Getting to know the lathe - Main components, lever position & lubrication points

Objectives: At the end of this lesson you shall be able to
- **name the main parts of a lathe**
- **state the safety precautions to be observed when working on a lathe.**

Turning and centre lathe

Turning is a machining process to bring the raw material to the required shape and size by metal removal. This is done by feeding a cutting tool against the direction of rotation of the work.

The machine tool on which turning is carried out is known as a lathe.

Constructional features of a lathe

A lathe should have provision :

- to hold the cutting tool, and feed it against the direction of rotation
- to have parts, fixed and sliding, to get a relative movement of the cutting tool with respect to the rotation of the work
- to have accessories and attachments for performing different operations.

The following are the main parts of a lathe. (Fig 1 & 2)

Headstock

Tailstock

Carriage

Cross-slide

Compound slide

Bed

Quick change gearbox

Legs

Feed shaft

Lead screw

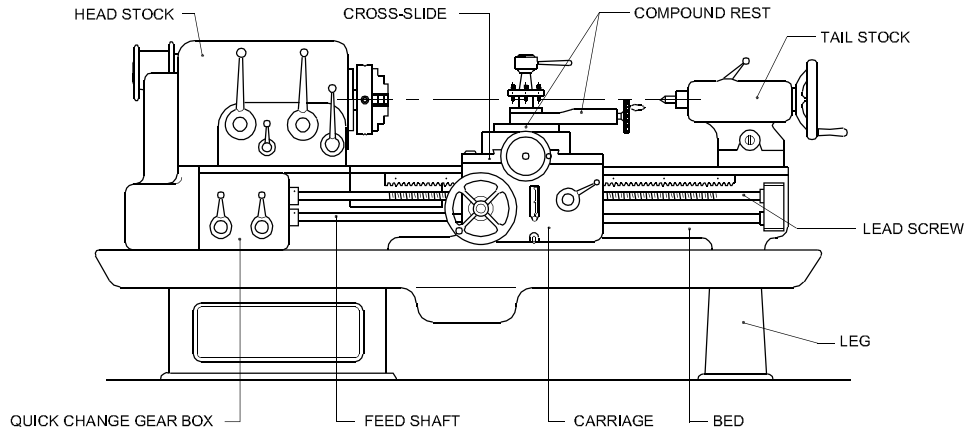
Safety precautions

Before working

Ensure that the electrical power supply is as needed for the machine.

Ensure that the safety guards are in proper condition. Ensure that the work area is clean and tidy.

Fig 1



Ensure that the meshing gears are in proper mesh, and the power feed levers are in neutral.

Ensure that the automatic lubricating system is functioning.

During working

Shift the levers to change the speeds and feeds only when the rotating parts are fully stationary.

Wear an apron (not too loose) with the sleeves of the shirt folded.

Avoid wearing rings and watches when working. Wear shoes to avoid injury to your feet.

Remove the chips by a hook, and use a brush to clear them.

After working

Clean the machine with a brush and wipe with cotton waste.

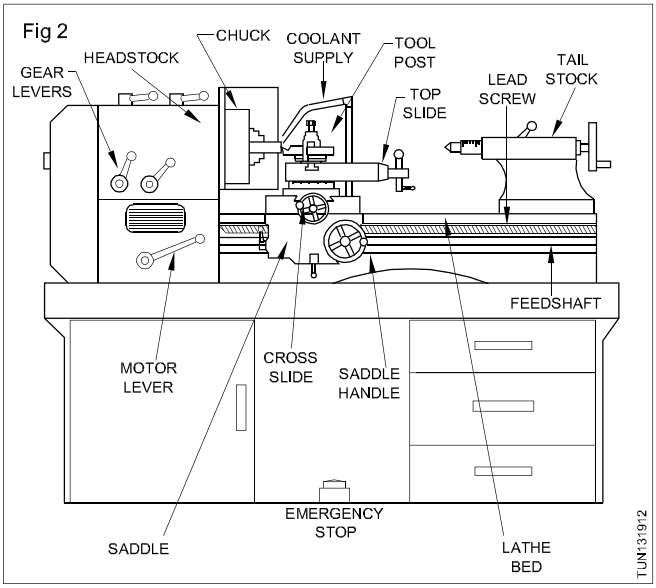
Oil the bed-ways and the lubricating points.

Clean the precision instruments and hand them over to the instructor for safe keeping.

Clean the cutting tools and place them in their respective places.

Clean the area surrounding the lathe by wiping the spilt oil and coolant, and remove the swarf.

Fig 2



Various Lubrication Points

1 Place a few drops of oil on the rockershaft bearing and cams every time the lathe is in use.

2 Countershaft roller bearing - Fill both grease cups with automotive cup grease every two weeks. Give the grease cup caps a turn or so every time the lathe is used.

3 Place a few drops of oil on the rockershaft lever bearings and lever fulcrum bearing every time lathe is used.

4 Motor bearings - sleeve type motors have two oil cups which should be filled once a week with S.A.E. No. 10. Motor oil or equivalent. Ball bearing motors have a sealed in - type bearing-every six months the small headless screw in these bearings should be removed and a moderate quantity of automotive cup grease forced around the bearing.

5 Left and right headstock bearings - oil with No.10 motor oil or equivalent every time the lathe is used.

6 Spindle pulley - every time the lathe is used in backgear, remove the small screw in the bottom of the second step of the idler pulley and oil freely with No. 10 motor oil or equivalent. Replace screw.

7 Back gear spindle - every time the back gears are used, remove the small screw in the centre of the back gear spindle and oil freely with No.10 motor oil or equivalent. Replace screw.

8 Back gears and change gears - A small amount of keystone No.122 heavy outer gear lubricant or equivalent applied to the gear teeth will aid in obtaining smoother, more quiet operation. Be sure to remove all oil in the gear teeth before applying this lubricant or it will not adhere.

9 Change gear bearings - put a few drops No.10 motor oil or equivalent on the change gear bearings each time the lathe is used.

10 Lead screw stub bearing and reversing gears - put a few drops of No. 10 motor oil or equivalent in the three oil holes on the top of the reversing gear box every time the lathe is used.

11 Carriage traverse gear case - every time the lathe is in use, put a few drops of No. 10 motor oil in oil hole on top of gear case on back of carriage apron.

12 Carriage hand wheel bearing - put a few drops of No.10 motor oil or equivalent in the ball spring oil hole every time the lathe is used.

13 Cross feed gear bearing - put a few drops of oil in the ball spring oil hole every time lathe is used.

14 Half-nut lever bearing-put a few drops of No.10 motor oil or equivalent in the ball spring oil hole every time the lathe is used.

15 Thread dial-once a week put a few drops of No.10 motor oil or equivalent around the rim of the top of the thread dial.

16 Wipers (front and back) - saturate the felts in the four wipers, located on the carriage with oil every time the lathe is used.

17 Cross slide screw - Put a few drops of No.10 motor oil or equivalent in the oil hole above the front cross slide screw bearing after removing the small screw. Replace the screw. This should be done every time the lathe is used. Clean the cross slide screw regularly with a small stiff brush. Oil the screw threads by running the compound rest back and forth.

18 Cross feed gears - put a few drops of oil in the oil hole above the cross feed screw after removing the small screw. Replace the screw. This should be done every time the lathe is used.

19 Cross slide ways - clean regularly and apply a liberal quantity of No. 10 motor oil or equivalent to the ways whenever the lathe is used.

20 Compound slide screw - every time the lathe is used put a few drops of No.10 motor oil or equivalent in the oil hole on top of the compound rest and above the compound screw bearing.

21 Compound slide ways - clean regularly and apply a liberal quantity of No.10 motor oil or equivalent to the ways whenever the lathe is used.

22 Lead screw - about once a month clean the lead screw threads with kerosene and a small stiff brush and apply a small amount of No.10 motor oil or equivalent.

23 Rack (on bed, under front way) - about once a month apply a small amount of cup grease to the rack after cleaning with kerosene and a small stiff brush.

24 Lead screw bearing (right end of lathe) - put a few drops of No.10 motor oil or equivalent in the oil hole on top of the bearing every time the lathe is used.

25 Place a few drops of oil between the handwheel and screw bearing when ever using lathe.

26 Tailstock center lubricant - fill the small cup on the tailstock with a mixture of white lead and oil and apply to the tailstock center whenever turning between centres. If white lead is not available, use a liberal amount of cup grease on the center.

27 Tailstock ram - keep the outside surface of the tailstock ram well oiled.

28 Lathe bed ways - keep the bed ways oiled at all times with No.10 motor oil or equivalent and free from chips. Wipe off the ways before using and cover with fresh oil. Always leave a generous film of oil on the ways when the lathe is not in use. The lathe should be completely covered when not in use. During all grinding operations cover bed ways with canvas or carboard.

Keep all the lathe bearing surfaces perfectly clean. Dirt is the natural enemy of accurate lathe work.

Definition of machine and machine tool, history & gradual development of lathe

Objectives: At the end of this lesson you shall be able to
- **distinguish between machine and machine tool**
- **history of lathe.**

Machine

Machine is a device that performes related operation to produce desired product. It can be stitching of a cloth with a sewing machine, producing a component in forging press, are it can be mass production using a CNC machine tool.

A machine tool is defined as a power driven machine, capable of holding/ supporting the work and tool, at the same time, directing/guiding the cutting tool or job or both to perform various metal cutting operations to produce various shape and size.

Fundamentals of machine tools

A machine tool is a device that utilizes electric energy for shaping and sizing a product by removing excess material in the form of chips, with the help of cutting tool.

Machine tools are used for producing components at a rapid rate. Optimum productivity from machine tool calls for a fairly high degree of skill. Properly carried out operations are capable of producing a large number of components at a fairly rapid rate.

Machine tools and machines are two different things. Machine tools when taken as a group cam produce a machine tool, which is not true of machines.

Lathe, milling machine, shaping machine, slotter etc., are all machine tools.

Every metal working machine cannot be called a machine tool merely because it removes material. Forging hammers, drawing dies, extruders, rolling machine etc., are not machine tools.

Functions of machine tools

1 To hold and support the workpiece to be machined.

2 To hold and support the cutting tool.

3 To provide requisite motion to the workpiece tool or both.

4 To regulate the cutting speed and feed of the tool and workpiece.

5 To hold variuos attachments for different operations. Jobs and tools are held in properly designed devices on a machine tool. Different machine tools are provided with different holding devices.

In a workshop, a machine tool is generally used for producing different shapes and for finishing the surfaces.

Classification of machine tools

1 According to the type of the surface generated.

   i) Cylindrical work machine tools - Lathes, capstan, turret etc.,

   ii) Flat surface machine tools - milling m/c, shapping m/c, planning m/c etc.,

2 Classification based on the purpose of the m/c tool.

   i) Single - purpose

   ii) Multi purpose

   iii) Special purpose

   iv) Transfer machine

   v) Numerically controlled

3 Classification based upon the size of chip

   i) Machine tools using cutting tools - lathe, milling, planner, slotter etc.,

   ii) Machine tools using abrasives - honing, lapping etc.,

Machine tool performance criteria

While designing a machine tool the following factors need consideration.

1 It should be safe and easy to operate.

2 It should be accurate.

3 It should have good production capacity.

4 The operational cost should be low.

5 Controls should be located at convenient points.

6 Blanks should be such that they can be loaded and clamped easily.

Factors in machining operations

The operations of removing metal by means of a cutting tool using some sort of machine tool in order to obtain a desired shape is called machining.

It includes number of operations such as turning boring, shaping, milling etc.,

The selection of a machine tool for a particular operation depends upon many factor such as

1 The shape and size of the product required.

2 The quantity of material to be removed.

3 The type of operation to be performed.

4 The number of components required.

5 The type of material to be handled.

6 the degree of accuracy required.

The - longitudinal axis tool holding equipment

Fig 1

Lathe introduction

Lathe is a machine widely used for wood works and machining of metal parts. Lathe is a machine which turns the work piece against a machine tool. The lathe is used for facing, turning, knurling, taper cutting, threading, gear cutting and many other metal and wood works.

History of lathe

Lathe is a very ancient tool and its first use dates back to 1300 BC in Egypt. Lathe was also known and used in Syria and Greece. Ancient romans came to know about this machine and they further developed this machine. During the medieval period, the use of this machine had spread to most parts of Europe and it was during the industrial revolution when this machine gained popularity with its use in all the industries. After the development of electronics, automated lathes have been developed.

Evolution of lathe

The first lathe was a simple lathe which is now referred to as two person lathe. One person would turn the wood work piece using rope and the other person would shape the work piece using a sharp tool. This design was improved by ancient romans who added a turning bow which eased the wood work. Later a pedal (as in manual sewing machines) was used for rotating the work piece. This type of lathe is called “spring pole” lathe which was used till the early decades of the 20th century. In 1772, a horse-powered boring machine was installed which was used for making cannons. During the industrial revolution, steam engines and water wheels were attached to the lathe to turn the work piece at higher speed which made the work faster and easier. After 1950, many new designs were made improved the precision of work.

Lathes are classified depending upon their application and functionality.

Light duty lathe - These machine find their application in automobile, electronic, electrical industries and are manufactured from quality tested raw materials.

Medium duty lathe - These machines are powerful than the light duty lathes and can work on bigger work pieces and have more strength than the light duty lathes.

Heavy duty lathe - these machines are manufactured from hightest grades of materials like iron and steel. They are designed for high precision heavy duty operations.

All geared lathe - In all geared lathe, all the rotating components of the machines are driven by the same source at different speeds by using gears to perform various operations.

Imported lathe - Imported lathes are high quality lathes used for high precision operations.

Depending upon the modes of operation, the lathes can be classified as

Manual lathe - In these lathes, the tool handling is done manually and so the precision of work also depends upon the skill of the person handling the machine.

CNC lathe - CNC lathes are completely automated lathes. We just have to feed the instructions into the computer and the lathe will perform the operations according to the data fed to the computer.