

## FAQ

### Module-4: Spur gears

#### 1) Why steel is widely used as gear material?

Steel is cheaper compared to other metallic materials. They have good wear resistance, load carrying capacity and shock absorbing capacity.

#### 2) Why dedendum is larger than addendum?

Meshing of mating teeth should occur on the involute portion of teeth. The teeth have involute profile from the base circles to addendum circles. If there is inaccuracy in manufacturing of gears, then the tip of tooth of one gear (always lies on its addendum circle) will dig the bottom portion of mating gear that results in interference. To avoid this bottom land of gears are lowered such that it lies on the periphery of the dedendum circle. The dedendum circle is made smaller than the base circle and also lies below the pitch circle at distance, ' $b$ '. Addendum circle lies at distance ' $a$ ', beyond the pitch circle, such that  $b > a$ .

#### 3) Is the line of action changing its direction when the teeth continue to mesh?

No. It is always tangent to base circles of mating gears and normal to the contacting surfaces of teeth. It intersects the centre line of gears at 'Pitch point'.

- 4) While mounting the mating gears, the centre distance is slightly increased. What will be the changes on the speed of output gear?

The correct centre distance ( $C$ ) must be equal to the radii of pitch cylinders of mating gears ( $r_1+r_2$ ). If the gears axes are shifted farther by  $dC$ , then the pitch point is displaced from the axes of both gears by  $dr_1$  and  $dr_2$  respectively; where  $dr_1$  and  $dr_2$  are proportional to  $r_1$  and  $r_2$  respectively. Then the velocity ratio must remain constant as,  $\frac{r_1}{r_2} = \left[ \frac{(r_1 + dr_1)}{(r_2 + dr_2)} \right]$ . There won't be any change in the speed of the output gear.

- 5) If accumulated fibres, dust and debris on gear teeth create interference, then why don't we use toothed belt drive for drafting rollers?

If the power transmission is less, then toothed belt is a better option. This can be done by driving the front and back rollers individually by separate motors using toothed belt drive. In this case, the power is distributed and each belt transmits smaller power. Toothed belt drives are already in use to drive drafting roller individually on drawing and ring spinning machines. The cost of machine may go up but the headstock looks simple.

- 6) Power transmission by gears is proportional to tangential load ( $F_t$ ) on the gear tooth which is the product of applied force and cosine of pressure angle. Then power transmission can be increased by having low pressure angle ( $14.5^\circ$ ) than having  $20^\circ$ . Then why do most spur gears have pressure angle  $20^\circ$ ?

Having larger pressure angle reduces the size of base circle on the gear resulting more involute portion on the gear teeth. This helps in reducing the incidence of interference.