MANUFACTURING PRACTICES
BETP 1303

LATHE/TURNING

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Lesson Outcomes

At the end of this topic, students be able to:

1. Explain basic structure of lathe
2. Differentiate types of cutting tools, lathe operations etc.
3. Understand how to operate lathe machine.
4. Identify cutting speeds and feed for lathe work.
5. Understand cutting tools geometry.

Contents

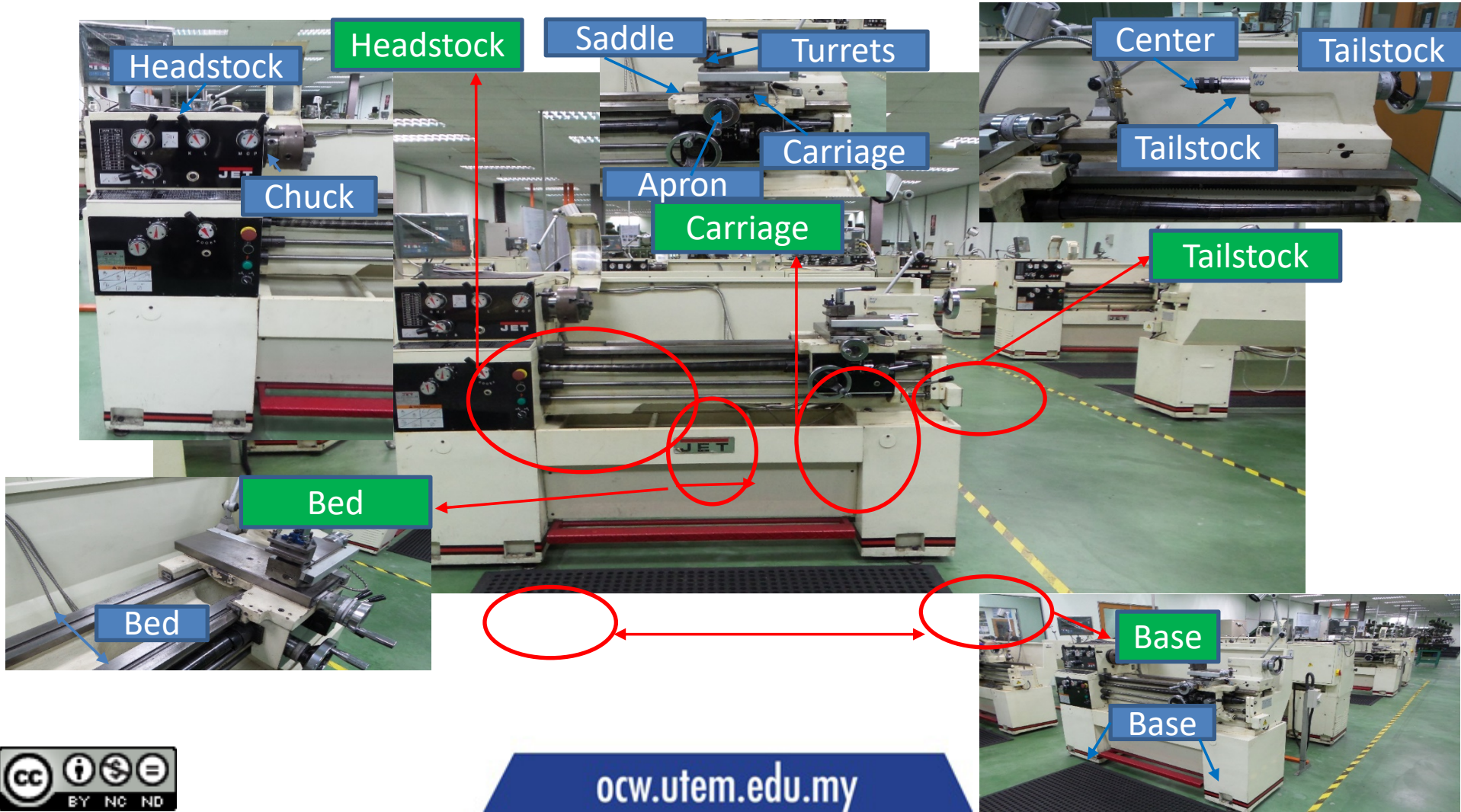
- Introductions
- Lathe nomenclature
  - Main structure of lathe
  - Types of cutting tools, tool holders and insert
  - Lathe operations
  - Cutting speeds and feeds for lathe work
  - Cutting tools geometry
  - Examples of products by lathe
  - Advance lathe/ CNC lathe machine

Introductions

- Turning is good at **processing of round bar materials.**
- Generally, there are **two types of lathe machine**. Ordinary lathe and standing lathe which only the orientation of the spindle is different.
- General lathe (ordinary lathe), the main shaft is positioned parallel to the ground, to hold the workpiece using a jig that was attached to the main spindle "chuck". In a normal lathe, the workpiece is done the processing is moved to the left and right things that parallel to the rotation and bytes and the ground. On the other hand, "standing lathe" is the main shaft is positioned perpendicular to the ground and held at the workpiece to the circular table attached to the main shaft. In the vertical lathe, the workpiece is rotated and vertically the ground, make the process move the byte up and down.

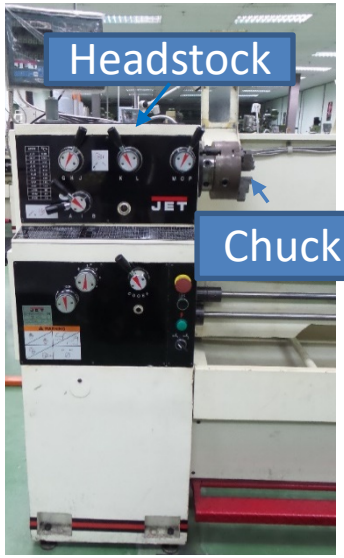
Lathe nomenclature

-Main structure of lathe-



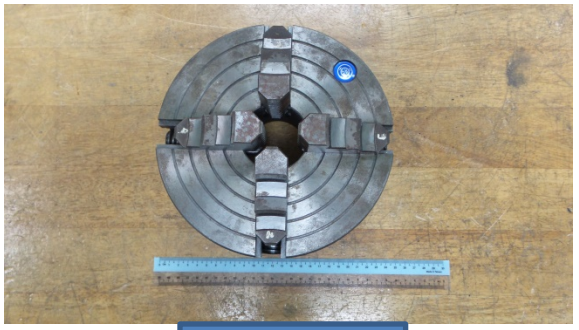
Lathe nomenclature

-Main structure of lathe-



Headstock – Fixed to the bed and supply power to spindle and at various rotational speeds that can be manually controlled or by electrical controls.

Chuck - Adjustable jaws permit holding of larger diameter materials usually in three of four jaws.

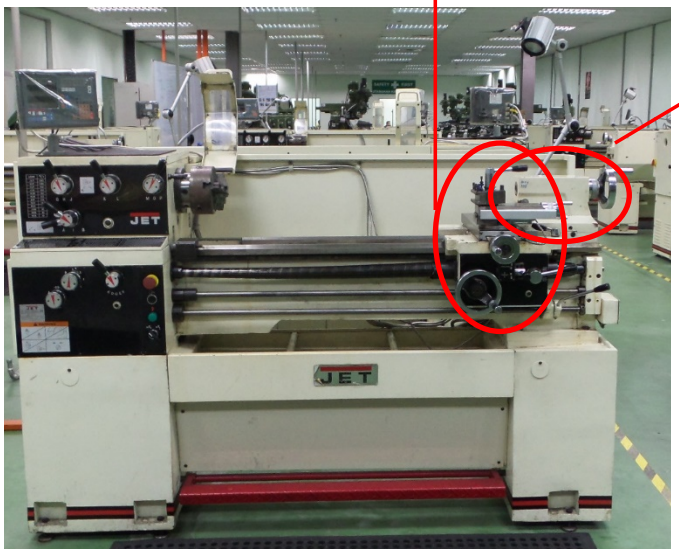


Lathe nomenclature

-Main structure of lathe-

Carriage

Tailstock



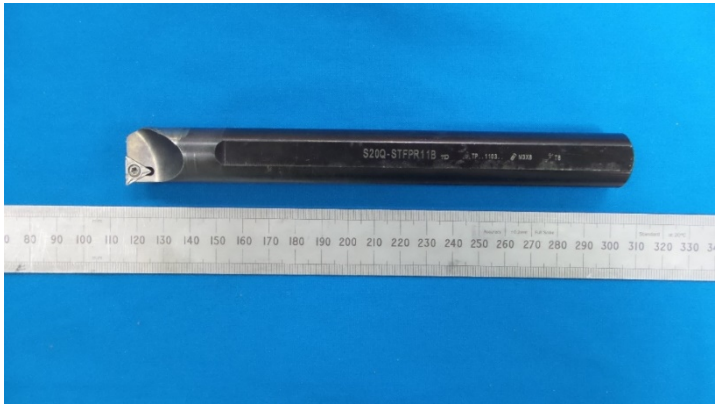
Tailstock – Can be clamped at any position, supports the other end of materials and slide along the ways.

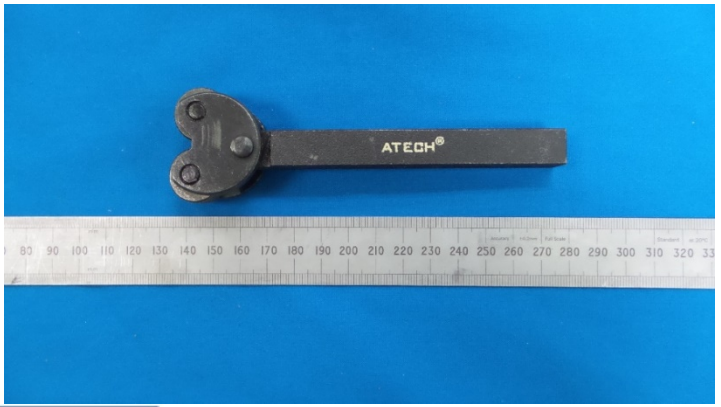
Carriage – Carriage assembly, slides along the ways and consists of the apron, cross-slide and tool post.

Lathe nomenclature

- Type of cutting tools-

Tool bits - Types of tool bits include threading tools, facing tools, cutoff tools and right and left hand turning tools.





Lathe nomenclature

- Types of toolholders -

Straight shank toolholder

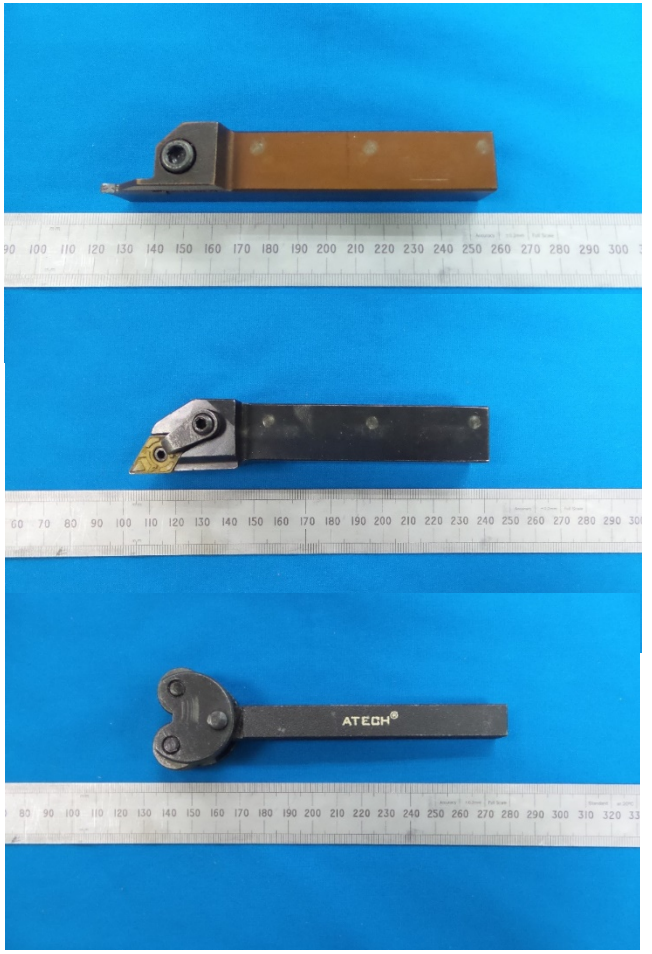
-Hold tool bit parallel to the base of the toolholder shank. Intended for holding cast alloy bit also carbide tipped tool bit

Throwaway insert toolholder

-Used to hold a chip breaker and ceramic/carbide cutting tool. Many types throwaway insert toolholder are made to hold variety of insert.

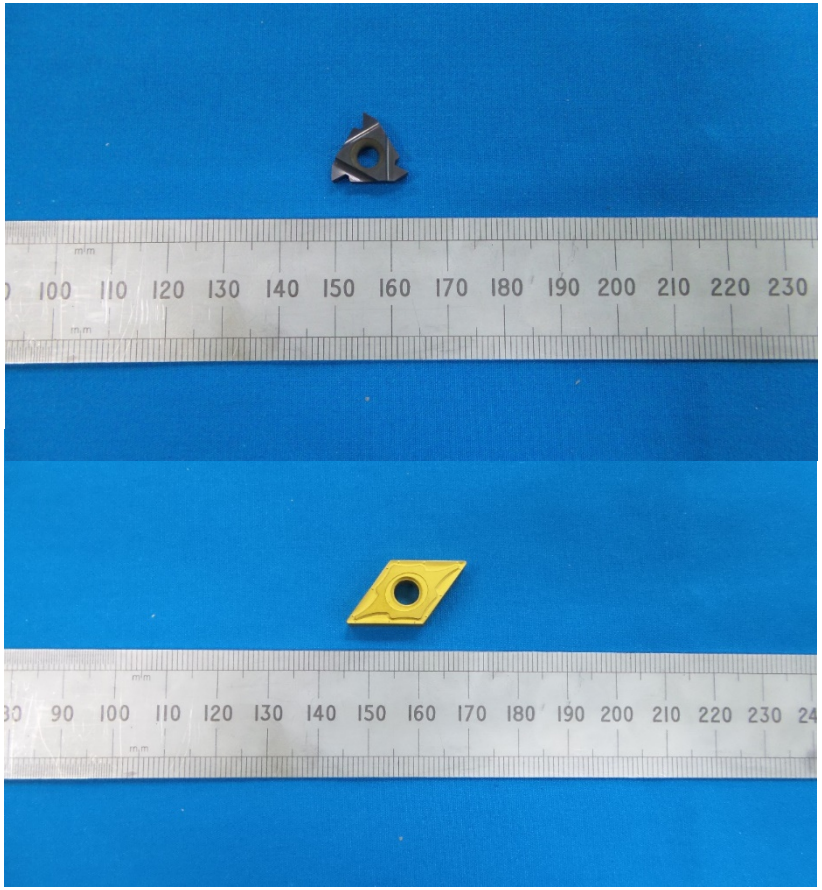
Knurling tool

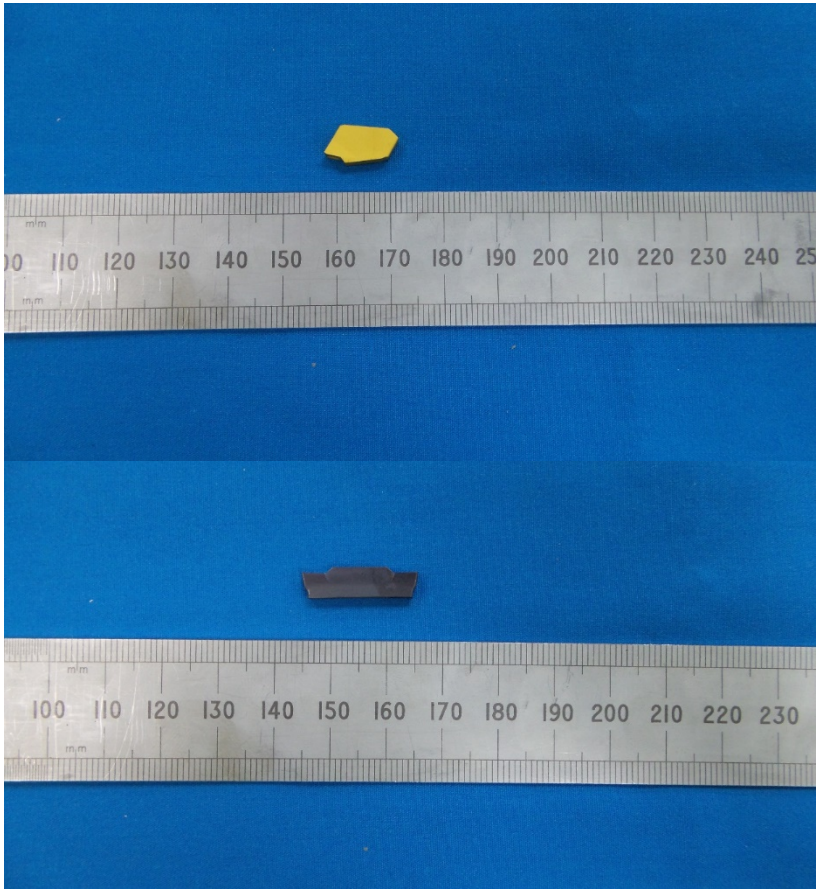
-Used for performing operations of knurling



Lathe nomenclature

- Types of insert -





Lathe nomenclature

- Lathe operations -

INSTALLING A CUTTING TOOL - first make sure to clean the holder and then tighten the bolts that will hold cutting tools on tool holders of lathe.

POSITIONING THE TOOL – release the bolts and tighten the cutting tool to the saddle. Use a dial indicator to position the saddle accurately. After that, rotate the cutting tool to the desired angle referencing the dial indicator at the base of the compound. The cutting tool can be hand fed along the desired angle. Use a micrometer dial to allow accurate positioning of compound and cross slide.

Lathe nomenclature

- Lathe operations -

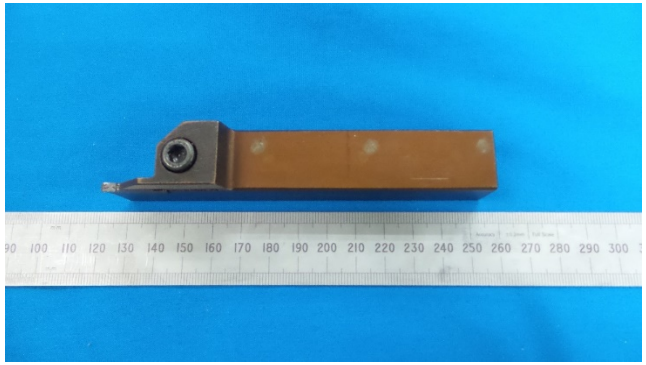
TURNING - To reduce the radius of a materials to a desired length. Firstly, clamp the materials in a lathe chuck. Secondly, install a roughing or finishing cutting tool. Thirdly, feeding the saddle toward the headstock and use the cross feed to set the desired depth of cut. Move the tool off from materials by backing the carriage up with the carriage handwheel.

FACING - To create a face, flat and smooth perpendicular to the axis of a cylindrical materials. Firstly, clamp the materials. Secondly, install a facing cutting tool. Thirdly, bring the cutting tool approximately into position, but slightly off of the materials. Then, move the cutting tool outside the materials and change the saddle to take the desired depth of cut.

Lathe nomenclature

- Lathe operations -

PARTING - It is to make narrow grooves and for cutting off materials. Make sure that the parting tool is perpendicular to the axis of rotation and the tip of parting tool is the same height as the center of the materials. Place the height of the cutting tool, lay it flat against the face of the materials, then lock the cutting tool in place. When the cut is deep, the side of the materials can rub against sides of the groove, so it's especially important to apply cutting lubricant.



Lathe nomenclature

- Lathe operations -

DRILLING - To drill hole accurately on a lathe with the centerline of a cylindrical materials . Firstly, install a drill chuck into the tail stock. Move the saddle forward to make room for the tailstock. Secondly, move the tailstock into position and lock the it in place. Use a center drill to start the hole with cutting tool.

Lathe nomenclature

- Cutting speeds and feeds for lathe work -

- It is important for good tool life and efficient machining with correct cutting speeds. For **lathe work, cutting speed refers to the rate in meter per minute at which the surface of the material moves past the cutting tool.**
- Condition that affect cutting speed:

1. Types of materials and the cutting tool is made
2. Types of the cutting process
3. Rigidity of the materials and lathe machine
4. Types of cutting fluid being used

Lathe nomenclature

- Cutting speeds and feeds for lathe work -

Cutting speeds are determined using the formula

$$rpm = v / (D \times \pi)$$

where

rpm = revolutions per minute

v = cutting speed, in meter per minute (mpm)

D = diameter of workpiece

π = 3.14

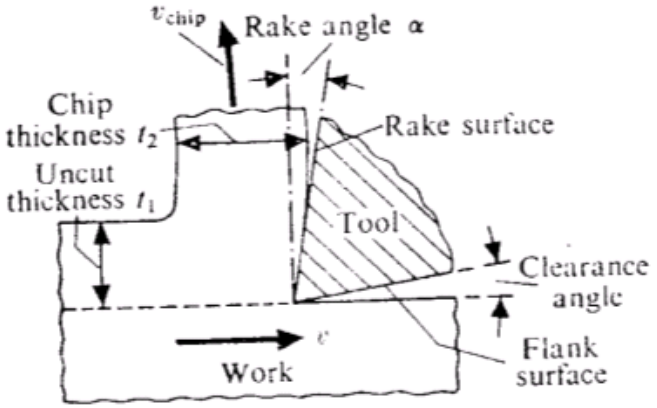
Lathe nomenclature

- Cutting tools geometry -

- **Cutting tool is suited to the machining operation which can be classified according to the machining process**. Lathe have drill bit, reamers, turning tools, cutoff tools, tap and many other cutting tool that are name for operation.
- Cutting tools can be divided into **two categories**: **Multiple cutting edge tools and single point tools .**

Lathe nomenclature

- Cutting tools geometry -



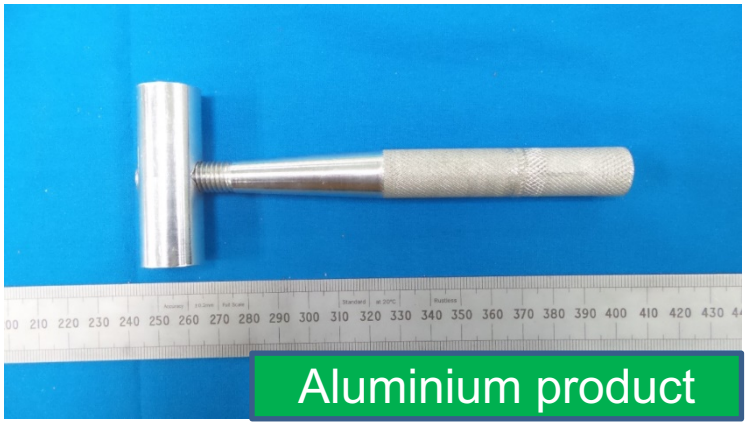
MECHANICS OF BASIC MACHINING

The important parameter involve

1. Thickness of the uncut layer (t_1)
2. Thickness of the chip deformation produced (t_2)
3. Inclination of the chip-tool interface with respect to the cutting velocity; i.e the rake angle(α)
4. The relative velocity of the workpiece and the tool (v)

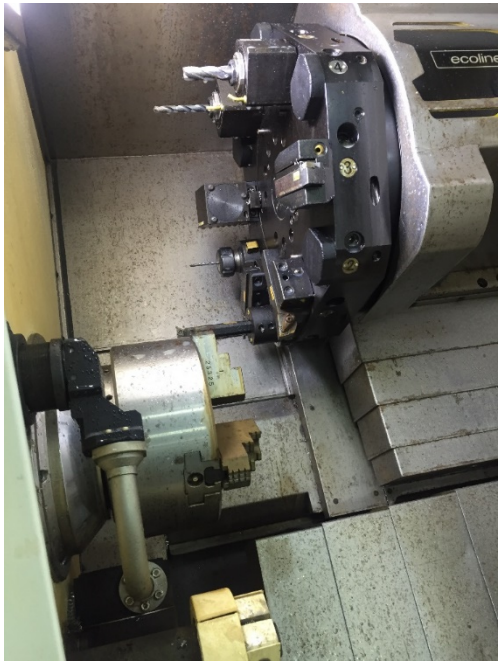
Lathe nomenclature

Examples of products by lathe



Lathe nomenclature

Advance lathe/CNC lathe machine



Self-Test

1. Define what is lathe/turning?

2. Differentiate between straight shank toolholder and throwaway toolholder.

3. Differentiate between turning and facing process.

4. What is the formula to calculate cutting speeds?

5. What's the difference between conventional and advance lathe/turning machine?

Summary

- ✓ Introduction to lathe/turning machine which **processing of round bar materials.**
- ✓ Lathe machine nomenclature which composed from **5 compounds; carriage, tailstock, bed, base and headstock.**
- ✓ Lathe operations included **facing, turning, cutoff, knurling etc.**