



MAIN COMPONENTS OF TRACTORS



Components of Tractors

- I.C Engine
- Clutch
- Transmission gears
- Differential unit
- Final drive
- Rear wheel
- Front wheels
- Steering mechanism
- Hydraulic control and hitch system
- Brakes
- Power-take-off unit
- Tractor pulley
- Draw bar
- Control panel

I.C engine

Internal combustion of suitable horse power is used as a prime mover in a tractor. Engines ranging from 8 to 200 hp are used in agricultural tractors. In India, four wheel tractors for agricultural operations are fitted with 25-80 hp. Walking type tractors are fitted with 8-12 hp engines

Clutch

Clutch is a device, used to connect and disconnect the tractor engine from the transmission gears and drive wheels. Clutch transmits power by means of friction between driving members and driven members

Necessity of clutch in a tractor

- Engine needs cranking by any suitable device. For easy cranking, the engine is disconnected from the rest of the transmission unit by the clutch. After starting the engine, the clutch is engaged to transmit the power from engine to gear box
- In order to change the gears, the gear box must be kept free from engine power, otherwise the gear teeth will be damaged and engagement of gears will be difficult. This work is done by clutch



MAIN COMPONENTS OF TRACTORS

- When the belt pulley of the tractor works in the field it needs to be stopped without stopping the engine. This is done by a clutch

Power transmission system of a tractor

Transmission is a speed reducing mechanism, equipped with several gears. It may be called a sequence of gears and shafts, through which the engine power is transmitted to the tractor wheels. The system consists of various devices, which cause forward and backward movement of tractor to suit different field conditions. The complete path of power from engine to wheel is called power train

Functions of power transmission system

- To transmit power from the engine to the rear wheels of the tractor
- To make reduced speed available, to rear wheels of the tractor
- To alter the ratio of wheel speed and engine speed in order to suit the field conditions
- To transmit power through right angle drive, because the crankshaft and rear axle are normally at right angles to each other.

The power transmission system consists of : 1. Clutch 2. Transmission gears 3. Differential 4. Final drive 5. Rear axle 6. Rear wheels

Transmission gears

A tractor runs at high speed, but the rear wheel of the tractor requires power at low speed and high torque. That's why it becomes essential to reduce the engine speed and increase the torque available at the rear wheel of the tractor because $\text{Power, kW} = \frac{T \times N}{60 \times 1000}$ Where, T is torque in Newton –meter N = speed in rev/min If engine power is constant, it is obvious that for higher torque at wheels, low speed is required and vice versa.. So gear box is fitted between engine and rear wheels for variable speed and torque.

Differential unit

Differential unit is a special arrangement of gears to permit one of the rear wheels of the tractor to rotate slower or faster than the other. While turning the tractor on a curved path, the inner wheel has to travel lesser distance than the outer wheel. The inner wheel requires lesser power than the outer wheel. This condition is fulfilled by differential unit, which permits one of the rear wheels of the tractor to move faster than the other at a turning point.



MAIN COMPONENTS OF TRACTORS



Differential Lock

Differential lock is a device to join both half axles of the tractor so that even if one wheel is less resistance, the tractor comes out of the mud etc. as both wheels move with the same speed and apply equal traction.

Final drive

Final drive is a gear reduction unit in the power trains between differentials and drive wheels. Final drive transmits the power finally to the rear axle and the wheels. The tractor rear wheels are not directly attached to the half shafts but the drive is taken through a pair of spur gears. Each half shaft terminates in a small gear which meshes with a large gear called bull gear. The bull gear is mounted on a shaft, carrying the tractor rear wheel. The device for final speed reduction, suitable for tractor rear wheels is known as final drive mechanism.

Steering mechanism

The system, governing the angular movement of front wheels of a tractor is called steering system. This system minimizes the efforts of the operator in turning the front wheels with the application of leverages. The different components of steering system are i) steering wheel ii) steering shaft iii) steering gear iv) drag link v) steering arm vii) tie rod viii) king pin. When the operator turns the steering wheel, the motion is transmitted through the steering shaft to the angular motion of the pitman arm through a set of gears. The angular movement of the pitman arm is further transmitted to the steering arm through drag link and tie rods. Steering arm are keyed to the respective kingpins which are integral part of the stub axle on which wheels are mounted. The movement of steering arm affects the movement of front wheel.

Hydraulic control system

It is a mechanism in a tractor to raise, hold or lower the mounted implement or semi-mounted equipments by hydraulic means. All tractors are equipped with hydraulic control system for operating three point hitch of the tractor. Hydraulic system works on PASCAL's Law which states that pressure applied to an enclosed fluid is transmitted equally in all directions.

➤ **Basic components of hydraulic system**

1. Hydraulic pump
2. Hydraulic cylinder and piston



MAIN COMPONENTS OF TRACTORS



3. Hydraulic tank
4. Control valve
5. Safety valve
6. Hose pipe and fittings
7. Lifting arms

The hydraulic pump draws up oil from the oil reservoir and sends it to the control valve under high pressure. From the control valve, the oil goes to the hydraulic cylinder to operate the piston, which in turn, raises the arms. The implements attached with the arms are lifted up.

Brakes

Brake is used to stop or slow down the motion of the tractor. It is mounted on the driving axle and operated by two independent pedals. Each pedal can be operated independently to assist the turning of tractor during field work or locked together by means of a lock. Types of brakes – a) Mechanical brake b) hydraulic brake

Power take off

It is a part of tractor transmission system. It consists of a shaft, a shield and a cover. The shaft is externally splined to transmit torsional power to another machine. A rigid guard fitted on a tractor covers the power-take-off shaft as a safety device. The guard is called power take off shield. As per ASAE standards PTO speed is 540+ 10 rpm when operating under load. In order to operate 1000 rpm PTO drive machine, a new standard has been developed.

Belt pulley

All tractors are provided with a belt pulley. The function of the pulley is to transmit power from the tractor to stationary machinery by means of a belt. It is used to operate thresher, centrifugal pump, silage cutter, and several other machinery. The pulley is located either on the left, right or rear side of the tractor. Pulley drive is engaged or disengaged from the engine by means of a clutch.

The control board of a tractor generally consists of

- 1. Main switch** - When the main switch is on, the electric current flows in the electric circuit
- 2. Throttle lever** - This lever is for increasing or decreasing the speed of the engine.



MAIN COMPONENTS OF TRACTORS



3. **Decompression lever** - This lever releases the compression pressure from the combustion chamber of the engine and helps to start the engine.
4. **Hour meter** - This meter indicates the engine hour as well as engine revolution per minute
5. **Light switch** - light switch is for light points only
6. **Horn button** - This is for horn of the tractor
7. **Battery charger indicator** - This indicates the charge and discharge of the battery.
8. **Oil pressure indicator** - this indicates the lubricating oil pressure in the system
9. **Water temperature gauge** - this indicates the temperature of water of the cooling system