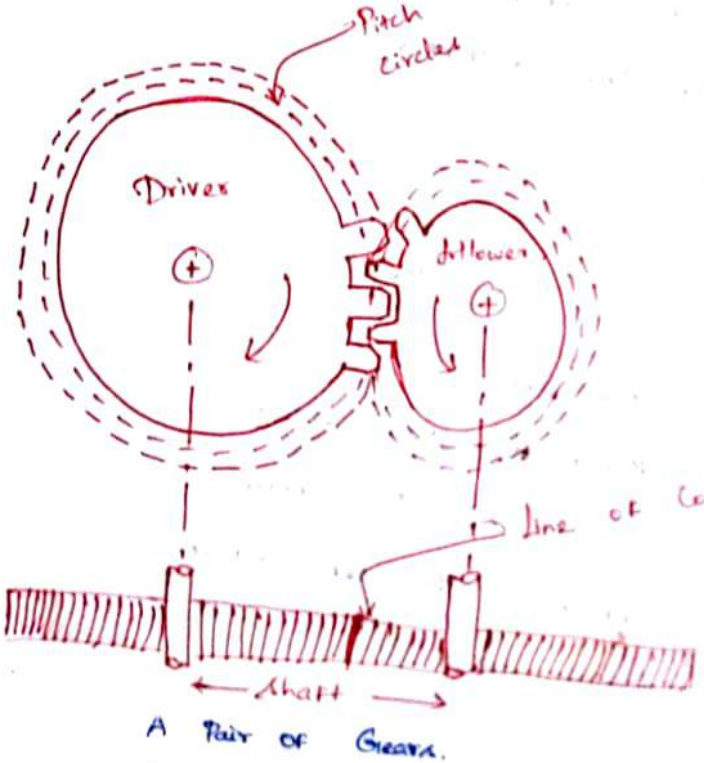
Gear measurement

When the positive drive (without slipping) is required for some precision machines and if the distance between the driver and follower is very small, the gears (or) toothed wheels are used.

Gears used for transmitting motion and power from one shaft to another with constant velocity ratio. When the driver gear is rotated by an input shaft it will rotate the follower in the opposite direction.



A pair of Gears.

Advantages and limitation of gear drive

Advantages :

* There is no slipping. So exact velocity ratio is obtained.
* Large power can be transmitted.
* High efficiency.
* Reliable service.
* It requires less space, Hence compact layout is possible.

Limitations :

Special machines, tools and Technology are required for the Manufacturing of gears.

The defective gears may cause Vibration and noise

Cost of Manufacturing is comparatively high.

Classification of Gears

Based on position of axes of the shaft

(i) Parallel shafts.
(ii) Intersecting shafts.
(iii) Non Parallel and Non-intersecting shafts.

Parallel shafts :-

In this case, two parallel and coplanar shafts are connected by any of the following gears.

Spur gears, Helical gear, Rack and Pinion, Herringbone gears and internal gears.

Bevel gears for Intersecting shaft :-

Bevel gears are used to connect two non-parallel (or) Intersecting but Coplanar shafts.

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(iii) - Parallel and non-intersecting shafts :-

Spiral gears are used to connect two non-parallel and non-intersecting i.e., non coplanar shafts. It is also called skew bevel gearing.

Based on type of gearing :-

External gearing.

Internal gearing.

Rack and Pinion

Worm and Worm Wheel.

Terminology and definition

. Spur gears are Normally straight tooth or involute gears. Some of the important terminologies of spur gear are defined as follows.

The Pitch Circle :-

It is a theoretical circle on which all calculations are usually based. The Pitch circle is an imaginary circle. The pitch circles of a pair of mating gears are tangent to each other.

Pitch circle diameter :-

The diameter of the pitch circle is known as pitch circle diameter. The size of the gear is usually specified by the pitch circle diameter.

Pinion :-

Pinion is a smaller of the two matting gears.

Gear (or) Wheel :-

The larger of the two mating gears is called the gear (or) wheel.

Pitch Point :-

It is a common normal to two gear teeth at the point of contact and the common tangent at the pitch point. The standard pressure angles are 14 ½° and 20°.

Addendum :-

It is the radial distance from the bottom top land and pitch circle.

Dedendum :-

It is the radial distance from the bottom land and Pitch circle.

Whole depth (or) Total Depth :-

It is the sum of addendum and dedendum.

Addendum circle :-

It is the circle drawn through the top of the teeth and concentric with the Pitch circle.

Dedendum circle :-

It is the circle drawn through the bottom of the teeth (or) root circle.

Dedendum circle dia (or) root circle dia } = Pitch circle dia × cos ϕ

Circular Pitch :-

It is the distance measured on the Pitch circle from a Point on one tooth to the corresponding Point on the adjacent tooths.

Circular pitch, $P_c = \frac{\pi D}{T}$

Where, D = Dia of Pitch circle in mm

T = Number of teeth on wheel.

Diametral Pitch:

It is the ratio of number of teeth to the pitch circle diameter.

Diametral Pitch $P_d = T/D = \pi/P_c$

Module:

It is the ratio of the pitch circle diameter to the number of teeth (or) reciprocal of Diametral Pitch.

$m = P/\pi = 1/P_d$

Clearance Circle:

It is a circle that is tangent to the addendum circle of the mating gear.

Tooth thickness:

It is a width of the tooth measured along the pitch circle.

Tooth Space:

It is a width of space between the two adjacent teeth measured along the pitch circle.

pitch line

It is the imaginary by which the width of a tooth space exceeds the thickness of the engaging tooth on the pitch circle

pitch point

It is the intersection of the gear tooth profile and the pitch surface

pitch surface

It is the surface of the gear which coincides with the pitch surface

pitch circle

It is the surface of the gear tooth at the root

face width

It is the width of gear tooth measured parallel to its axis

Profile

It is the curve formed by the face and flank of the tooth

fillet radius

It is the radius that connects the root circle to the profile of the tooth

Surface finish measurement

Generally Components are subjected to several Machining Operations for Producing required geometrical surface. But it is not Practically Possible to Produce a Component in exact dimension due to various factors like Machine Vibrations, Nature of Workpiece, Method of Operations tool Conditions and skills of the labourers etc.,.

Surface Texture :-

The surface texture is defined as the regular (or) irregular surface spacings which tend to form a pattern on the surface.

Types of Irregularities :-

Primary Texture (or) Roughness.

Secondary Texture (or) Waviness.

Roughness Height (or) Height of Unevenness :-

It is the height of the irregularities with respect to a reference line. It is measured in "mm" or Microns.

Waviness Height :-

Waviness height is the peak to Valley distance of the surface Profile. It is measured in "mm".

Lay :-

Lay Indicates the direction of Predominant surface pattern Produced and it reflects the Machining Operation Used to Produce it. The various Lay are given.

(a) Straight lay.
(b) Circular lay.

Reason for Measuring the surface Texture

Surface Texture is measured for following reasons.

* To Predict the Performance of the work Material.

To Control the Manufacturing Process.

Factor Affecting the surface finish :-

The following factors affect the surface finish.

(a) Machine Variables.

(i) cutting speed.

(ii) feed.

(iii) Depth of cut.

(iv)

Tool Geometry also influence the surface finish.

Nose radius

Rake angle.

Side cutting edge angle.

cutting edge.

Important terms :-

Avarge Roughness.

The root Mean Square roughness

The skewness Sk and the kurt...

The Maximum Peak height Rp.

The Maximum Valley height Rv.

The Maximun Peak to Valley height (Rmax)

Analysis of Surface finish :-

A Numerical assessment of Surface finish can be carried out a Number of ways.

1. Peak to Valley height
2. The Avarge Roughness.
3. Form factor (or) tooarity ca...

Measurement of Surface finish :-

The inspection and assesment of surface Roughness of machine component are carried out by Means of various Measurement Techiques.

Surface finish can be Measured by in Following.

(a) Surface Inspection by Comparision Method.

(b) Direct Instrument method.

Surface Inspection by Comparision Method :-

The Surface Inspection by Comparion Method is Classified as.

1. Touch Inspection
2. Vidual Inspection
3. Scratch Inspection
4. Surface Photographs
5. Reflected light Intensity.
6. Micro Interferometer.