

A green combine harvester is shown in the upper left corner, harvesting a vast field of golden wheat. The harvester is moving from left to right, leaving a trail of harvested grain behind it. The field is a uniform golden-brown color, and the sky is a clear, pale blue. The overall scene is a typical agricultural landscape during harvest time.

POST-HARVEST TECHNOLOGY

UNIT 1 - THRESHING

THRESHING: Manual Threshing

WHAT IS THRESHING?

The operation of detaching the grains from the ear head, cob or pod is called threshing. It is basically the removal of grains from the plant by striking, treading or rupturing.

- ❑ Threshing is the process of beating plants in order to separate the seeds or grains from the straw.
- ❑ To maintain the high quality of the harvested grains, it should be threshed immediately after harvesting.
- ❑ Avoid field drying and stacking for several days as it affects grain quality due to over drying. Stacked grains of high moisture content results in discoloration or yellowing.



Principles of threshing

The threshing mechanism, which separates the grain from the stalks, consists mainly of a revolving cylinder and the concaves.

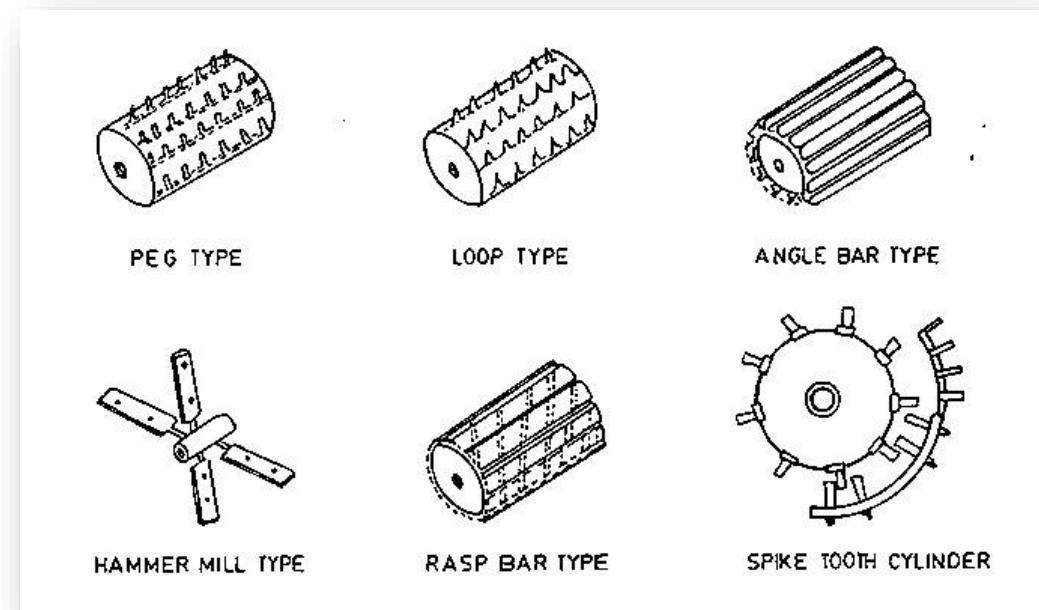
- ❑ A feeder beater is usually located in front of the cylinder and at the upper end of the elevator-feeder to assist the elevator-feeder in feeding the grain to the threshing mechanism.
- ❑ Most threshers are provided with the rasp-bar type cylinder and concaves.
- ❑ The grain is rubbed from the stems without materially cutting the straw.
- ❑ Tooth-type cylinder and concaves are available on some combines.
- ❑ Adjustments are provided for varying the speed of the cylinder to suit the kind of crop being harvested.
- ❑ V belt variable-speed drives are used on most combines.
- ❑ The straw is thrown back onto the separating mechanism, while the grain falls through the concaves onto a grain pan or grain carrier and is conveyed to the cleaning mechanism.

The Threshing Unit

The threshing is accomplished by the impact of the rotating pegs mounted on the cylinder, over to the ear heads, which force out the grain from the sheath holding it. In the threshing of wheat crop, the straw is also bruised and broken up by the impact, thus converting it into 'bhusa' (straw).

Threshing unit is mainly consists of a cylinder and concave. There are different types of threshing cylinders such as:

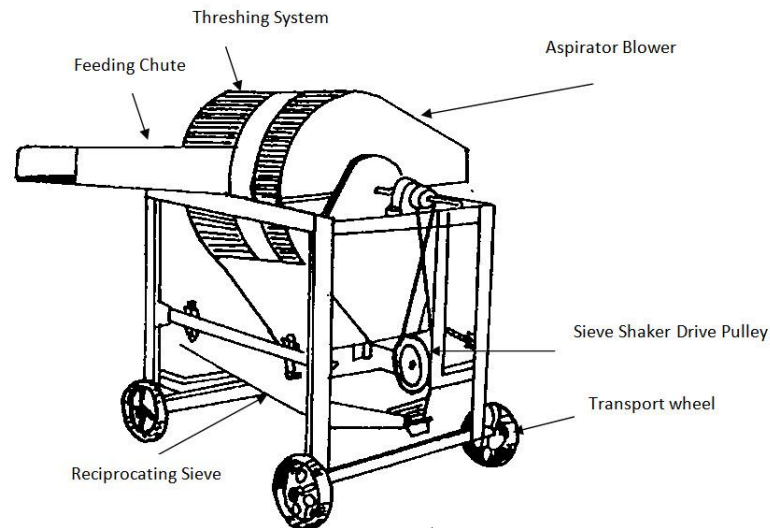
- Spike tooth/peg type cylinder
- Rasp bar type cylinder
- Angled bar type cylinder
- Wire loop type cylinder
- Cutter blade or syndicator type cylinder
- Hammer mill type cylinder



Types of Power Threshers & Main Components

Main Components of Thresher

- | | |
|---------------------|-------------------------|
| (i) Drive pulley | (ix) Towing hook |
| (ii) Fan/blower | (x) Upper sieve |
| (iii) Feeding chute | (xi) Lower sieve |
| (iv) Spikes | (xii) Transport wheel |
| (v) Cylinder | (xiii) Suspension lever |
| (vi) Concave | (xiv) Can pulley |
| (vii) Flywheel | (xv) Shutter plate |
| (viii) Frame | |



1. According to crops being threshed

- Single Crop
- Multi-crop

2. According to functional components

- Regular (Through-put)
- Drummy
- Axial flow

3. According to types of threshing cylinder

- Syndicator
- Hammer Mill or Beater type
- Spike tooth type
- Rasp bar type

Single and Multi Crop Threshers

SINGLE CROP THRESHERS:

Paddy thresher of pedal operated type consists of mainly a well-balanced cylinder with a series of wire loops fixed on wooden slates. It has got gear drive mechanism to transmit power.

- ❑ While cylinder is kept in rotary motion at high speed, the grain bundles of suitable sizes are applied to the teeth.
- ❑ The grains are separated by combining as well as by hammering action of threshing teeth. Crop is threshed due to impact and rubbing action between threshing drawn loops and concave screen.
- ❑ The grains are cleaned with the help of a fan and cleaned grain goes down through the grain outlet at the bottom of the thresher.
- ❑ They are available in different horse power range.

MULTI CROP THRESHERS:

A multi-crop thresher attains the axial movement of the crop while handling paddy and all crop material is made to move through the concave.

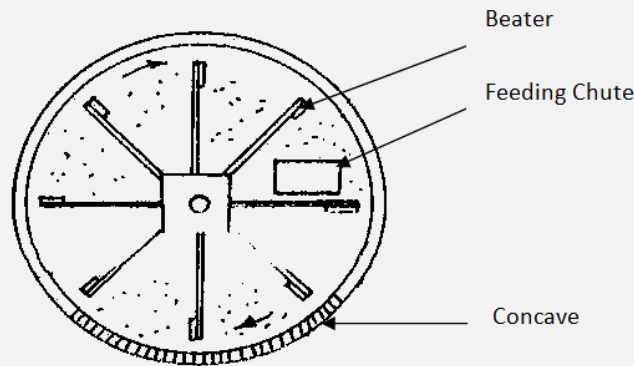
- ❑ The main components of multi-crop threshers are: feeding chute, threshing cylinder, aspirator blower, paddy chaff outlet, wheat straw outlet, hopper, and cam for oscillating sieves, oscillating sieves, transport wheel, frame, main pulley and louvers.
- ❑ The axial flow of material can be accomplished by providing seven louvers with spacing of 150 mm in the hexagonal casing. The clearance between louvers and tip of cylinder spikes is 20 mm.
- ❑ The first three louvers are placed with ribbed casing and side plates are fixed with top casing and concave to prevent material flow in the second portion.
- ❑ The top sieve has holes of 9-mm diameter for wheat and 5 mm for paddy grains. The lower sieve has holes of 1.5-mm diameter common for both the crops. The upper sieve can be changed easily depending upon crop to be threshed

Types according to Functional Components

Drummy

These threshers were very popular in the beginning when threshers were introduced because of its simplicity and low cost. The radially arranged arms known as beaters are mounted on the shaft. These are made of mild steel square section with mild steel flat welded or bolted at the top. The beaters revolve inside an enclosed casing. Ribs are provided inside of upper half of the cover in order to have better threshing. The lower half (known as concave) has rectangular openings made out from square bars. The crop is fed through feeding chute. Crop receives impacts from the rotating beaters till size is reduced to pass through concave.

The clearance between beater and concave is kept about 18-20 mm. The crop should be well dried before feeding in the thresher. A wet crop raps around the beater shaft and machine becomes overloaded. These threshers do not have provision for separation and cleaning of grains. The threshed material is later separated and cleaned by small pedal type blower.



Axial Flow Thresher

Regular Threshers are also used for threshing wheat crop. A pair of bullocks pulls it around over the dried crop spread in a circular form on the threshing ground. Threshing is continued till the entire material becomes a homogeneous mixture of grain and 'bhusa' (chaff). It consists of about 20 circular grooved discs each of 45-cm diameter and 3-mm thickness placed 15 cm apart in three rows. An operator's seat is provided on the frame to control the movement of animals. All discs are mounted staggered to give more effective cutting of the straw. It has 3 or 4 wheels to facilitate its movement from one place to other. Threshing by this thresher is fairly efficient and cheap but is quite slow with low output capacity. This machine can be used for threshing wheat, barley, gram etc.

Axial Flow Thresher

The crop in this thresher is fed into the cylinder through a feeding chute located at one end of the threshing drum. In a multi-crop thresher, threshed wheat crop passing through concave is cleaned by a set of sieves and a blower or aspirator. Axial flow of paddy crop is facilitated by the use of louvers provided on the upper concave. The straw is thrown out of the threshing unit by paddles. The cleaning and separation of grain is accomplished by a set of sieves and a blower or aspirator.

Types according to Threshing Cylinder

Syndicator type Cylinder

This is essentially an adoption of chaff cutter for threshing. The crop is fed as is done in case of chaff cutters. After passing through a set of rollers, crop is cut into pieces. Varying the set of gears can vary the size. Three to four serrated blades are fastened on the radial arm of the flywheel. Threshing is done mainly due to cutting helped by rubbing and impact. The main advantage of syndicator thresher is that it can handle crop with higher moisture content. However, chopping knives need to be sharpened every 3-5 hours of operation. The machine is more prone to accidents due to positive feed rollers.

Spike tooth type Cylinder

Spike tooth type cylinder: In this type of threshing drum, there is a hollow cylinder, made out of MS flat. Over to its entire periphery, a number of spikes/pegs of square /round bars or flat iron pieces are welded or bolted. Now days, in most of threshers, round peg with adjustable length are used. These spikes are staggered on the periphery of the drum for uniform threshing. The crop is fed along with the direction of motion of the rotating drum. The spike tooth cylinders are available in various sizes. A spike tooth cylinder with spikes of flat front and streamlined back has lower energy consumption.

Rasp Bar type Cylinder

Rasp bar type cylinder: In this type of cylinder, there are slotted plates, which are fitted over to the cylinder rings, in such a way that the direction of slot of one plate is opposite to another plate. This type of cylinder is commonly used in threshers. It gives better quality of bhusa and it can be used for a wide variety of crops viz.-wheat, paddy, maize, soybean etc.

Hammer Mill type Cylinder

It uses beaters to do the required job of threshing. The shape of this type of cylinder is different from the above-discussed cylinder. The beaters are made of flat iron pieces and are fixed radially on the rotor shaft. Generally feeding chutes are used with hammer mill type threshing cylinder. The cut crop is fed perpendicular to the direction of motion of rotating beaters. This type of thresher requires more power as compared to spike tooth type of thresher.