FAQ

Module-9: Clutches

1) Where do we use square jaw clutches?

They have inherent limitation of sudden engagement and poor slip during disengagement. Hence they are used for very low speed application under 10 rpm. In current textile machines they are not used.

2) What is the main advantage of toothed clutch?

They provide positive engagement which facilitates large power transmission. For the same reason they are smaller in size and can be accommodated in the limited space of machine compared with friction clutches

3) Why do we need clutch in the drive from doffer to feed roller?

During lot changes the card must be cleaned thoroughly. For this the feed roller must be stopped while running the other elements (lickerin, cylinder and doffer).

4) What is the main advantage of friction clutches?

They are gradually engaging clutches. Initially, when the disks contact, the output disk slips; and gradually picks up the speed. In the mean time, the motor generates enough torque. In case of machine jamming, the output disk slip, and the torque would not be transmitted to the motor, thus safeguarding the motor.

5) In design of friction clutch, uniform wear theory is used. Why?

In new clutch, the rigidity of disks and spring will ensure uniform pressure between the disks. This will be for some period (months). But the clutches are used for many years. During the major part of service life of clutches, the friction lining undergoes uniform wear. The power transmission capacity of clutch under uniform wear is low compared with when they undergo uniform pressure.

6) What is the advantage and disadvantage of conical clutch compared with single disk friction clutch?

The advantage of conical clutch is very large power/torque transmission for a given effective radius of friction lining, coefficient friction and actuating force as evidenced from the following equations for uniform pressure criteria (same is the situation under uniform wear criteria),

For single disk friction clutch,
$$M_t = \frac{2}{3}\mu.F\frac{\left(R^3 - r^3\right)}{R^2 - r^2}$$

For conical disk friction clutch,
$$M_t = \left(\frac{2\mu.F}{3\sin\alpha}\right)\frac{\left(R^3 - r^3\right)}{\left(R^2 - r^2\right)}$$

Alternately, they may be made in smaller size or require less actuating force compared with plate clutch. The disadvantage is that if the cone angle (a) is very low, it is difficult to disengage them.

7) What are the advantages of centrifugal clutch?

Depending on the torque and speed characteristics of motor, the clutch is designed to engage at a particular speed which is safe for the motor. By selecting the spring, the engagement speed is precisely controlled. It does not require external force to actuate the clutch. The centrifugal force is the actuating force, which is generated from the motor speed. The torque capacity is also preciously designed by varying the number of shoes and its mass, drum diameter, spring constant and operating speed, (full speed of motor). They are cheaper and require less maintenance.