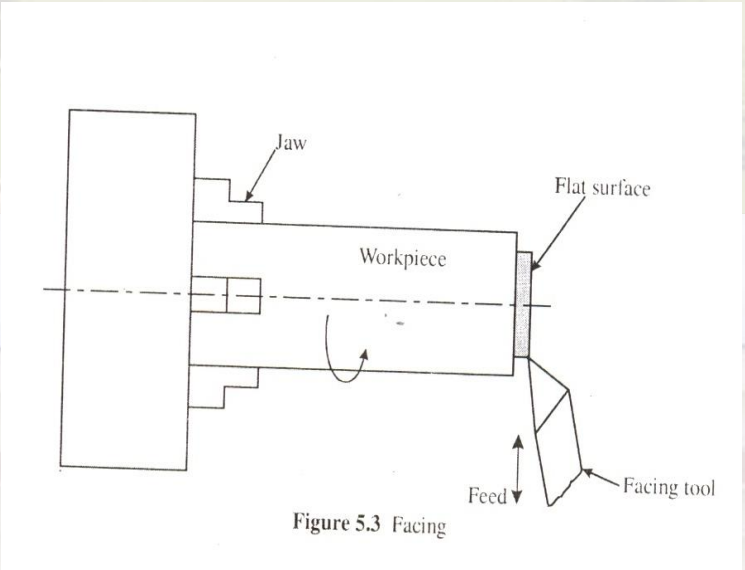
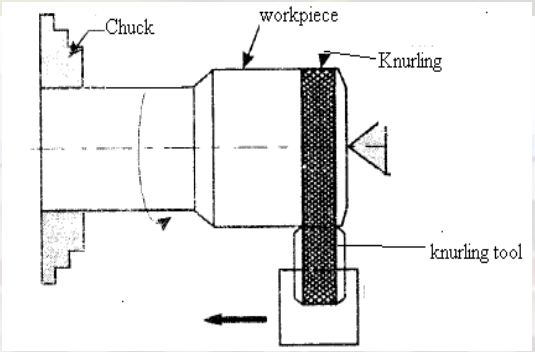


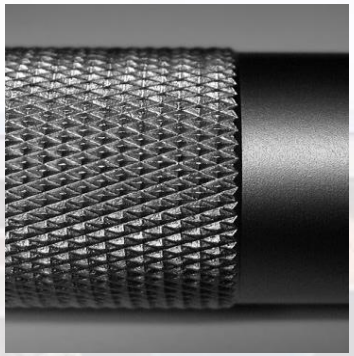
Figure 5.3 Facing

LATHE OPERATIONS

Knurling

- Operation performed on lathe to generate serrated surface.
- Tool used is called as “knurling tool”.
- Tool consist of one upper roller and one lower roller which contains the impression.
- Tool is set in such a way that both rollers touch the work.
- Low speed of about 60 to 80 rpm and feed is 0.38 to 0.78mm/revolution.





LATHE OPERATIONS

Taper Turning

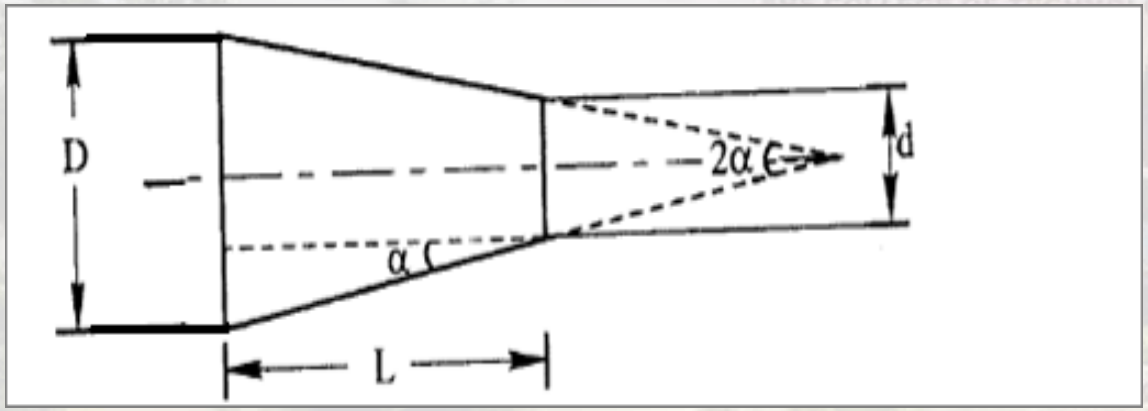
- It is the operation of reducing the diameter of the workpiece gradually along its length.

Different types of Taper turning

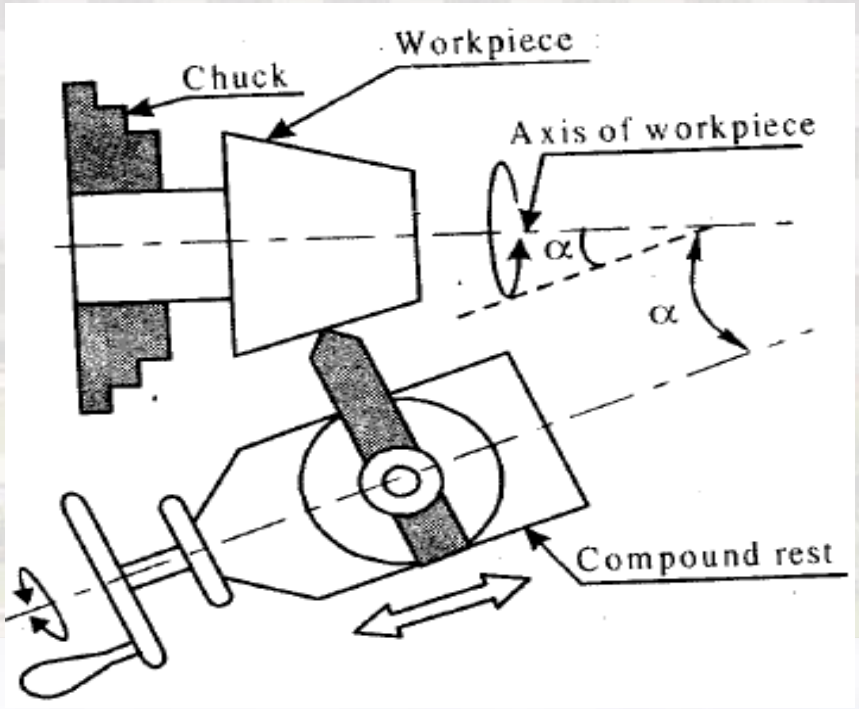
1. Compound slide swiveling method
2. Tailstock offset

- Axis of the tool is moved inclined to produce the required taper.
- Compound rest which supports tool post is swiveled at required taper angle and locked.

TAPER TURNING BY SWIVELING THE COMPOUND REST



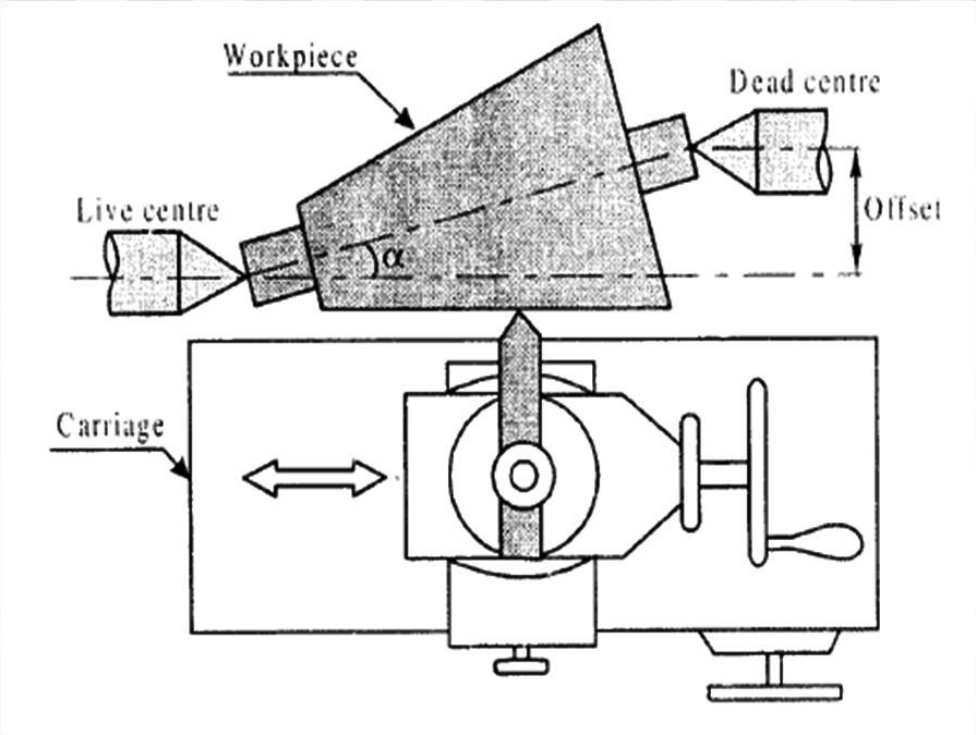
$$\alpha = \tan^{-1}\left(\frac{D-d}{2L}\right)$$



TAPER TURNING BY TAILSTOCK OFFSET

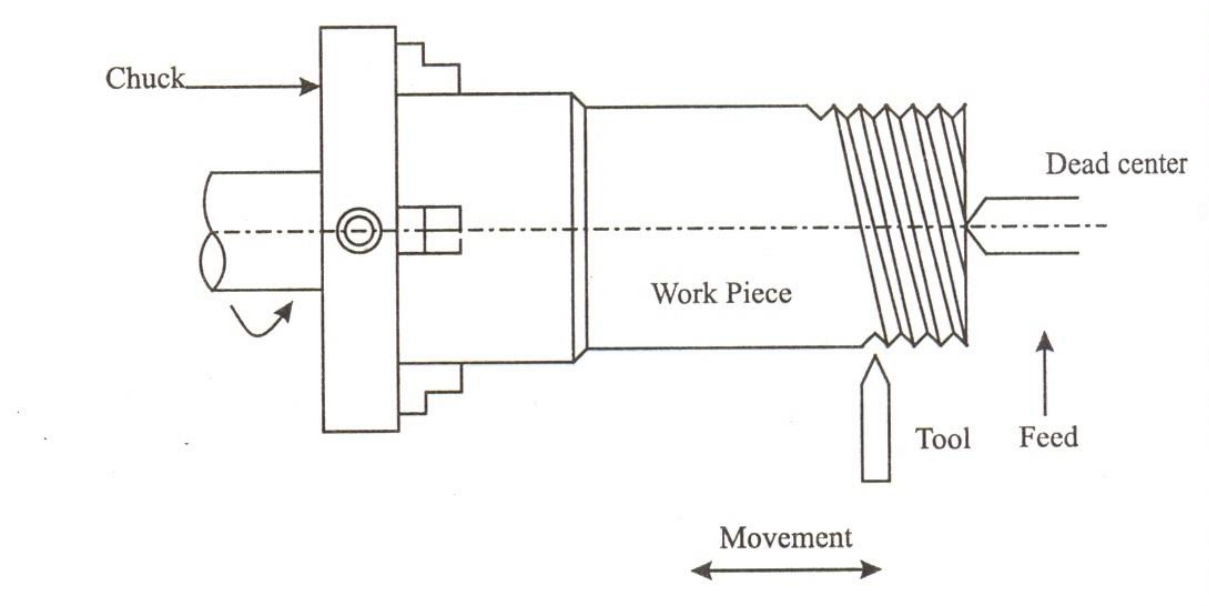
- In this method the workpiece is inclined with respect to the lathe axis.
- Tool movement is in line with the lathe axis to produce taper.
- Tail stock is shifted by a small distance called *offset*.

$$K = \left(\frac{D-d}{L}\right)$$



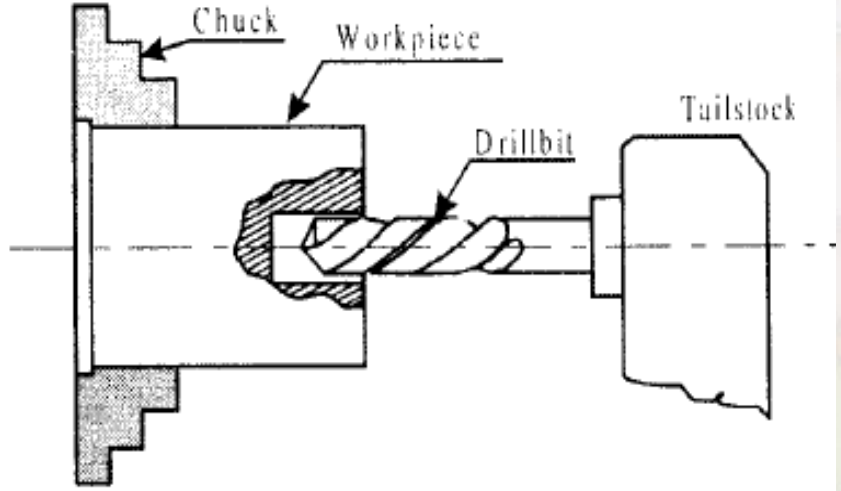
THREAD CUTTING

- A thread is a *helical shaped groove* formed on cylindrical surface of workpiece.
- *Thread cutting* is an operation performed on lathe to produce threads by using a tool whose shape will be same as that of thread.



DRILLING

- Drilling is an operation to produce a cylindrical hole in workpiece.
- Tool used is called as “drill bit”.
- Tool is held on the tailstock and stationary.
- Work is held in chuck.
- Tool is fed against the revolving work by rotating hand wheel.



THANK YOU