

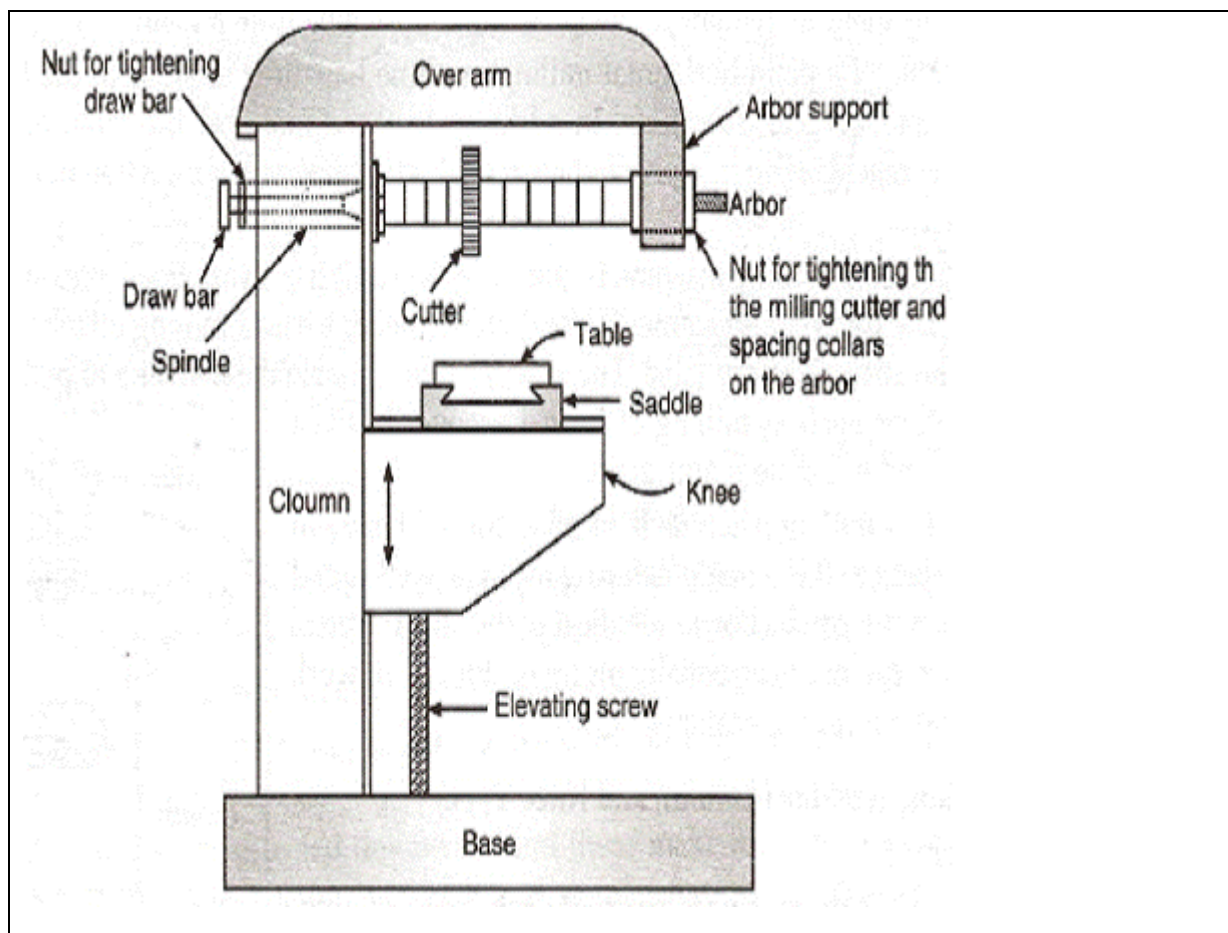
Milling Machine

The milling machine is a type of machine which removes the material from the workpiece by feeding the work past a rotating multipoint cutter. The metal removal rate is higher very high as the cutter has a high speed and many cutting edges.

It is the most important machine in the tool room as nearly all the operations can be performed on it with high accuracy.

MRR (Material Removal Rate) can be further increased by increasing the number of teeth on the cutter.

Milling Machine is used for Machining flat surfaces, Slotting, Contoured surfaces. It is also useful for making Complex and irregular areas, Revolution surface, Gear cutting, Machining external and internal threads. Machining helical surfaces of various cross-sections and many more.



1. Base:

The base is the part upon which the whole machine parts are being mounted. It is a type of foundation for the machine. The base is mostly made up of cast iron, so it has good strength and rigidity. It also helps in the absorption of shocks. Cutting fluid can also be stored in the base.

2. Column:

The main supporting frame which consists of all the driving mechanisms and the motor is called the column. The driving mechanism usually consists of a cone pulley mechanism in which the v-belt is being used to connect it to the motor.

Further by using this driving mechanism the speed of the machine can control as per our requirement.

3. Knee:

The knee shape is quite similar to that of the human body knee. This is an important part of this machine that supports the other parts like the saddle and table. It is attached to the column and has guideways by which it can move up and down with the help of the elevating screw for adjusting its height.

4. Saddle:

The saddle is present on the top of the knee which further carries the table. Its basic function is to support the table.

A saddle can slide on the guideways which are exactly at 90 degrees to the column face. Saddle moves crosswise (in or out) on guideways provided on the knee.

5. Table:

The table is present on the top of the saddle. The table consists of T-slots or sometimes fixtures are used for holding up the workpiece on the table. A table can travel longitudinally in a horizontal plane.

6. Over-arm:

It is also called the over-hanging arm. Overarm is present at the top of the column. The basic function of the over-arm is to support the arbor and spindle.

7. Spindle or Arbor:

The top portion of the column contains the spindle. The spindle is also an important part of the machine as it is the part where the multipoint cutter is attached. Power required for the rotation of the spindle is obtained from the motor through the belt, gear, and clutch assembly.

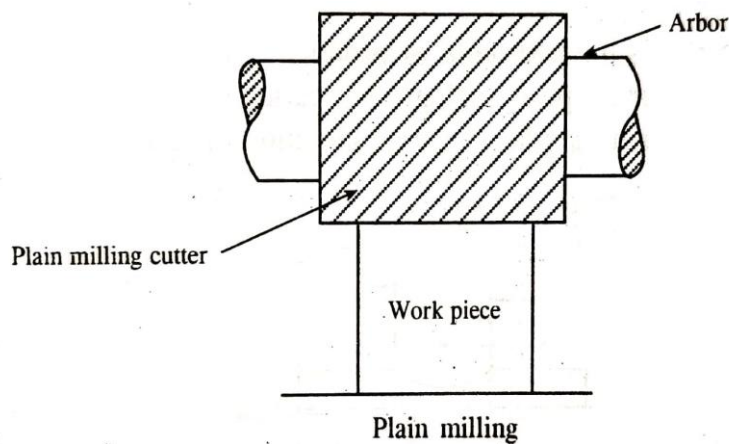
Milling Machine Working Principle:

- Milling machine employed in the metal removing operation in which the work is rigidly clamped on the table of the machine and the revolving cutter which has multiple teeth is mounted on the arbor.
- The cutter revolves at high speed and the work is fed slowly past the cutter.
- The work can be fed in a vertical, longitudinal, or cross direction depending upon the type of milling machine being used.
- As the work proceeds, the cutter-teeth remove the metal from the surface of the job (workpiece) to produce the desired shape.

Milling Machine Operations

1. Plain Milling or Slab Milling Operation:

Plain or slab milling is a process in which the plain, horizontal or flat surfaces are produced, which are parallel to the axis of the rotation of the cutter. A peripheral mill cutter is used for performing the slab milling operation.

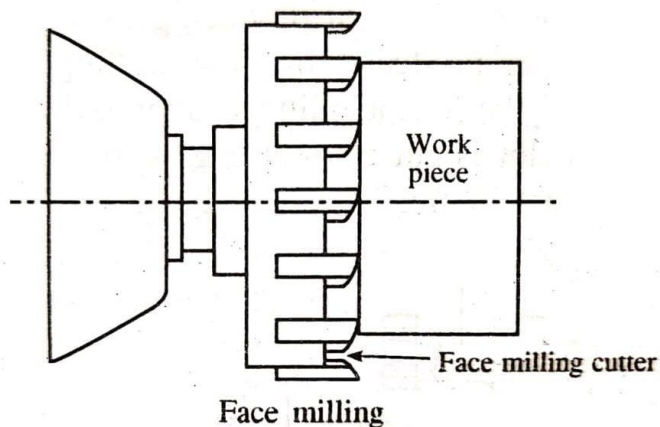


Plain Milling Operation

2.Face Milling Operation:

It is a type of milling operation in which the layer of material is removed from the face of the material. **The end milling cutter is preferred for performing face milling operations.** In Face Milling operation the teeth for cutting are present on both the periphery and the face of the cutter.

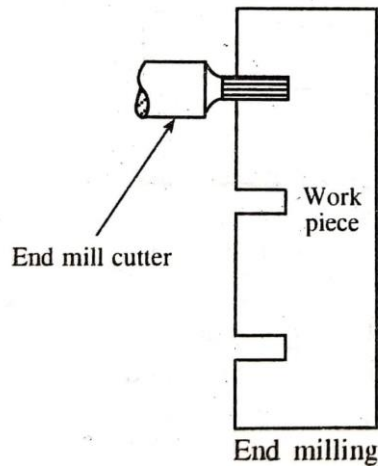
The axis of rotation of the cutter is perpendicular to the work surface. In face milling most of the cutting is done by the periphery portions of the teeth, the face portion provides finishing the action.



Face Milling Operation

3.End Milling Operation:

This type of operation is the combination of the slab milling and face-milling operation used for creating slots in the workpiece and is mostly used for handling the complicated profile.



End Milling Operation

Up Milling and Down Milling:

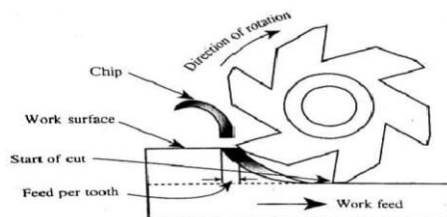
Up milling is a method of milling operation in which the cutter and the workpiece both move in the opposite direction.

Down Milling is a method of milling operation in which the direction of the rotation of the cutter coincides with the direction of the work feed.

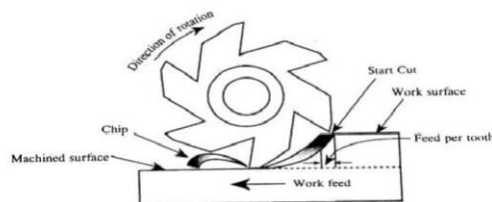
Chip Thickness will be minimum in the beginning and maximum at the end in the case of up-milling. Whereas, the chip thickness will be greater at the beginning and lesser at the end in the case of down-milling.

Tool Life will be more in the case of down-milling as compared with the up-milling.

Difference Between UP and DOWN Milling?



UP MILLING



DOWN MILLING

The surface finish will be more in the case of the down-milling as compared with the up-milling method due to which down-milling method is used for the finishing operations in the industries.

Accuracy will be more in the case of up-milling as compared with the down-milling process since in up-milling the workpiece is pulled against the table so the fasteners will be under tension and we know that under tension the backlash error will not have any effect which ultimately results in the better accuracy in up-milling.

