

TRB/TNPSC

Sparks Academy

MECHANICAL ENGINEERING

**PRODUCTION
TECHNOLOGY**

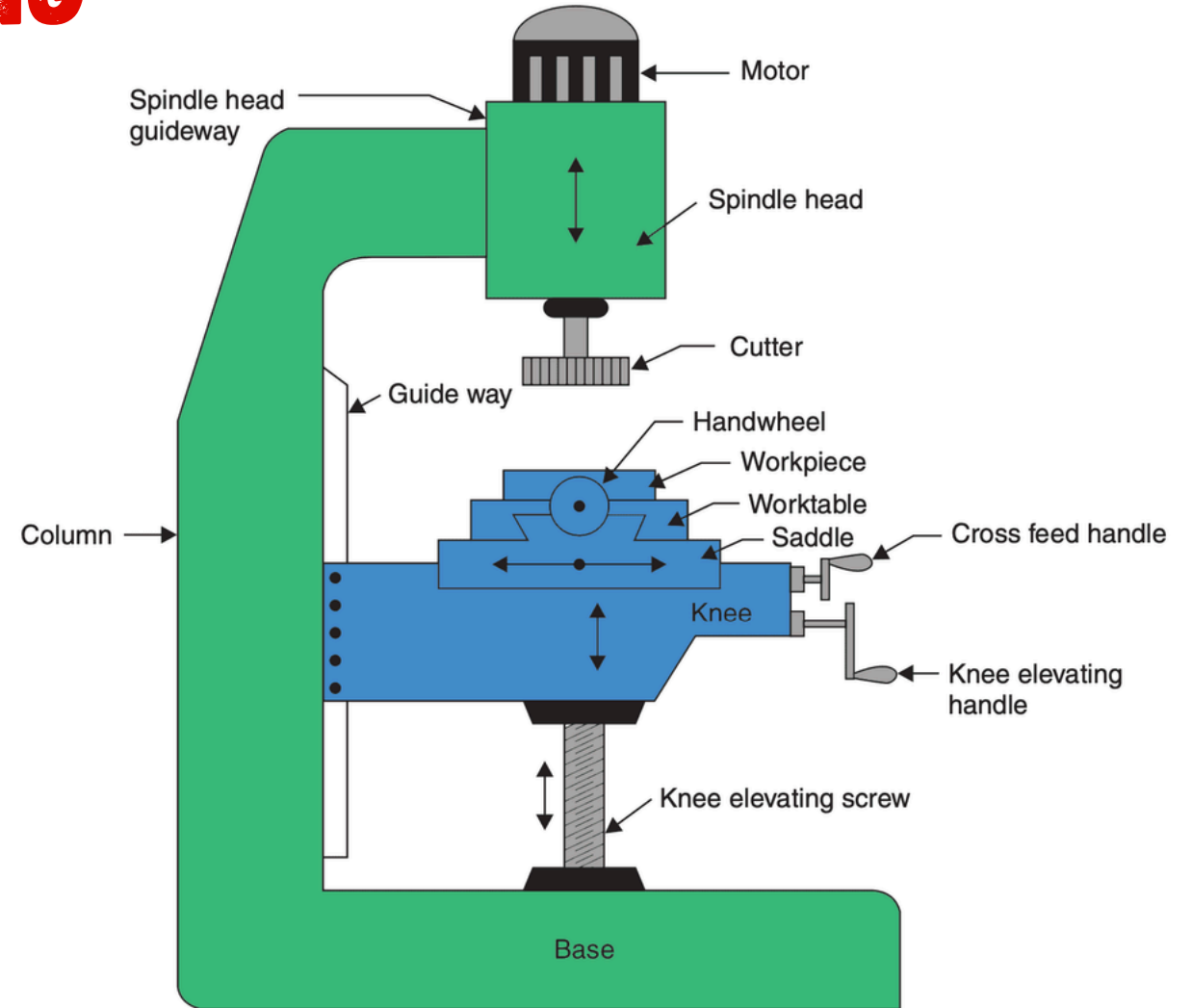


DAY 03

Ph. 81 908 79379

MILLING

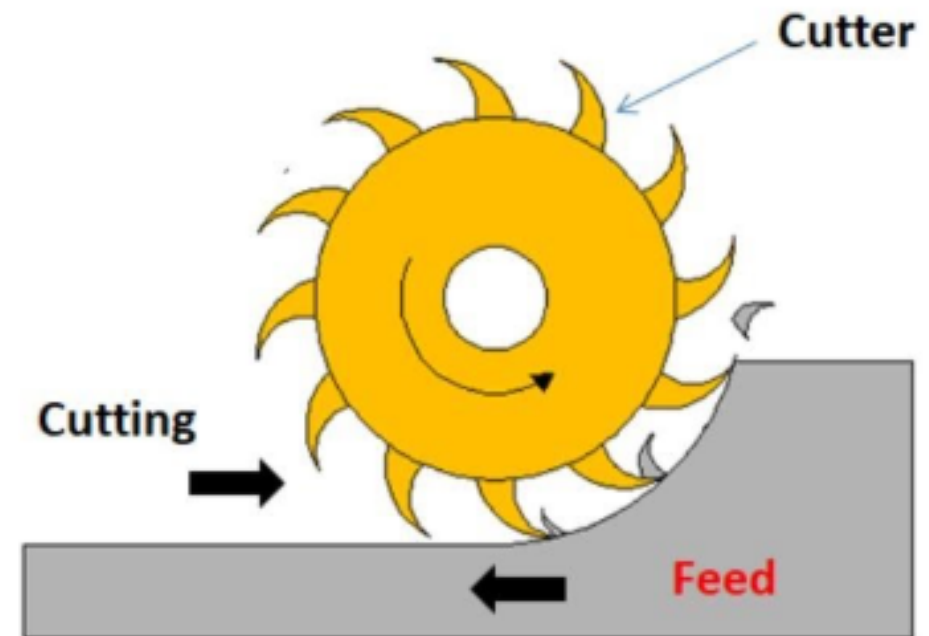
- These machines are called **MTM — Multi-tasking Machines**.
- The cutting action is accomplished by **feeding the workpiece against a rotating cutter**.
- The workpiece can be **fed vertically, longitudinally, or diagonally**.



UP-MILLING OPERATION

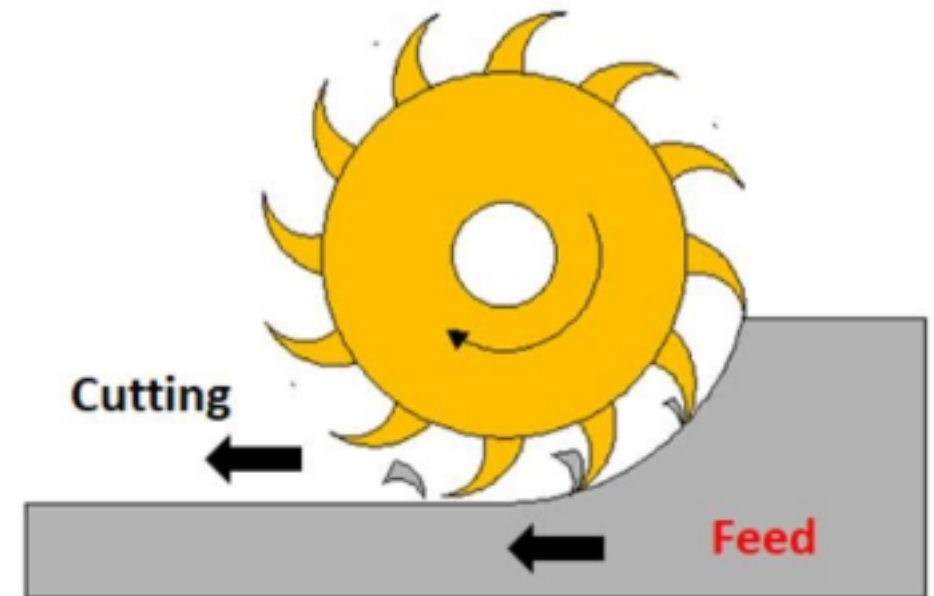
- The up-milling is also known as **conventional milling**.
- In this, a **cutter revolving in the opposite direction of the workpiece** removes the metal in the form of tiny chips
- The **chip thickness** varies from **minimum at the beginning and maximum at the end** as the cutter advances.

- The **primary drawbacks** of the up-milling technique are the tendency of the cutting force to lift the work from the fixtures and the **poor surface finish**.



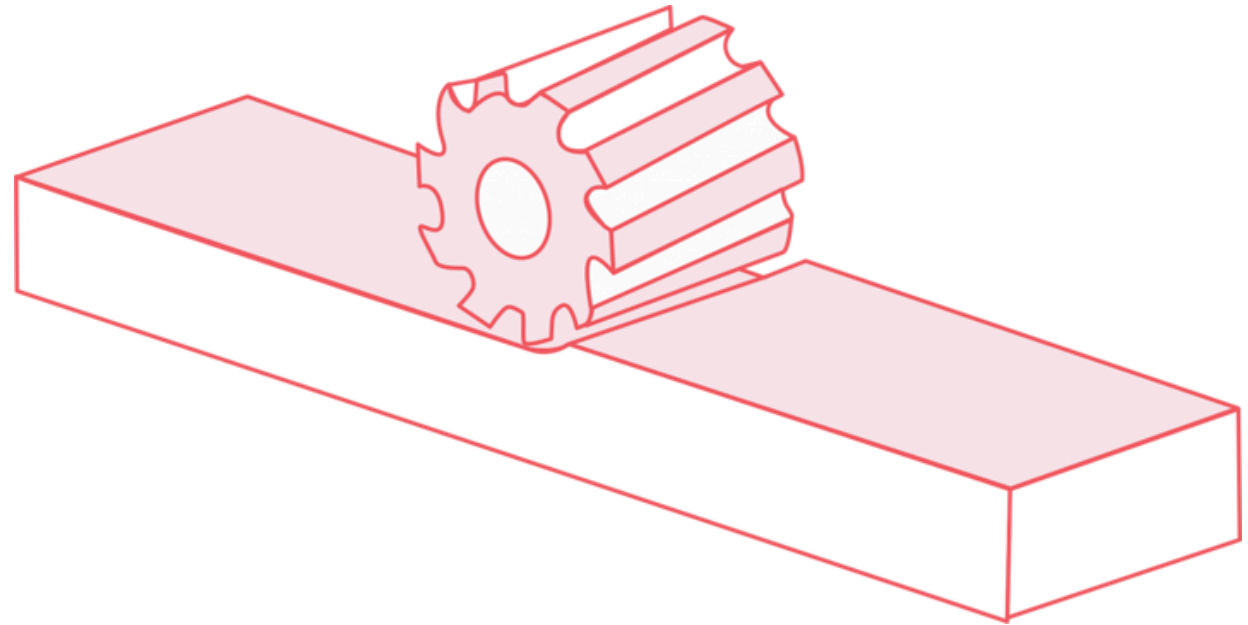
DOWN MILLING OPERATION

- A down-milling operation is also known as 'climb milling'
- In this operation, the cutter rotates in the same direction as the feed.
- The chip thickness varies from maximum at the beginning to minimum at the end.



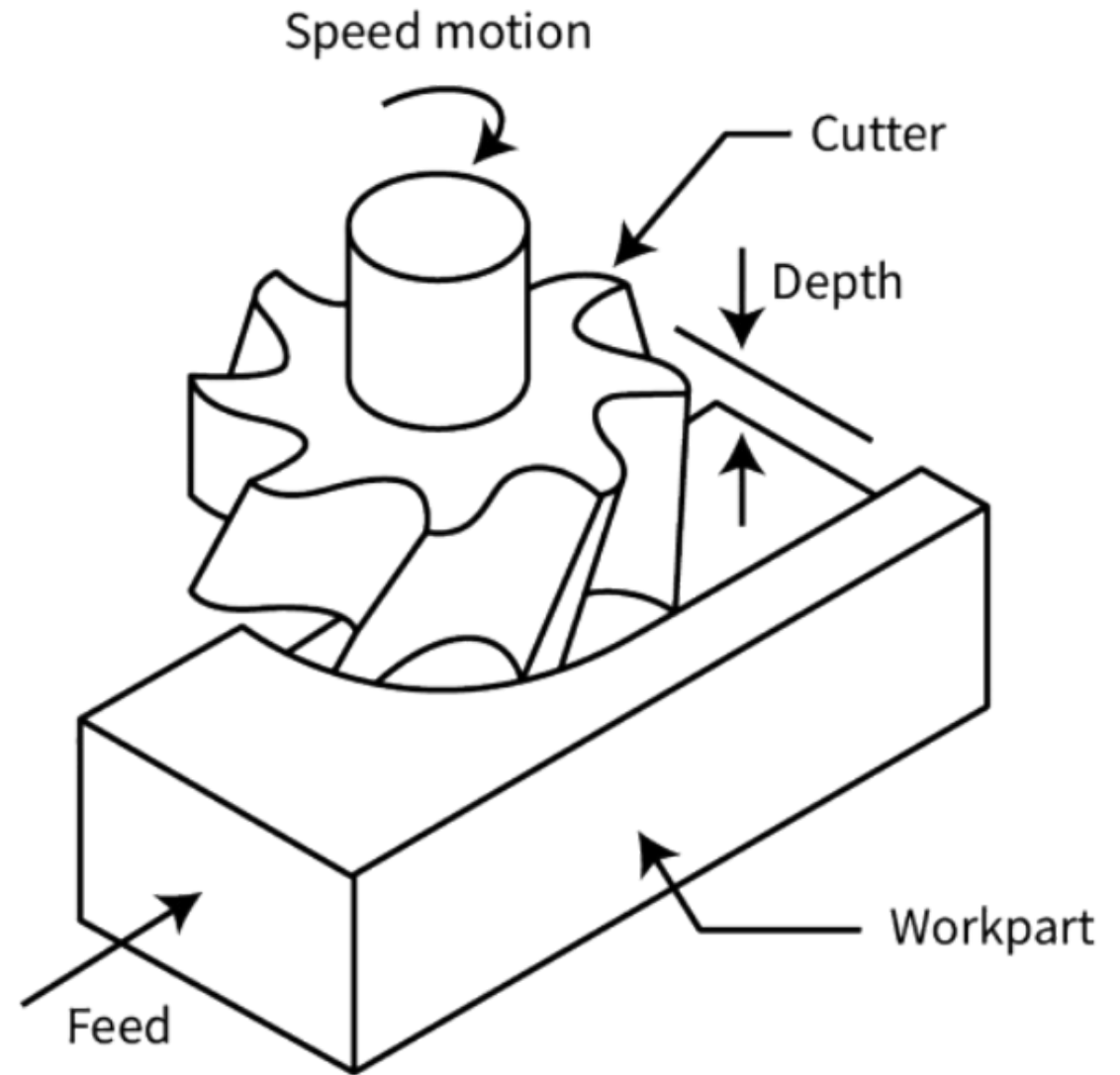
PLAIN MILLING OPERATION

- The most commonly used milling machine operation is plain milling.
- It is also referred to as slab milling
- This operation creates a smooth and horizontal surface that is parallel to the axis of rotation of the cutter



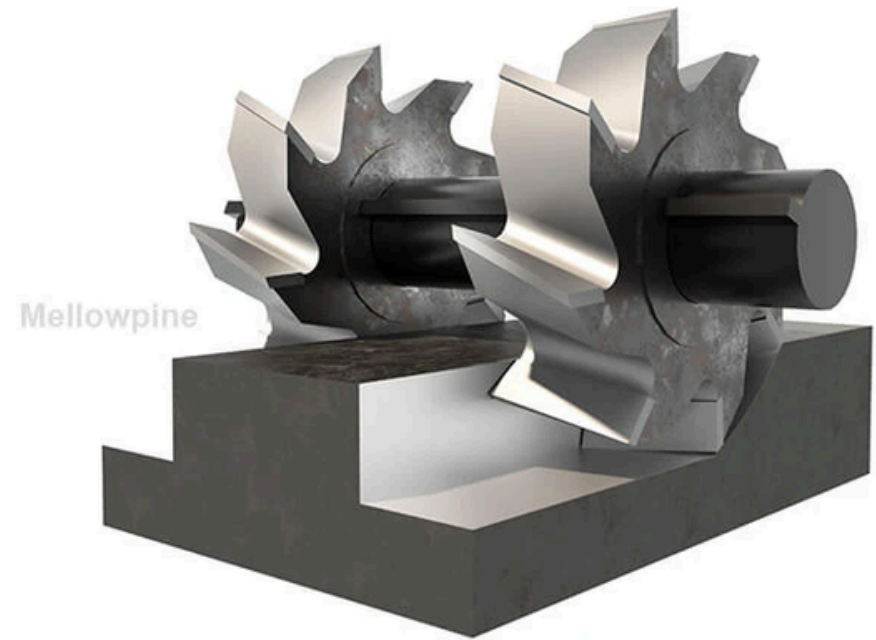
FACE MILLING OPERATION

- The **most simple operation** on a milling machine is face milling.
- This procedure is carried out with a face milling cutter that is **rotated about an axis perpendicular to the work surface**



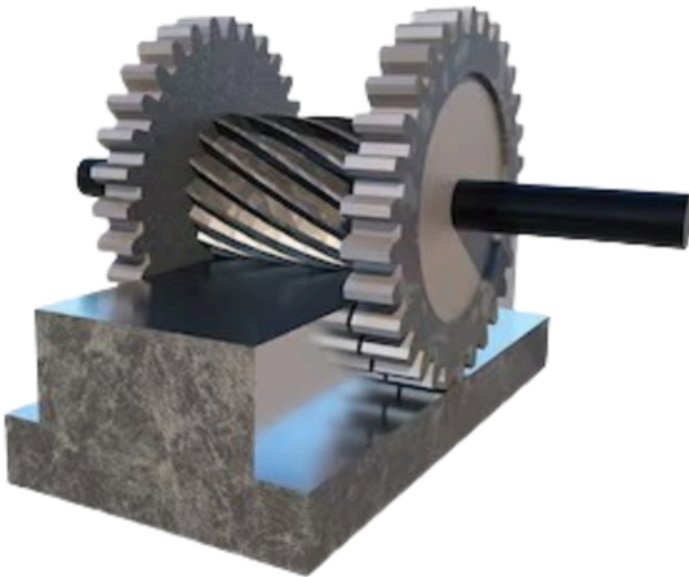
STRADDLE MILLING OPERATION

- The milling operation in which two surfaces are milled simultaneously is a straddle milling operation.
- straddle milling creates flat and vertical surfaces on both sides of the workpiece.
- The operation is used to create hexagonal or square surfaces.



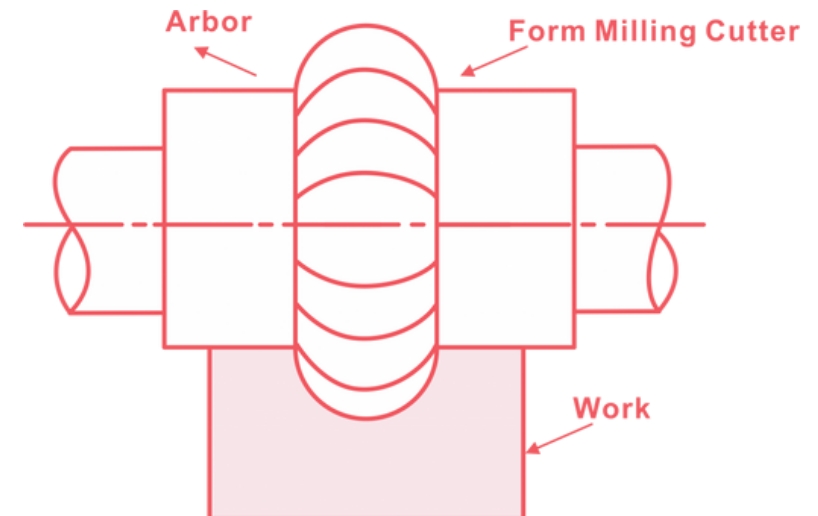
GANG MILLING OPERATION

- The operation of simultaneously milling multiple surfaces of a workpiece by feeding the table against numerous cutters



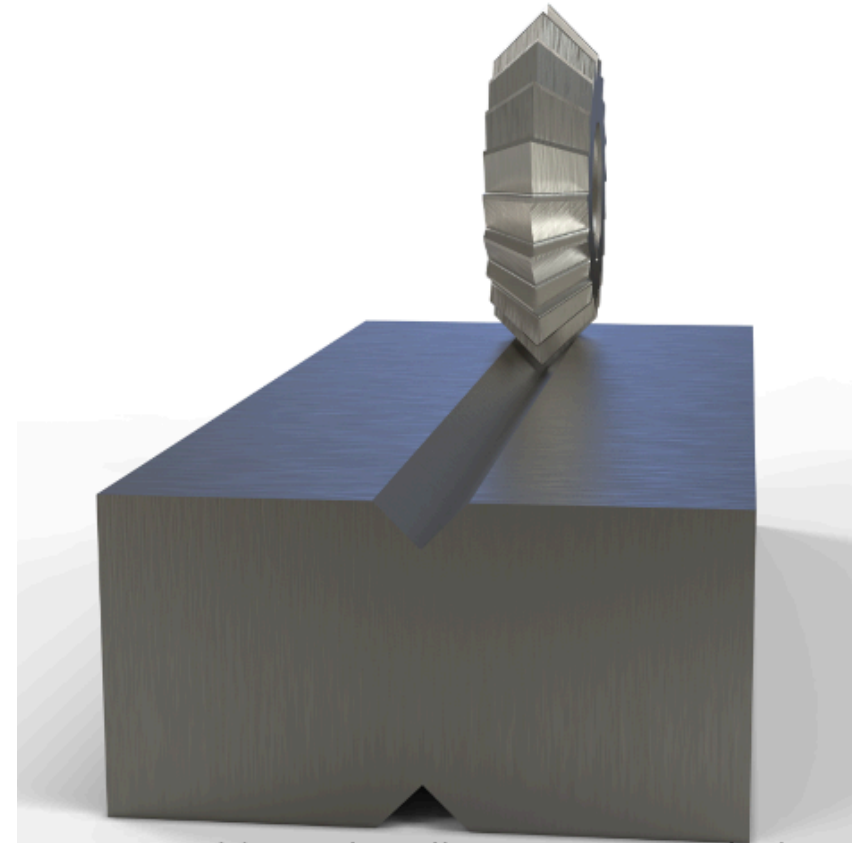
FORM MILLING OPERATION

- The process of creating an uneven shape like convex, concave shapes
- This operation has a 20% – 30% slower cutting rate than plain milling.



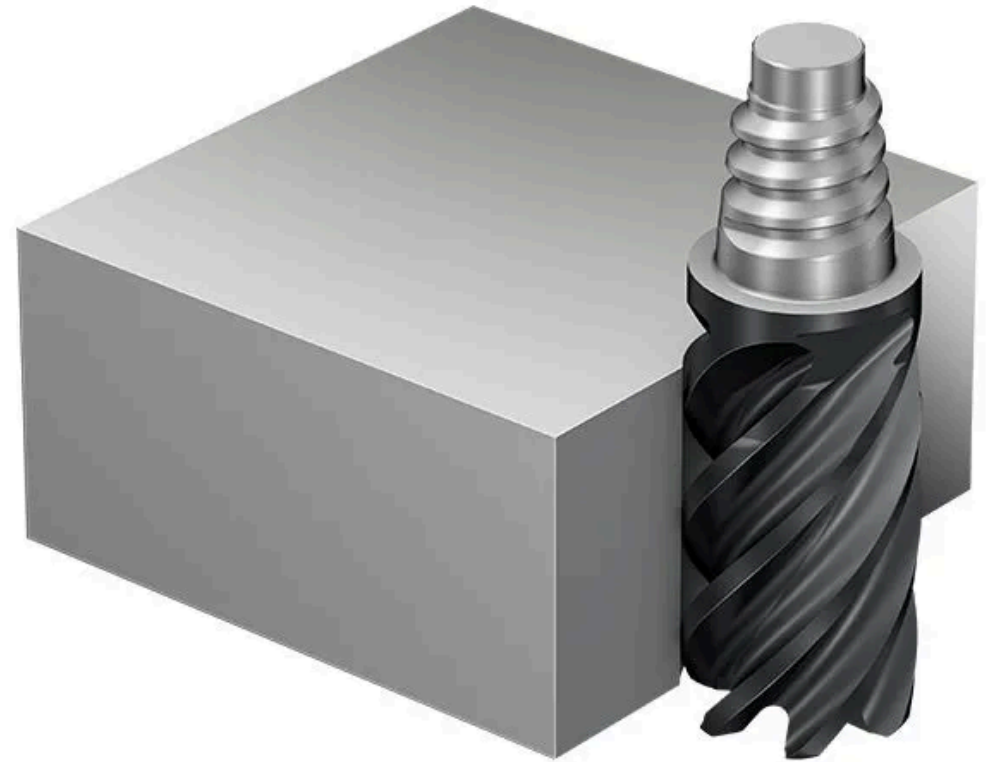
ANGULAR MILLING OPERATION

- The process of generating an angular surface on a workpiece which is not at right angles to the spindle axis of the milling machine
- **V-block manufacturing** is an example of angular milling.



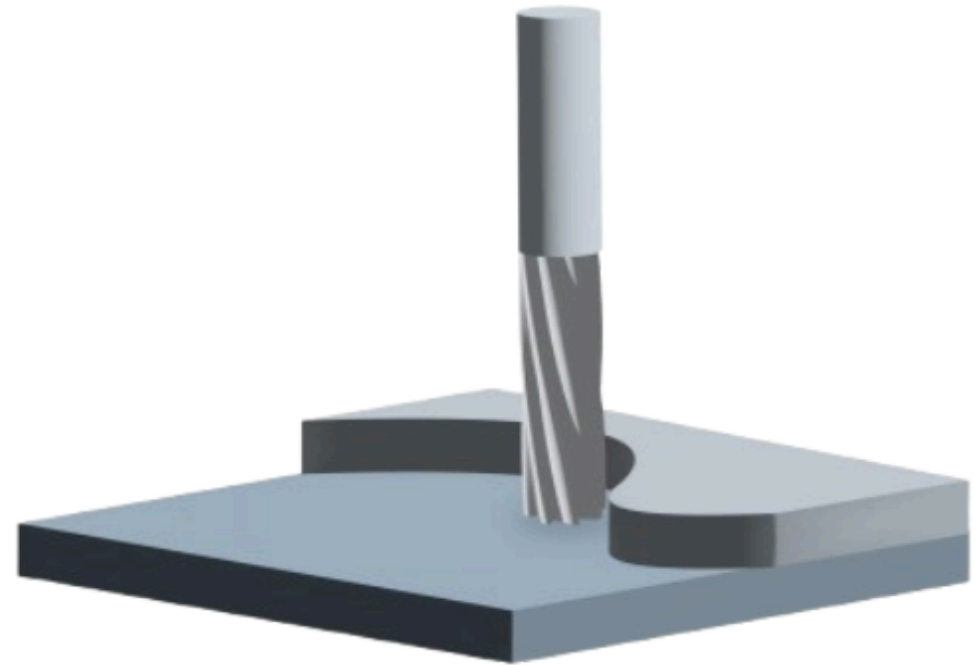
SIDE MILLING OPERATION

- The process of side milling involves using a side milling cutter to create a flat, vertical surface on the side of a workpiece.
- The depth of cut is provided by adjusting the vertical feed with the help of the screw on the table.



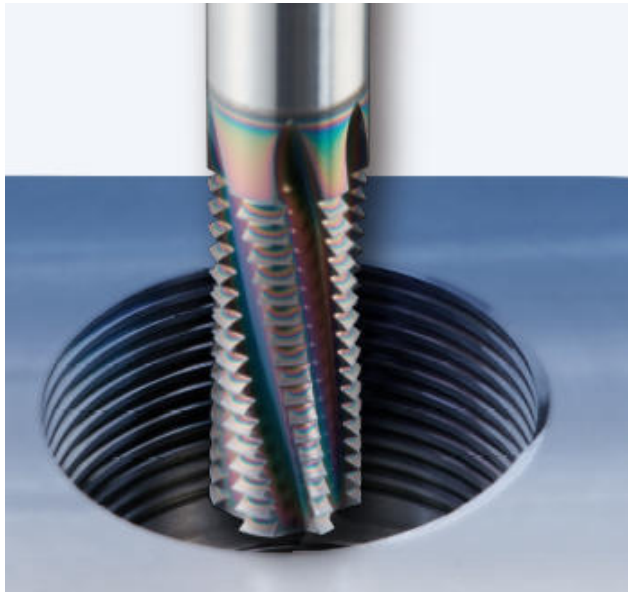
PROFILE MILLING OPERATION

- The process of replicating an intricate shape of a master die on a workpiece is known as profile milling.
- One of the milling cutters that is frequently used in profile milling is the end mill cutter.



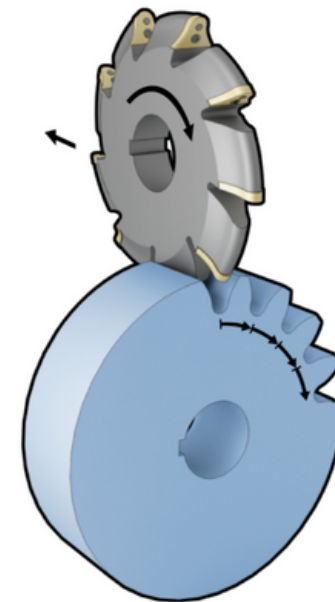
THREAD MILLING OPERATION

- The thread is finished by feeding the **rotating cutter longitudinally** over a distance equal to the pitch length of the thread



GEAR CUTTING OPERATION

- A **form-relieved cutter** on a milling machine executes the gear-cutting operation.
- The cutter type may be **either cylindrical or end mill**



HORIZONTAL MILLING MACHINE

- Cutting tools for these machines are thicker and shorter gears are cut in this machine

VERTICAL MILLING MACHINE

- cutting tools for vertical milling machines are longer and thinner

SIMPLEX MILLING MACHINE

- The spindle head can only move in one direction

DUPLEX MILLING MACHINE

- This machine is a combination of two machines

TRIPLEX MILLING MACHINE

- The spindle of these machines travels in three directions x, y, and z axes.
- These machines are extremely accurate

POCKET MILLING

- it is used in aerospace and shipyard industry

TURRET MILLING MACHINE

- it has a stationary spindle and the table is moved both perpendicular and parallel to the spindle

OMNIVERSAL MILLING MACHINE

- in this machine the table can be tilted in a vertical plane due to the swivel arrangement at the knee
- this machine is mainly used in tool rooms

UNIVERSAL MILLING MACHINE

- The table is turned to any angle between 0° and 45° on either side
- this machine is similar to the horizontal milling machine in all respects with an additional swivelling movement

PERIPHERAL CLEARANCE ANGLE

- it is the angle between the cleared flank of the blade and a tangent to the periphery of the cutter in a diametrical plane passing through the cutting edge

FACE CLEARANCE ANGLE

- this is the angle between the face of the blade and the plane tangent to the periphery of the cutter

PERIPHERAL RELIEF ANGLE

- this is the angle between the relieved surface of the blade and a tangent to the periphery in a diametral plane passing through the cutting edge

FACE RELIEF ANGLE

- this is the angle between the relieved surface of the blade and a plane perpendicular to the cutting edge

1

Milling two sides of a piece of work by employing two side-milling cutters at the same time is _____milling.

- | | |
|--------------|-----------|
| (a) Form | (b) Plane |
| (c) Straddle | (d) End |

2

In upmilling, the cutter rotates:

- (a) Against the stationary work piece
 - (b) In the same direction of travel of the work piece
 - (c) Against the same direction of travel of the work piece
 - (d) None of these
-

3

In which milling operation, the cutting force tends to lift the work piece?

- | | |
|------------------|----------|
| (a) Climb | (b) Down |
| (c) Conventional | (d) Face |

4

Down milling is also called

- (a) conventional milling
- (b) climb milling
- (c) end milling
- (d) face milling

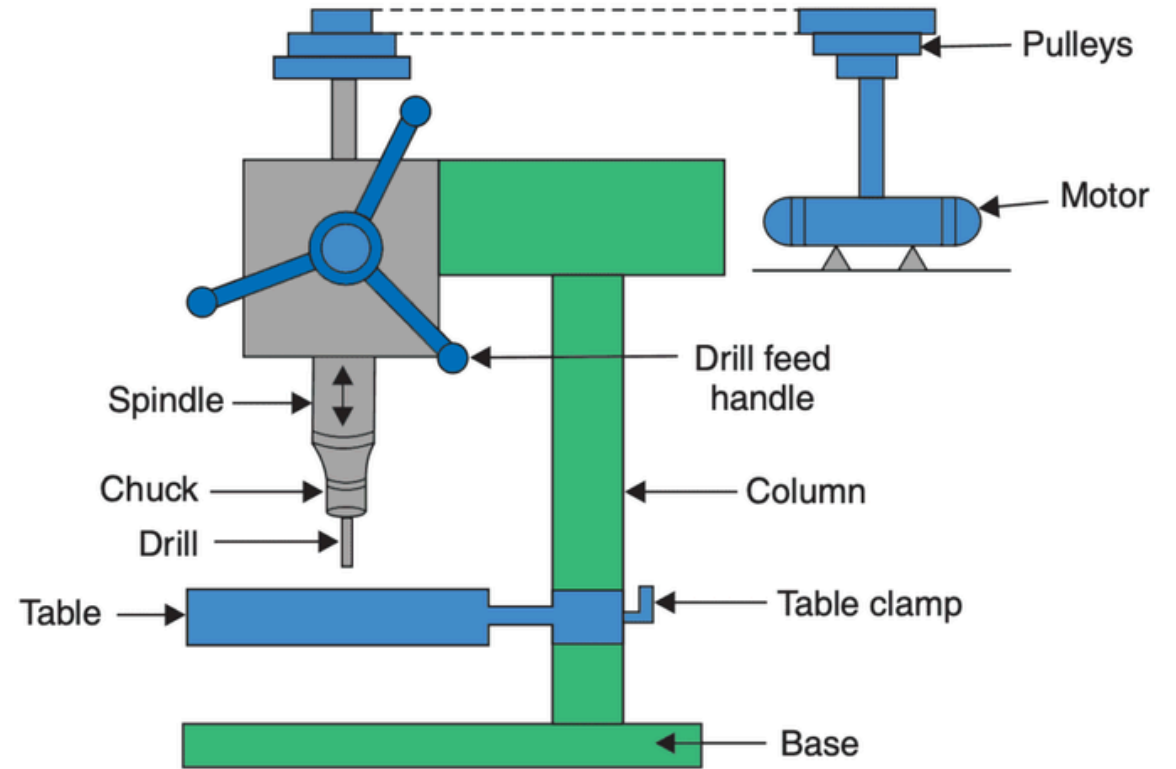
5

In down milling, the thickness of chip is

- (a) minimum at the beginning of the cut and maximum at the end of the cut
- (b) maximum at the beginning of the cut and minimum at the end of the cut
- (c) uniform through the cut
- (d) none of these

DRILLING

- Drilling is a machining operation for producing round holes in metallic and nonmetallic Materials.
- The most common drill used is the **twist drill**.



FEED

- The range of the feed is 0.05 to 0.35 mm
- The best tool life can be attained by employing the maximum feed rate

CUTTING SPEED

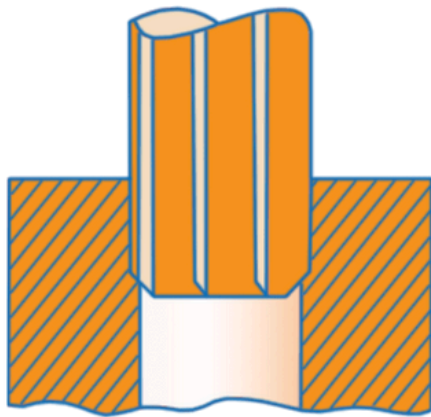
- the cutting speed range is between 10 m/min to 90 m/min
- cutting speed = $v = \pi dN/1000$
- d=drill dia
- N=number of rotation of cutting tool per min

MACHINING TIME

- machining time = $T=L/(N*f)$
- drill bit is typically a multi-point rotary cutting tool

REAMING

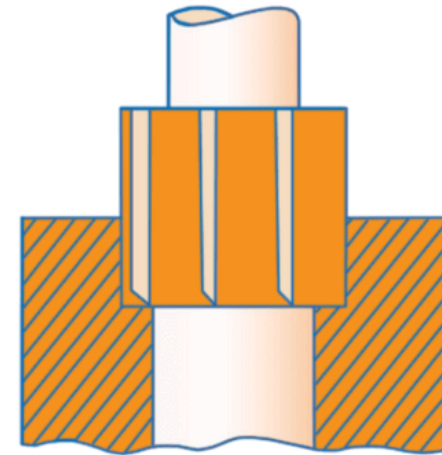
- A high-precision **hole-finishing procedure** carried out with a multi-edge tool is known as reaming



Reaming

BORING

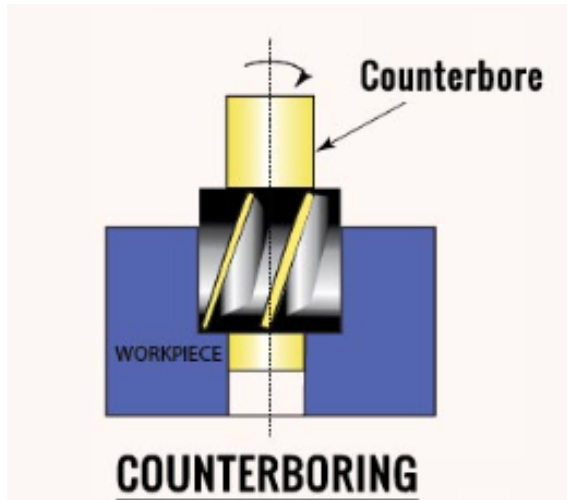
- A cutting process that entails **enlarging an existing hole** in a workpiece with a single-point cutting tool



Boring

COUNTERBORING

- The process of enlarging a hole over a particular section

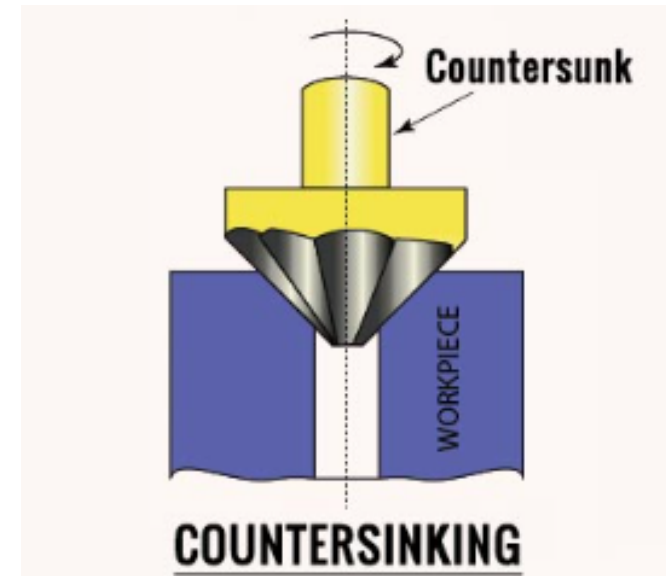


TREPPANNING

- The process of creating a hole by removing metal using a hollow cutting tool

COUNTERBORING

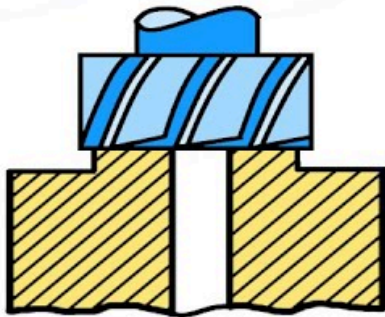
- The process of enlarging one end of the hole giving it a conical shape
- it creates a V-shaped edge near the hole's surface



SPOT FACING

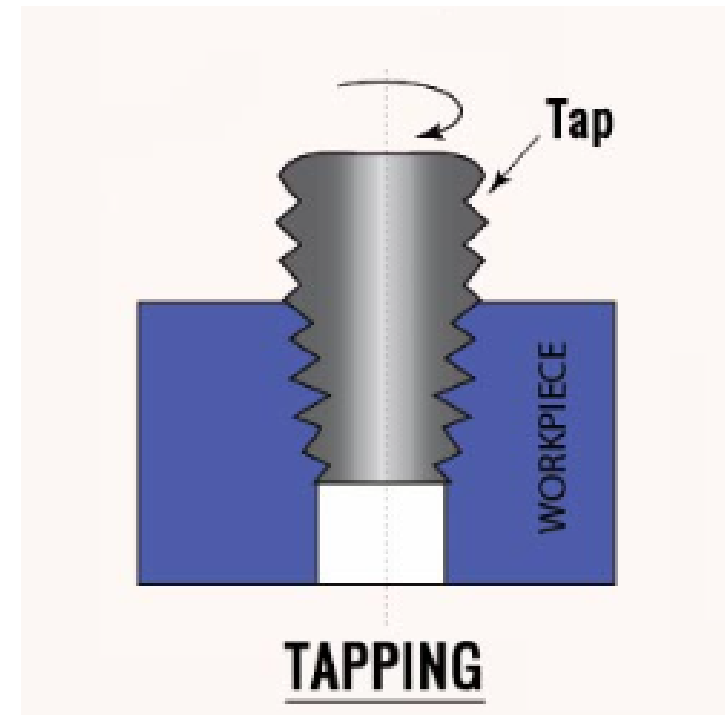
- A technique used to create a flat edge on a cylindrical workpiece is called spot facing
- This is also possible with end-mill cutters.

Spot Facing



TAPPING

- The process of creating internal threads using a tool known as the tap is referred to as tapping



FLAT OR SPADE DRILL

- it is used for large diameter drills
- The cutting edge ranges from 90 ° to 120 °
- relief at the front ranging from 3 ° to 8 °



STRAIGHT FLUTE DRILL

- Straight-fluted drills have flutes or grooves that are perpendicular to the drill axis



POINT ANGLE

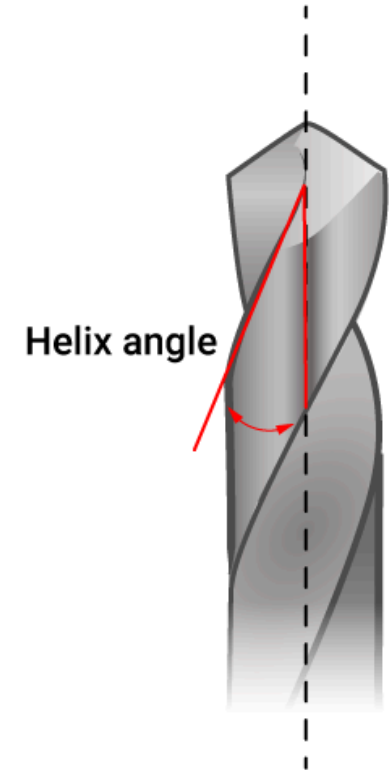
- The standard point angle of drill is used for wood and fibre is 60 degree
- for general purpose drilling the point angle of 118 degree is used

Point angle



HELIX ANGLE

- The usual range of helix angle is 20–30 degree
- The low-helix drill was developed primarily to drill brass and other thin materials like plastics. the low-helix drill can remove the larger volume of chips formed by high rates of penetration.
- High helix-drills are designed for drilling deep holes in aluminium, copper, die-cast material, and other metals where the chips have a tendency to jam in a hole. The angles vary between $(35^{\circ} - 45^{\circ})$.



SPOT DRILLING

- creating a shallow hole to locate the exact center for further drilling

DEEP HOLE DRILLING

- drilling holes with a depth to diameter ratio is greater than 10:1

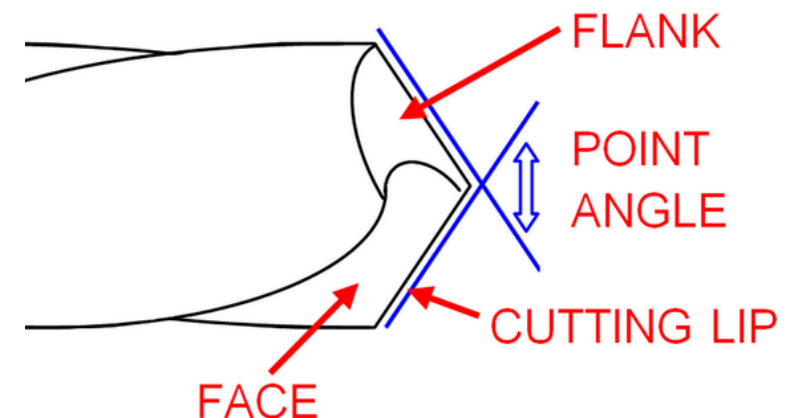
LIPS

- cutting edges of the twist drill

POINT

- The cone shaped end which does the cutting

- the value of depth of cut in drilling operation is equal to half of the diameter of drill
- $\text{depth of cut} = \text{diameter of drill} / 2$
- in drilling operation the metal is removed by shearing and extrusion



- for heavy job radial drilling machine is used
- in drilling operation the rate of feed depends of the
finish required
material of tool
material to be drilled
- blind hole drilling can perform by using a stop ring
- bevel gears are used in hand drill machine
- in drilling machine the cutting speed is in m/min

1

The point angle of a standard ground drill is:

(a) 100°

(b) 90°

(c) 118°

(d) 130°

2

Operation of producing large holes by removing metal along the circumference of a hole is known as

- (a) spot facing
- (b) counter sinking
- (c) lapping
- (d) trepanning

3

Low helix angle drills are preferred for drilling holes in :

- (a) Plastic
- (b) Copper
- (c) Cast steel
- (d) Carbon steel

4

Which of the following processes results in the best accuracy of the hole made?

- | | |
|---------------|-------------|
| (a) Reaming | (b) Tapping |
| (c) Broaching | (d) Boring |

5

The point angle of a drill, for drilling stainless steel, is

(a) 90°

(b) 118°

(c) 135°

(d) 150°

Thank
you

