Materials Manufacturing (EDPT 601)

Tutorial 7

Machining

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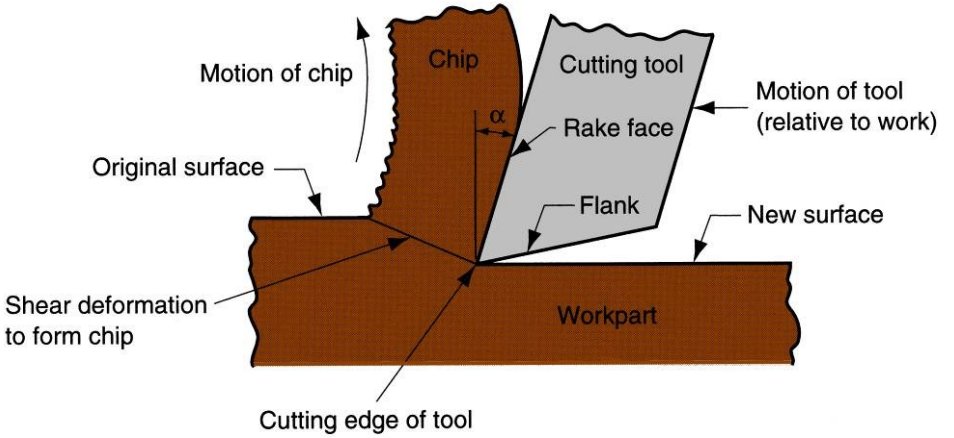
Machining

- Machining is a material removal process in which a sharp cutting tool is used to mechanically cut away material so that the desired part geometry remains.
- Cutting action involves shear deformation of work material to form a chip.



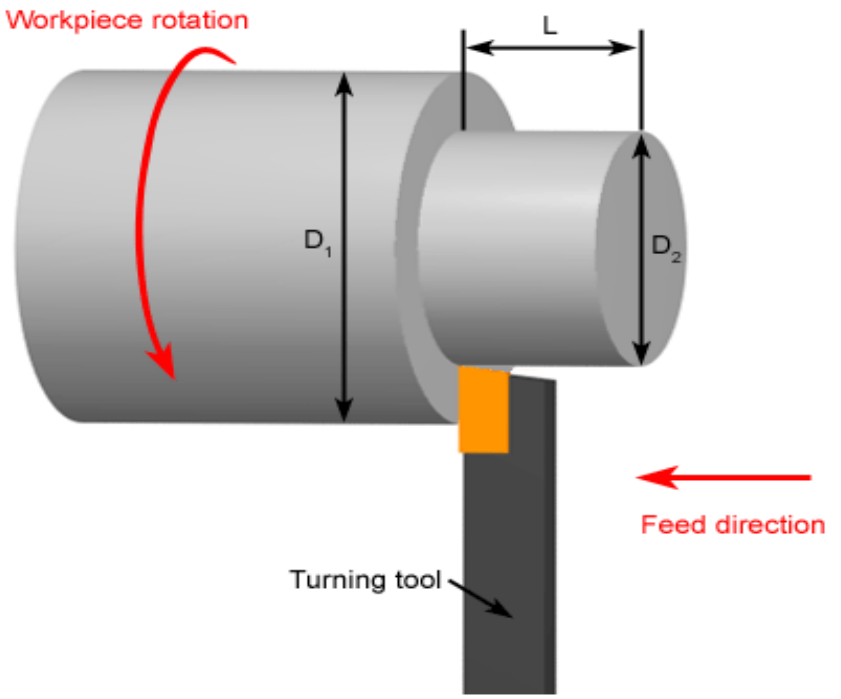
A cross-sectional view of the machining process

Machining Operations

- Most important machining operations:
  - Turning
  - Drilling
  - Milling

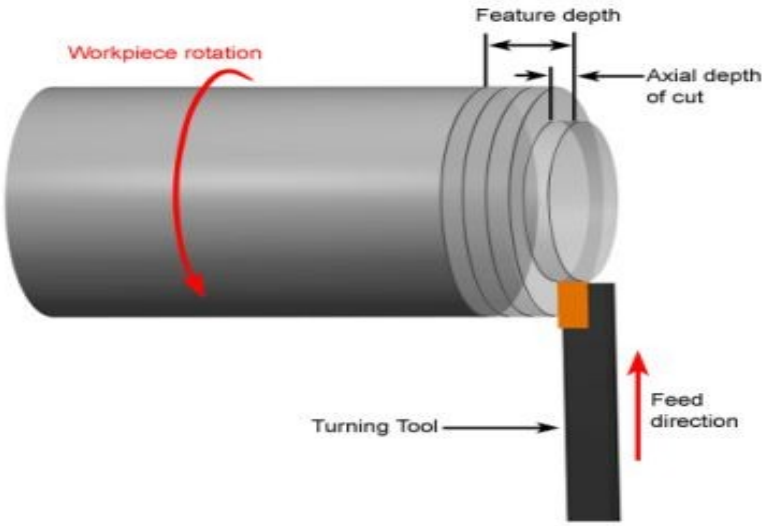
Turning

- Turning is the process of machining cylindrical and conical surfaces
- It is usually performed on a lathe where the workpiece is rotated into a longitudinally fed, single point cutting tool.

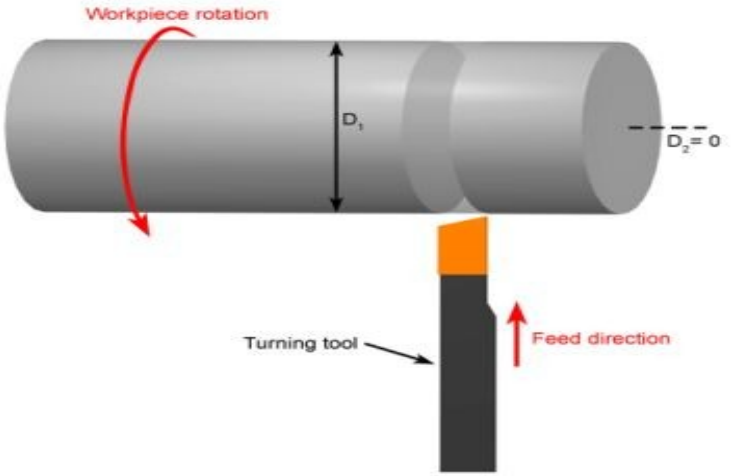


- Other important turning operations include:
  - Facing
  - Parting (cutting off)
  - Threading
  - Grooving
  - Taper turning
  - Chamfering
  - Form turning (profiling)
  - Knurling
  - Drilling

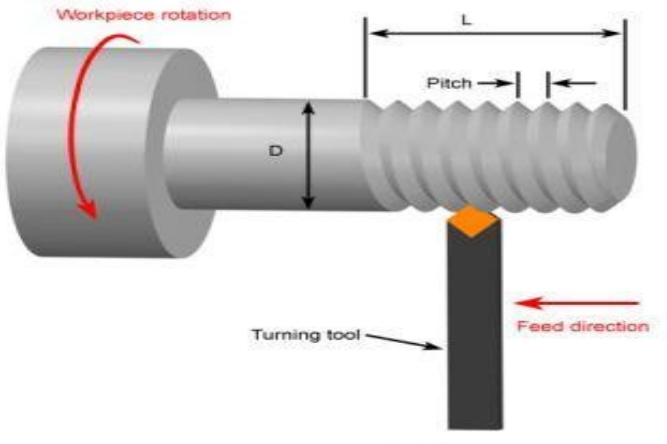
Facing



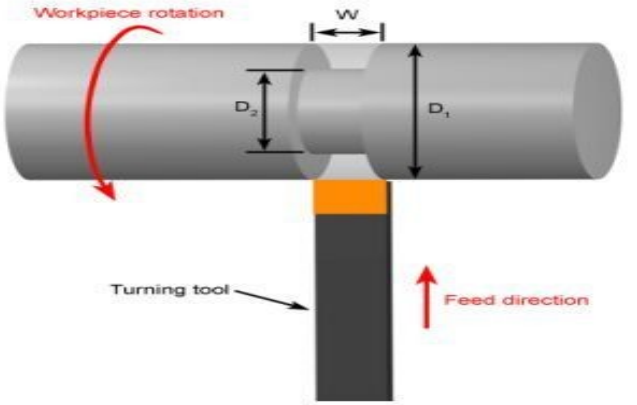
Parting (Cut Off)



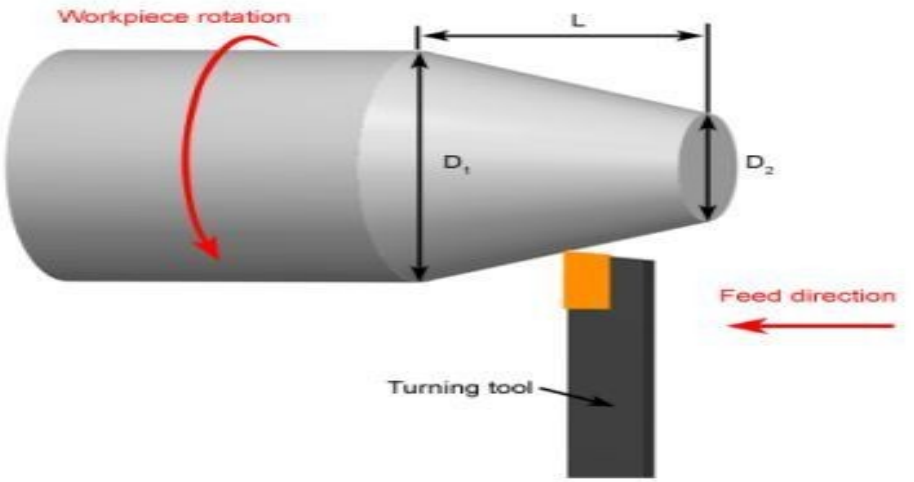
Threading



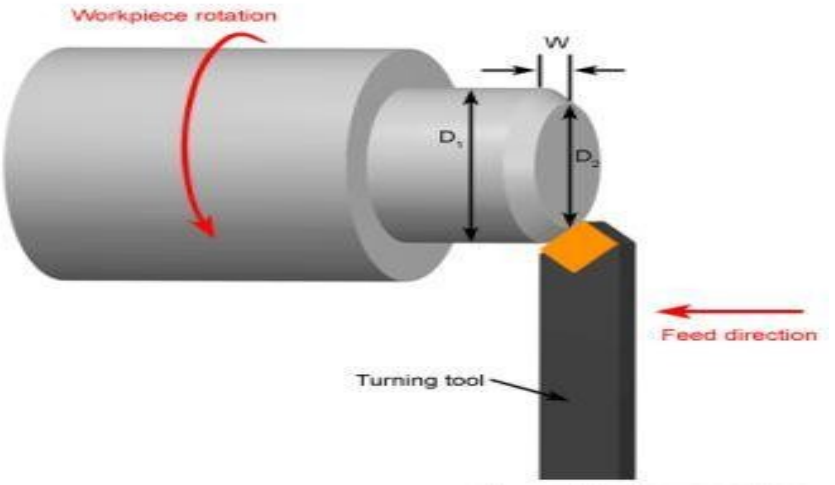
External Grooving



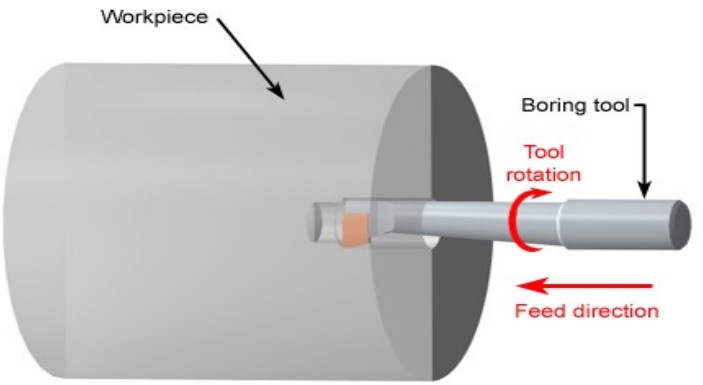
Taper Turning



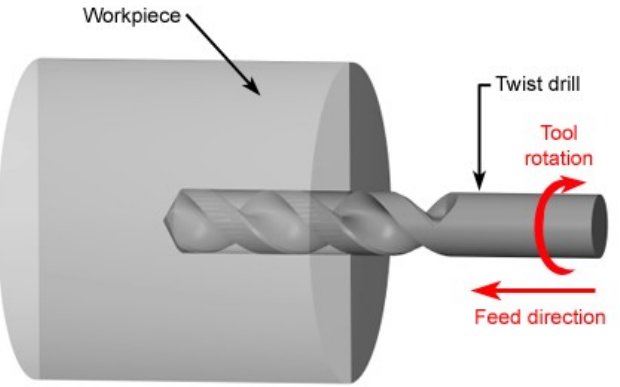
Chamfering



Boring and Internal Grooving



Drilling



Common Turing tools

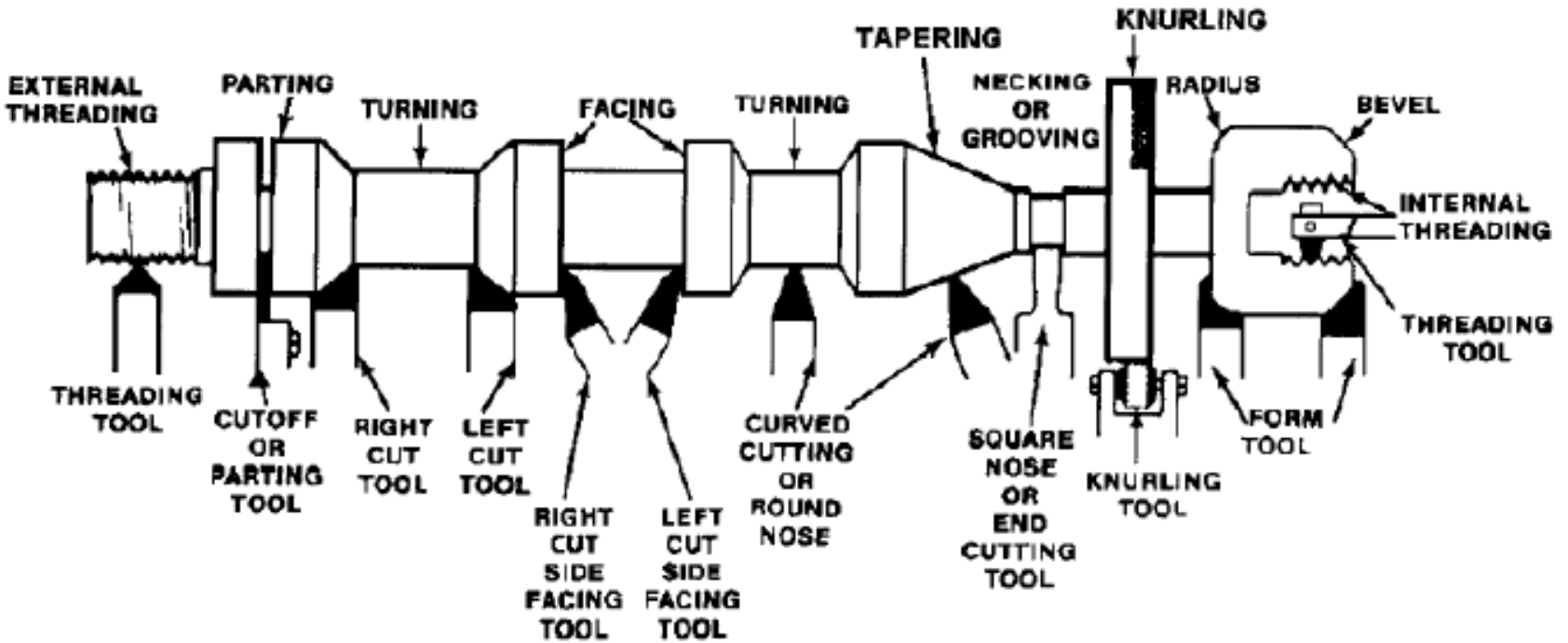
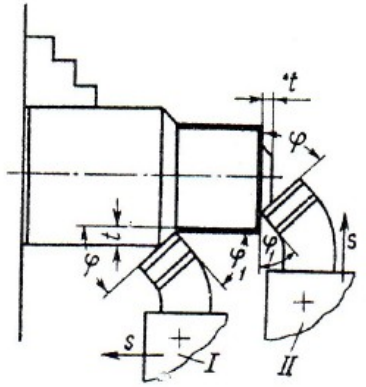


Fig. 2.23 Types of tuning tools and shapes of machined surfaces

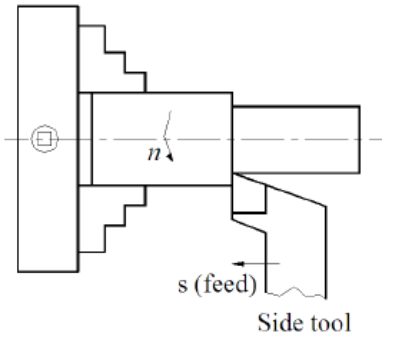
Facing

(RH/LH facing tool or bent tool)



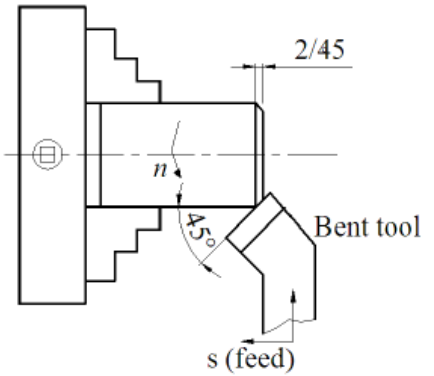
Side turning

(RH or LH side tool)



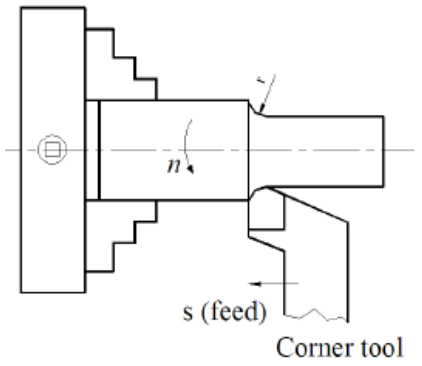
Chamfering

(Bent tool)



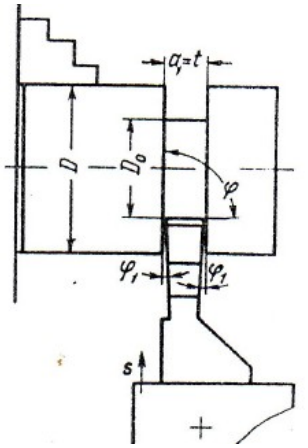
Cornering

(corner tool)



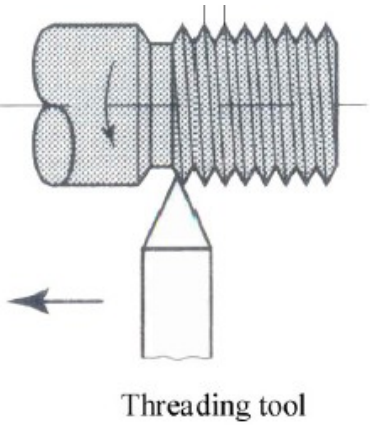
parting off

(Cut-off tool)



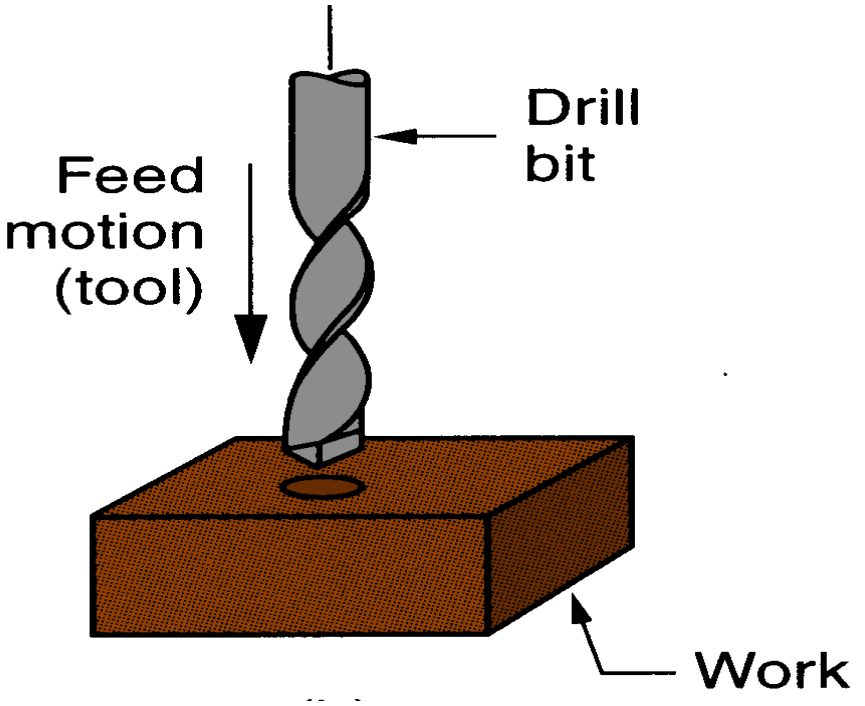
Threading

(Threading tool)

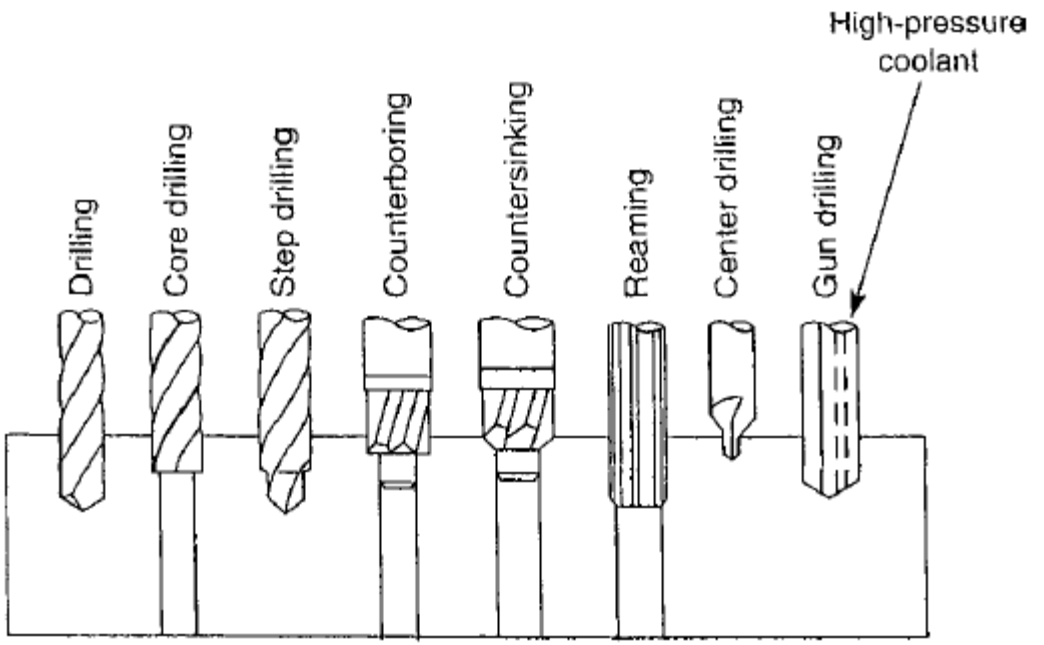


Drilling

- Drilling creates a round hole in a workpiece
- It is performed on a drill press using a drill/drill bit.

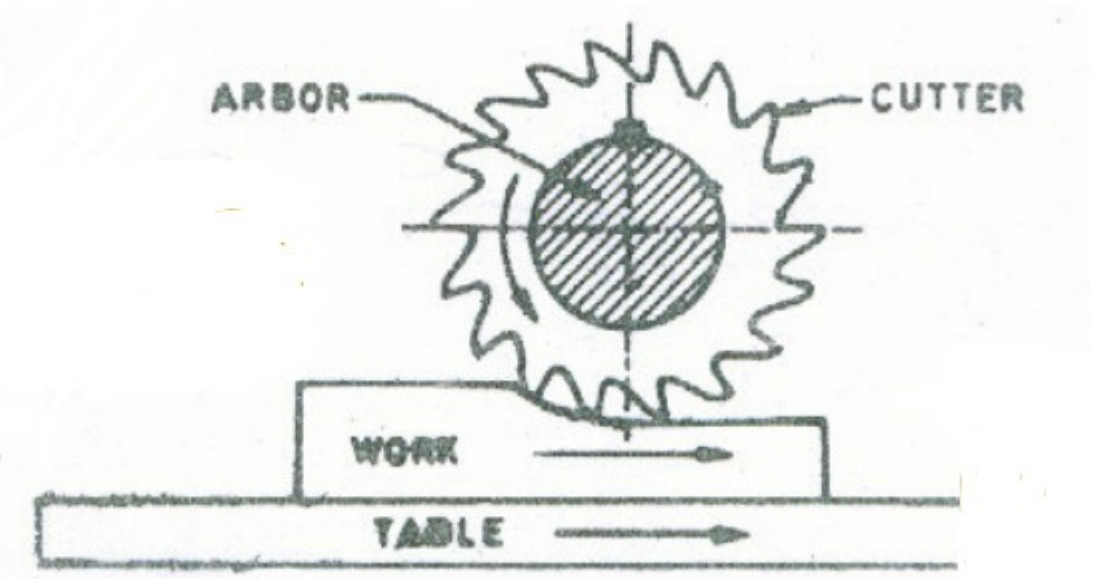


- Operations that can be performed on a drill press are:
  - Drilling
  - Core drilling
  - Step drilling
  - Counter-boring
  - Counter-sinking
  - Reaming
  - Center drilling
  - Gun drilling



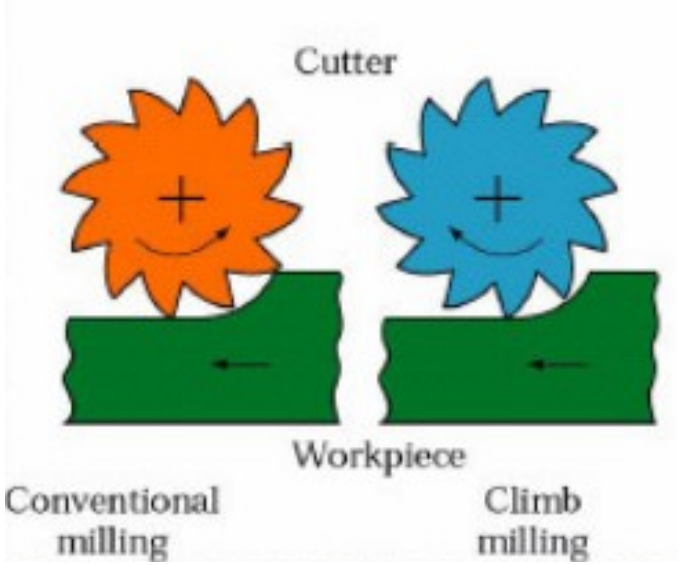
Milling

- Milling is the process of machining flat, curved or irregular surfaces by feeding the workpiece against a rotating cutter containing a number of cutting edges.



Conventional and climb milling

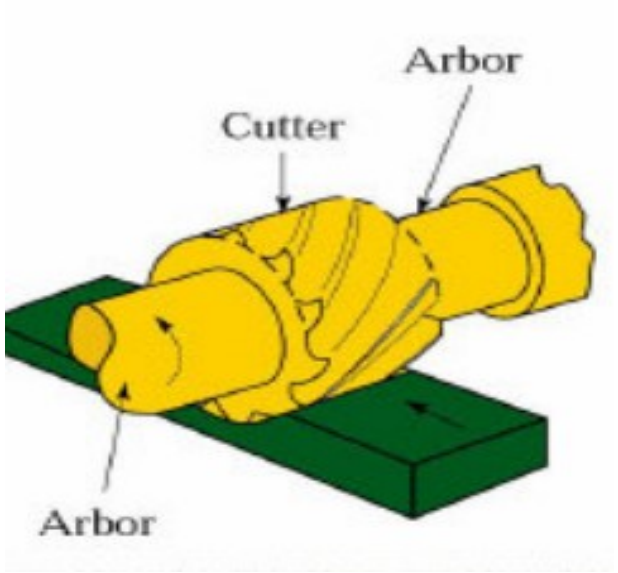
- Conventional milling is the common type of milling. There may be a tendency for the tool to chatter and the workpiece to be pulled upward, necessitating proper clamping. It is also called slab/up milling.
- In climb milling, also called down milling, the downward component of the cutting forces holds the workpiece in place.



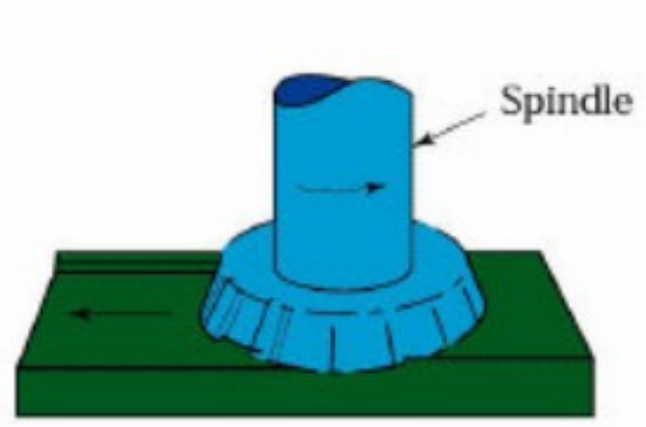
Milling Operations

- Milling operations include:
  - Slab milling
  - Face milling
  - End milling
  - Straddle milling
  - Form milling
  - Slitting
  - Slotting

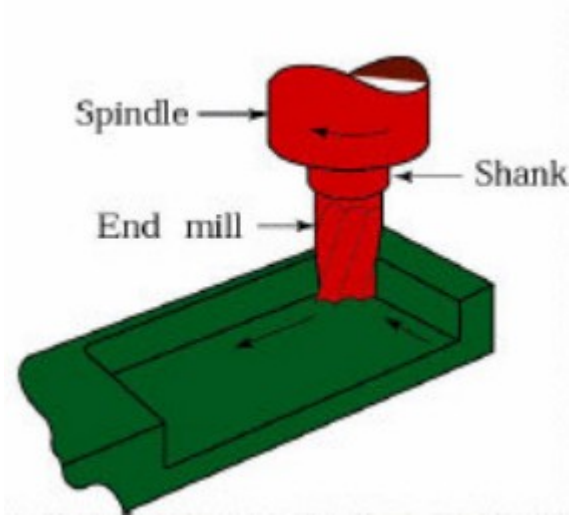
Slab milling



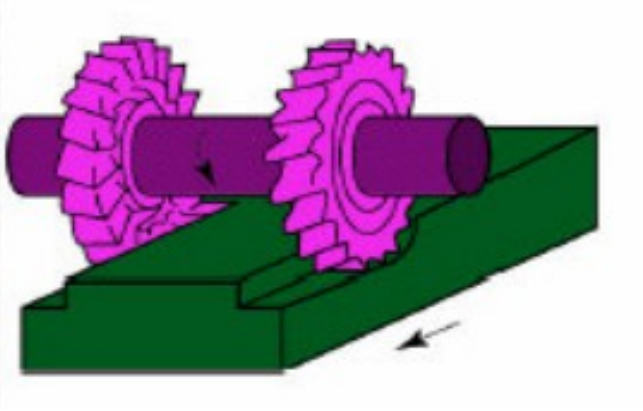
Face milling



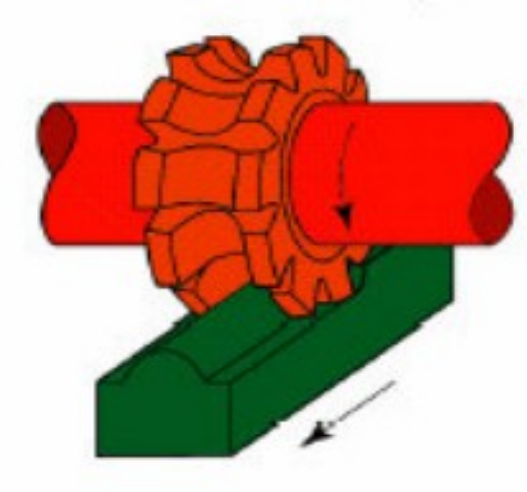
End milling



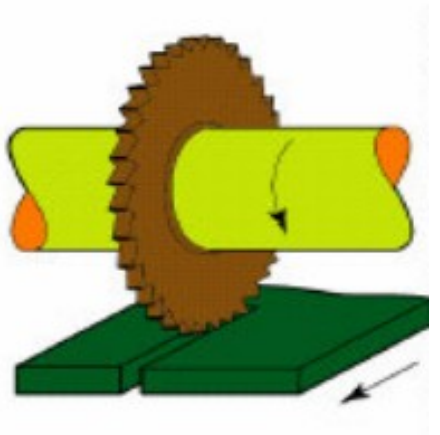
Straddle Milling



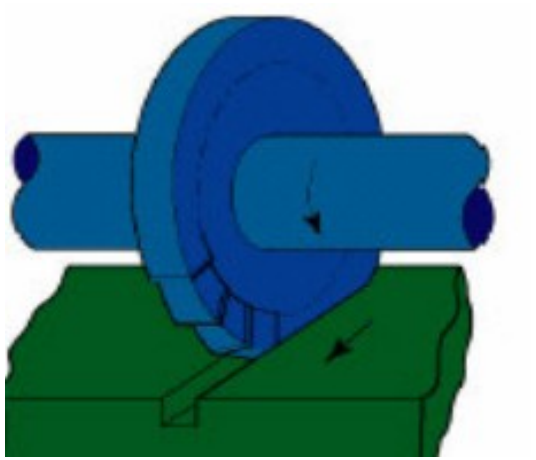
Form milling



Slitting



Slotting



T-slot Cutting