Thapar Institute of Engineering & Technology, Patiala

Manufacturing Processes
UTA026

Thapar Institute of Engineering & Technology
(Deemed to be University)
Bhadson Road, Patiala, Punjab, Pin-147004
Contact No. : +91-175-2393201
Email : info@thapar.edu

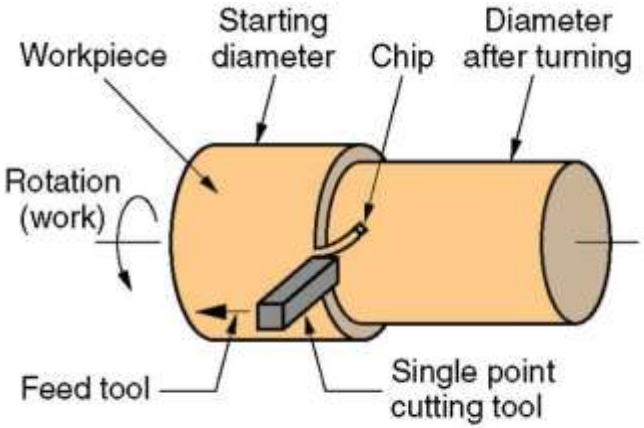
THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

MATERIAL REMOVAL PROCESSES

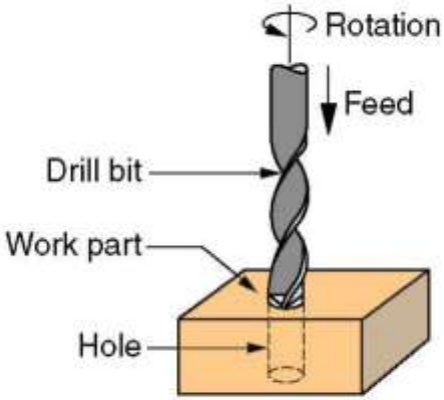
- The **MATERIAL REMOVAL PROCESSES** are a family of **SHAPING OPERATIONS** in which excess material is removed from a starting work-part so that what remains is the desired final geometry.
- The most important branch of the family is conventional machining, in which a **sharp cutting tool** is used to **mechanically cut** the material to achieve the desired geometry.

MATERIAL REMOVAL PROCESSES

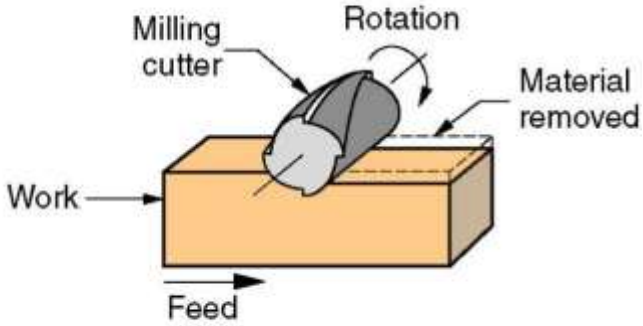
- The three principal machining processes are turning, drilling, and milling.



TURNING



DRILLING



MILLING

Image source: http://home.iitk.ac.in/~jrkumar/download/Lecture-2.pdf

MACHINING PROCESSES

- Machining is important commercially and technologically for several reasons:
  - Variety of work materials.
  - Variety of part shapes and geometric features.
  - Dimensional accuracy.
  - Good surface finishes.

MATERIAL REMOVAL PROCESSES

- On the other hand, certain disadvantages are associated with machining and other material removal processes:
  - Wasteful of material
  - Time consuming

MATERIAL REMOVAL PROCESSES

- Machining is generally performed after other manufacturing processes such as casting or bulk deformation (e.g., forging, bar drawing).
- The other processes create the general shape of the starting work-part, and machining provides the final geometry, dimensions, and finish.

CUTTING TOOL

- A **CUTTING TOOL** has **one or more sharp cutting edges** and is made of a material that is **harder than the work material.**
- The **cutting edge** serves to **separate a chip** from the parent work material.

SINGLE POINT CUTTING TOOL

- A **SINGLE-POINT** tool has **one cutting edge** and is used for operations such as **turning**.
- In addition to the tool features shown in Figure (next ppt), there is one tool point from which the name of this cutting tool is derived .
- During machining, the point of the tool penetrates below the original work surface of the part.
- The point is usually rounded to a certain radius, called the nose radius.

SINGLE POINT CUTTING TOOL 3-D VIEW

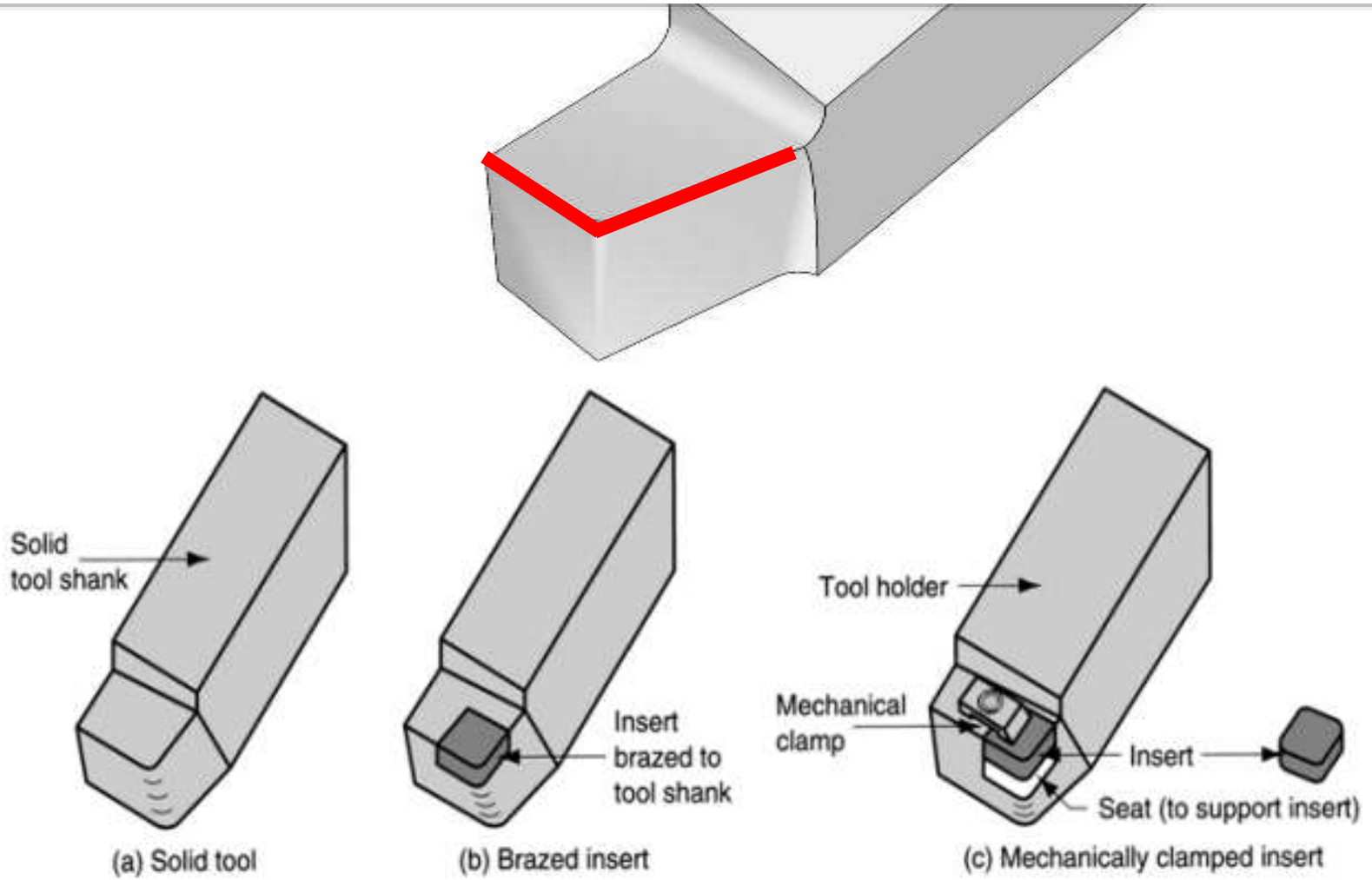
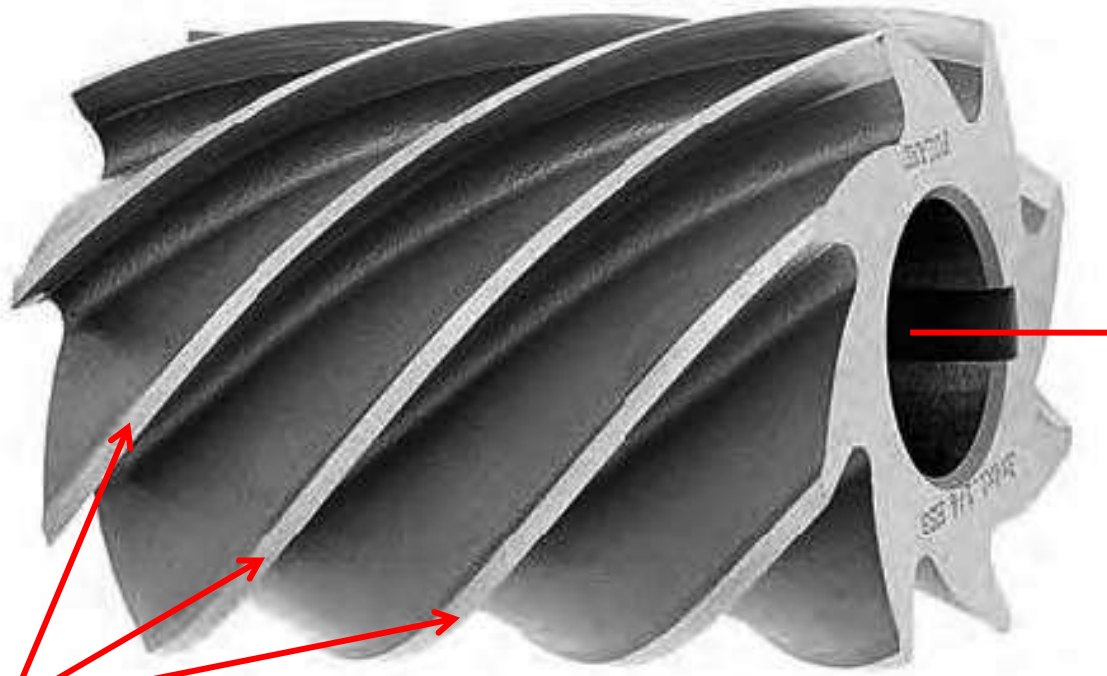


Image source: Cutting tool technology, (https://www.egr.msu.edu/~pkwon/me478/cuttingtool.pdf)

MULTI-POINT CUTTING TOOL

- **MULTIPLE-CUTTING-EDGE TOOLS** have more than one cutting edge and usually achieve their motion relative to the workpart by rotating.
- Drilling and milling use rotating multiple-cutting-edge tools.
- Figure shows a helical milling cutter used in peripheral milling.
- Although the shape is quite different from a single point tool, many elements of tool geometry are similar.

MULTI-POINT CUTTING TOOL



Direction of Rotation

Cutting Edges

Image source: https://encrypted-tbn0.gstatic.com/images?q=tbn%3AANd9GcTUrHMdTdjfdwAvIh-fMb7NQCwD0zOz3Xba4A&usqp=CAU

MULTI-POINT CUTTING TOOL: Milling cutters

Source: https://madhavuniversity.edu.in/images/milling-cutters.jpg

MULTI-POINT CUTTING TOOL: Drill bits

HSS or Metal Drill Bit

Wood or Brad Point Drill Bit

Masonry Drill Bit

Glass Drill Bit

Image source: https://www.the-diy-life.com/which-drill-bit-to-use/

MULTI-POINT CUTTING TOOL