

IISER Mohali

Machine Shop

Lab Record

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Machine Shop

Introduction

A machine which performs material removal operation with tools, to produce the desired shape is known as a lathe machine. The purpose of the machine tools is to save time, cost of production and to get better output which cannot be obtained with hand tools

Various types of machine tools

1. Lathes
2. Shapers
3. Planers
4. Drilling machine
5. Grinding machine

We performed our job on the lathe machine.

Lathe Operations

1. Plain turning
2. Step turning
3. Facing
4. Drilling
5. Reaming
6. Boring
7. Taper turning
8. Parting
9. Knurling
10. Grooving
11. Threading
12. Forming
13. Under cutting
14. Shoulder turning
15. Spring winding

Lathe Machine

The lathe machine is one of the most important machines in any workshop. It performs jobs like cutting, handing, knurling, drilling or shaping.

Lathe machines are also used in wood turning, metal working, metal spinning, and glass working. Lathes can be used for shaping pottery, the best known design being the potter's wheel.

Most suitably equipped metal working lathes can also be used to produce most solids of revolution, plane surfaces, screw thread and helices.

Lathe Working and Principle

The adjoining figure demonstrates the lathe working principle. Work piece is held between two rigid and strong supports called centres, which are in a chuck or a face plate which revolves around its axis at a uniform speed.

Cutting tool performs cutting job at a right angle to the axes.

The cutting tool may also be fed at right angle relative to the axis of work, for machine tapers and angles. Cutting takes place since there exists a relative motion between the work-piece and cutting tool.

Lathe Principle Parts

1. Bed: It is a heavy casting moulded with the lathe's working parts. It carries a head stock and a tail stock.
2. Legs: These carry the entire load of the machine and are firmly secured to the floor by bolts.
3. Head Stock: It's clamped on left hand side of bed, which serve as housing for driving pulleys back gear. It is a hollow cylindrical shaft.
4. Gear Box: It's placed below the head stock, and contains a number of different gears.
5. Carriage: Lies between the headstock and the tail stock and serves the purpose of supporting, guiding and feeding the tool.

Main parts of the Carriage

1. Saddle: 'H' shaped casting mounted on top of the lathe provides support to the cross slide.
2. Cross Slide: It's the top of slide and provides automatic cross movement for the tool.
3. Compound Rest: It's fitted on top of the cross slide, and it's used to support the tool post and the cutting tool.
4. Tool Post: It's placed on the compound rest, and is rigidly clamped to the cutting tool on the tool holder.
5. Tail Stock: It's a movable casting located opposite the headstock and can slide along the bed to accommodate different sizes of work pieces. Its spindle has an internal taper holding the dead centre.

Measuring Gauges and Instruments

1. Steel Rule: Made of tempered steel and most common, low-precision linear measuring instrument
2. Vernier Callipers: A precision instrument used for measuring internal and external diameters of shafts, their thickness etc. The typical least count is 0.02 mm.
3. Screw Gauge/Micrometer: This too is a precision instrument, used to measure the external diameter/width of a part upto the accuracy of 0.01mm.

Job Process

Material used for the job: mild steel

The whole job process is done in 4 different steps with certain fixed parameters.

1. Facing Operations: This was done at one end of the job. When the object is turned or rotated about its axis, the tool is parallel to the lathe axis.
2. Roll Number Punching: At facing end, the number punching nail is fixed and hammered strongly, so that the numbers form an impression, as per the requirements. The roll number is punched for identification.

3. Plain Turning: From the facing end 105 mm is measured and marked. A cylindrical cut portion of diameter 21.5 mm is thus produced by running the cutter perpendicular to the plane of the job upto the marking. The diameter was measured at intervals and made to 21.5 mm diameter.
4. Step Turning: From the facing end, 65 mm is measured. A diameter of 23mm is attained for the distance between the marking and previously plain turned region. Diameter is checked out using callipers and adjusted.
5. Taper Turning: A distance of 13 mm is measured from the other end and marked. The cutter axis is then rotated for 10 degree angle upto the marking, so that when the job rotates, the cutter cuts at an angle of 10 degrees.
6. Knurling: This is a method of forming a pattern on the job, so the surface is uneven and easy to handle. The designing part of the carriage is pressed against the surface of the job in the position where we want the imprint. We can set the depth of the pattern.
7. Grooving: The grooving tool is oriented at the job and as the job rotates, the groove is made larger into the depth. The depth of the groove can be increased by increasing the distance between the groove and the job. The dimensions were measured before and after.

Precautions

1. Ensure the direction of rotation of the mill is correct
2. Do not touch the tool to the part, until the lathe has started rotation
3. Move the feeds gradually for best smoothness
4. Wear glasses to prevent metal parts from flying into your eyes