

Power transmission elements, Belt drive

Belt drive

Belt drive is one of the most common and effective devices of transmitting motion and power from one shaft to the other by means of a thin inextensible band running over the two pulleys. Where the pulley may run at the same speed or at the different speed. The amount of power transmission depends upon the velocity of the belt, the tension under which the belt is placed on the pulley, the arc of contact between the belt and the smaller pulley and the condition under which the belt is used.

Types of belts drives

* Flat belt: The flat belt is mostly used in the factories and workshops, where a moderate amount of power is to be transmitted, from one pulley to another when the two pulleys are not more than 10m apart.

* 'V' belt: The v belt is mostly used in the factories and workshops where a great amount of power is to be transmitted from one pulley to another. When the two pulleys are very near to each other less than 5m.

* Circular belt or rope belt: The circular belt or rope is mostly used in the factories and workshops, where a great amount of power is to be transmitted from one pulley to another, when the two pulleys are more than 5m apart.

7.4.2.1.Types of flat belt drives

- **Open belt drive:** Open belt arrangement is employed for transmitting motion between parallel shafts rotating in the same direction. When the centre distance between the two shafts is large, thus the tight side of the belt should be the lower one.
- **Cross or twist belt drive:** The crossed belt drive is used with shafts arranged parallel and rotating in the opposite directions. A little consideration will show that at a point where the belt crosses, it rubs against each other and there will be excessive wear and tear. In order to avoid this, the shafts should be placed at a maximum distance of $20b$, where b is the width of the belt and the speed of the belt should be less than 15m/sec.
- **Belt drive with idler pulley:** A belt drive with an idler pulley is used with shafts arranged parallel and when an open belt cannot be used due to small angle of contact on the smaller pulley. This type of drive is provided to obtain high velocity ratio and when the required belt tension cannot be obtained by other means.
- **Compound belt drive:** A compound belt drive is used when power is transmitted from one shaft to another through a number of pulleys.
- **Stepped or cone pulley drive:** A stepped or cone pulley drive is used for changing the speed of the driven shaft while the main or driving shaft runs at constant speed. This is accomplished by shifting the belt from one part of the steps to the other.

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7.4.2.2. 'V' belt drives

The 'V' belts are made of fabric and cords molded in rubber and covered with fabric and rubber as shown in fig. These belts are molded to a trapezoidal shape and are made endless. These are particularly suitable for short drives. The included angle for the V belt is usually from 30° - 40° . The power is transmitted by the wedging action between the belt and the V groove in the pulley. A clearance must be provided at the bottom of the groove as shown in order to prevent touching of the bottom as it becomes narrower from wear. The 'V' belt drive may be inclined at any angle with tight side either at top to bottom. In order to increase the power output. Several 'V' belts may be operated side by side.

Advantages:

- The V belt drive gives compactness due to the small distance between centre of pulleys. The drive is positive, because the slip between the belt and the pulley groove is negligible.
- The operation of the belt and pulley is quite correct.
- The belts have the ability to cushion the shock when machines are started.
- The high V.R. (maximum 10) may be obtained.
- The wedging action of the belt in the groove gives high value of limiting ratio of tensions. The ratio of tensions in V-belt drive is cosec times more than the flat belt drive. Therefore the power transmitted by V-belt is more than flat belts for the same coefficient of frictions are of contact and allowable tensions in the belt.
- The V-belt may be operated in either direction, with tight side of the belt at the top or bottom. The centre line may be horizontal, vertical or inclined.

Disadvantages:

- The V-belt cannot be used with large center distance.
- The V-belts are not so durable as flat belts.
- The construction of pulleys for V-belts is more complicated than pulleys of flat belts.