

# Thresher performance



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Threshing performance parameters are affected by the following factors:

Design factors: cylinder diameter, concave length, number of rasp bars/ threshing elements;

Operating parameters: cylinder speed, cylinder-concave gap, material feed rate

Crop condition: crop moisture content, crop maturity, crop type.

# Losses during threshing

**Separation loss or “blower loss”** : mature grains that are mixed with straw or chaff during the cleaning operation.

**Scatter loss** : mature grains that are scattered on the ground during the threshing and cleaning operation.

**Threshing loss** : mature grains that remain attached to the panicle in the straw after completion of the threshing operation. High threshing efficiency will lead to low threshing loss, and vice versa.

**Sieve losses**: threshed or un-threshed grain that move out of the sieve



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# Effect of peripheral speed on losses and damage

Low speed,  
more  
cylinder  
loss  
(unthresh  
ed)

More speed  
more  
grain  
damage

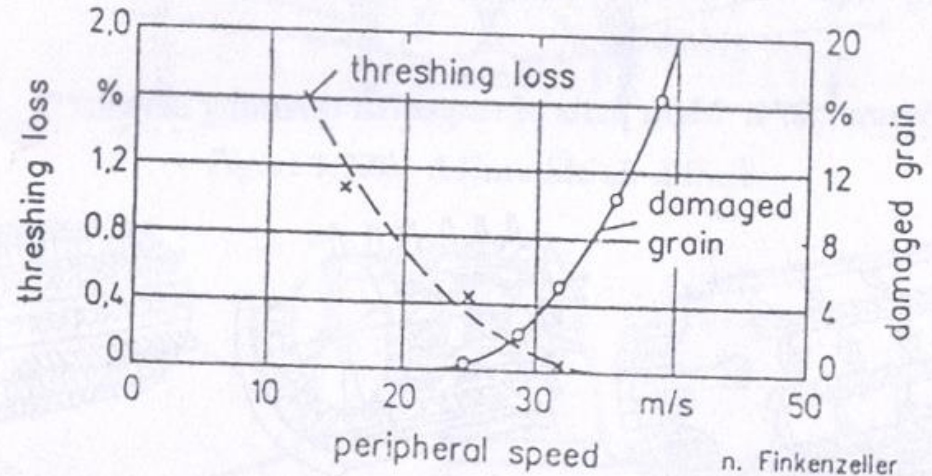
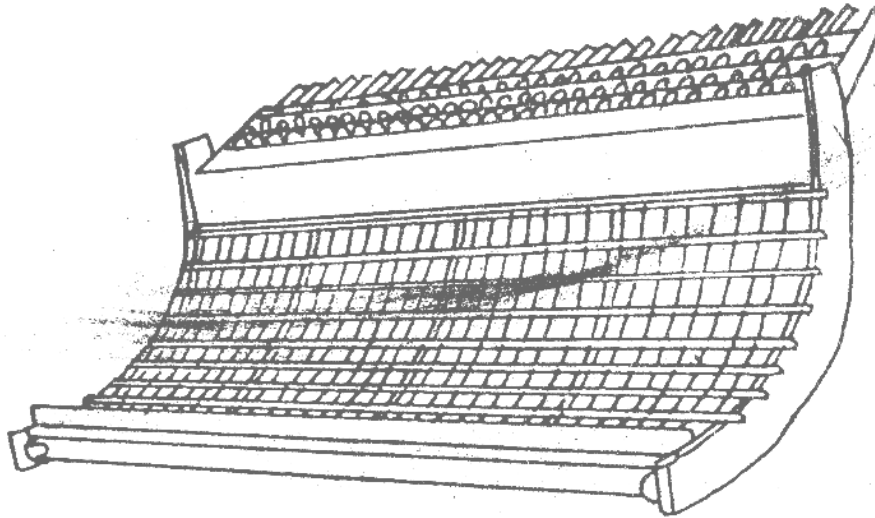


Figure 1.276. Threshing loss and grain damage versus peripheral speed.



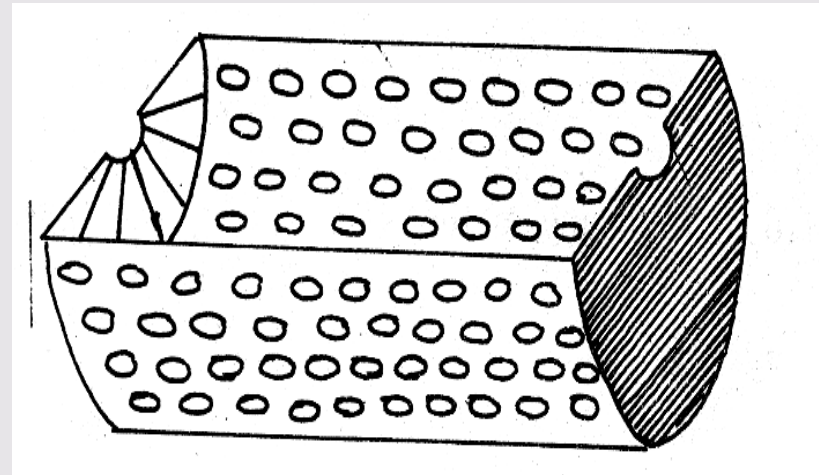
# Concave

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Opening with m. s bar/rod

**Concave  
perforation  
area/ kg of  
feed rate: 300-  
450 mm<sup>2</sup>**



**Grate type**

# Effect of concave setting

## Concave clearance

For most threshers clearances between peg-teeth and concave should not be more than 25mm.

**Smaller clearance increases grain damage and might lead to clogging of straw.**

**Wet crop: increase speed and reduce concave clearance**

**High drum speed also increase grain separation through concave**

**Larger concave clearances reduce threshing efficiency and grain damage.**

**Increase concave length, increases grain separation**



- **But increases seed damages & straw breakup particularly at high cylinder speed**
- **Crop hard to thresh needs longer concave**
- **Closed concave increases seed damage**



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# Performance of raspbar cylinder

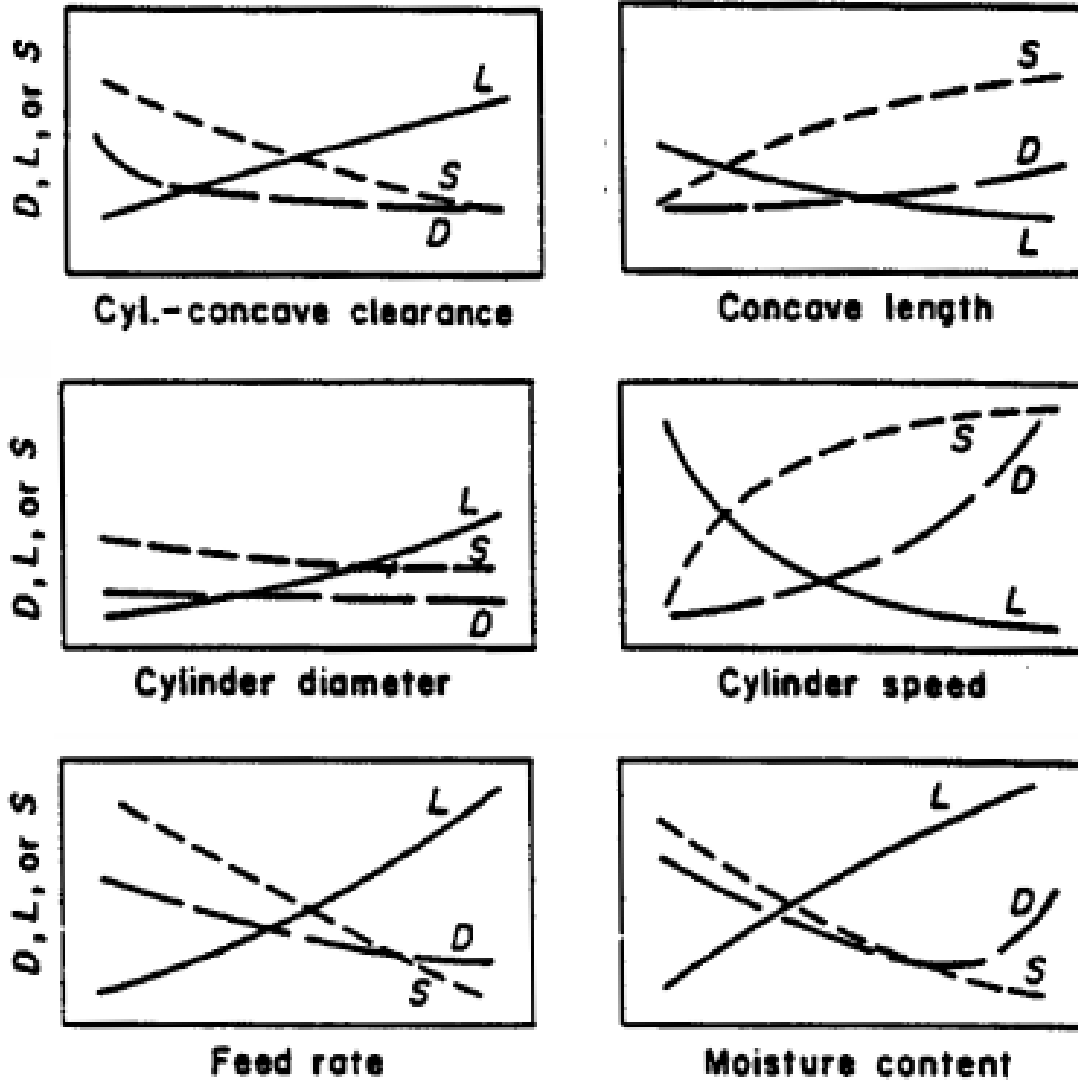


Figure 12.21 – Graphical characterization of some of the performance relations for a rasp-bar cylinder with an open-grate concave. L = cylinder loss; D = grain damage; and S = percent of grain separated through concave grate (Wieneke, 1964).

# Threshing efficiency



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## Depends on

Peripheral speed of threshing drum

Concave clearance

Number of times material passes through the concave

Moisture content

Feed rate

Type of crop

**Threshing efficiency:  $(1 - H/A) \times 100$**

H = wt of un-threshed grain, A = Total grain input

A = B + C + H = Total grain input

B = weight of threshed grain/unit time at main outlet

C = Weight of threshed grain /unit time collected at other outlets

H= Wt, of un-threshed grain

**% un-threshed grain :  $(H/A) \times 100$**



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# Threshing efficiency

**It increases asymptotically with concave length up to a certain point.**

**Increasing concave length beyond this point does not increase threshing efficiency and might even decrease it under certain conditions.**

**There is little advantage of increasing the concave length beyond 33 cm.**

**Increasing the diameter of the conventional threshing cylinder increases threshing losses at a rate of about 0.9% for each 7.5 cm increase in the diameter.**

**The number of rasp bars and their spacing do not seem to have any affect on the threshing efficiency.**





# Threshing efficiency

**Cylinder speed is one of the most important variables affecting threshing losses.**

**For hard-to thresh crops threshing losses can be significantly reduced by increasing the cylinder speed.**

**In one set of experiments increasing the speed from 23 to 33 m/s reduced cylinder losses from 8% to 4%. Means increased threshing efficiency**

**The cylinder-concave gap affects threshing losses adversely. An increase of 1/8 in. increased the unthreshed loss from 0.6% to 2.0%.**

**Changing the concave clearance ratio (the ratio of the gap at the front to that at the rear of the cylinder) is done to facilitate crop feeding into the cylinder, but the effect of this variable on the threshing efficiency is not consistent.**



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# Performance index

$$PI = C \left(1 - \frac{W_l}{W_i}\right) * E_t \left(1 - \frac{W_d}{W_i}\right)$$

PI = Performance index

C = Capacity of thresher

$W_l$  = weight of loss grain

$W_i$  = total grain input

$E_t$  = threshing efficiency

$W_d$  = Wt. Of damaged grain