



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3601 POST- HARVEST TECHNOLOGY

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AI3601 – POST-HARVEST TECHNOLOGY

UNIT V: CROP PROCESSING

CO5: To use different post-harvest operations and processing methods of harvested crops.

Dehusking of Paddy

Introduction to Dehusking

- Dehusking (also called shelling or hulling) is the process of removing the outer hard protective covering (husk or hull) from the paddy grain to obtain brown rice.
- The husk constitutes about 18–22% of the paddy weight.
- Dehusking is a critical operation because:
 - it must be done with minimal damage to the kernel (to maximize head rice yield).
 - the choice of method affects subsequent polishing and overall rice quality.
- No dehusking method is 100% efficient; some paddy remains unshelled and must be separated and returned for another pass.

Methods of Dehusking

There are three principal methods used for dehusking paddy:

- i) Centrifugal / Impact Dehusking
- ii) Disc / Under-runner Dehusking
- iii) Rubber Roll Dehusking

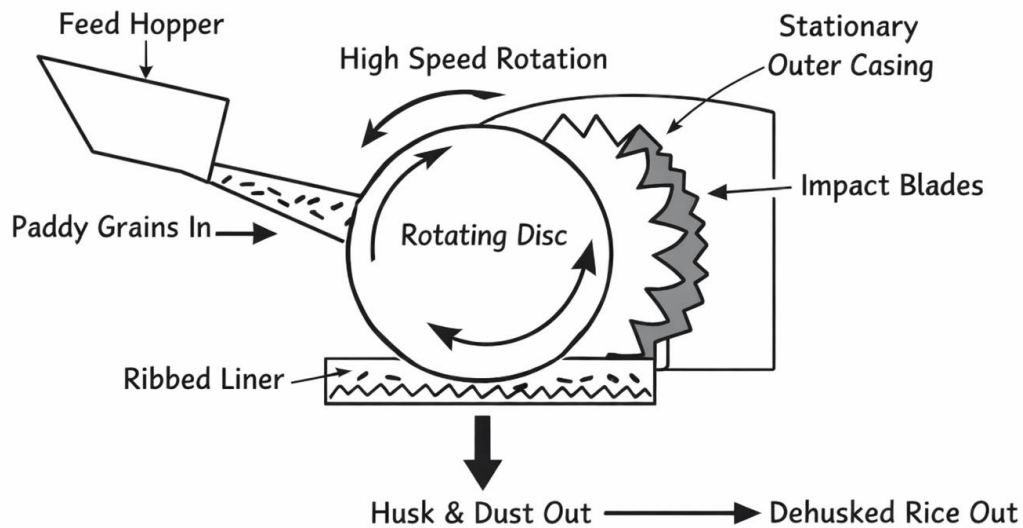
Method 1: Centrifugal / Impact Dehusking:

Working Principle:

- Paddy grains are fed into the centre of a high-speed rotor (impeller) rotating at 1200–1500 rpm.

- The grains are thrown outward by centrifugal force and strike against a stationary hard rubber or abrasive ring (impact ring) surrounding the rotor.
- The impact force cracks and removes the husk.

Centrifugal / Impact Dehusking of Paddy



Construction:

- Consists of a high-speed rotor with blades or fins.
- Surrounded by a stationary impact ring made of rubber or emery.
- Housing with feed inlet and outlet for brown rice and husk mixture.

Merits:

- Simple construction with few moving parts.
- Low maintenance cost.
- Compact design requiring less floor space.

Demerits:

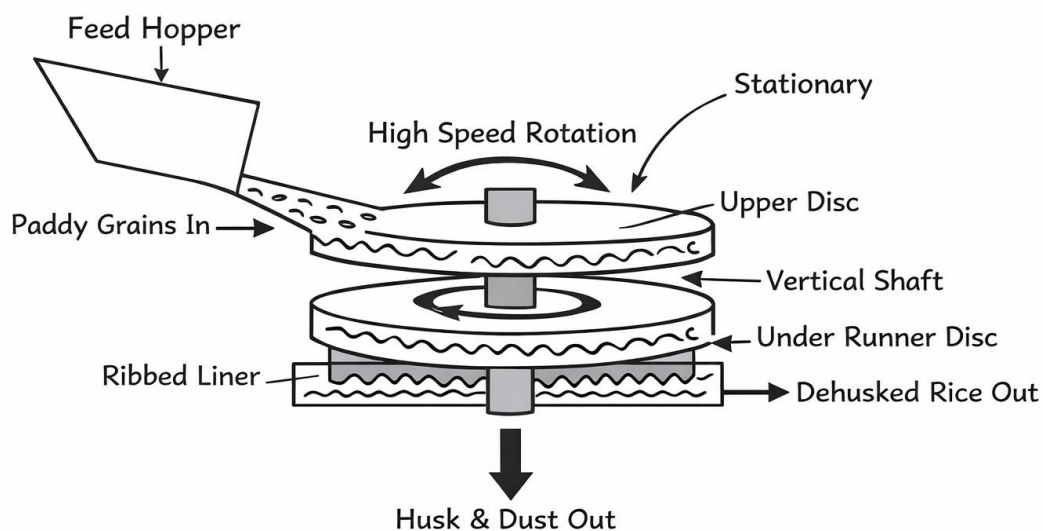
- **High grain damage:** Impact force can cause significant kernel breakage, especially in delicate or high-moisture paddy.
- **Lower head rice yield:** Not suitable for high-quality rice production.
- **Less control:** Limited adjustability for different paddy varieties.

- Largely obsolete in modern milling, replaced by rubber roll shellers.

Method 2: Disc / Under-runner Dehusking

Working principle

- Paddy passes between two vertical abrasive discs (emery-coated).
- One disc is stationary, and the other rotates (or both rotate in opposite directions).
- The abrasive action rubs off the husk as grains move from the centre to the periphery under centrifugal and frictional forces.



Construction

- Two vertical discs with abrasive surfaces.
- Adjustable clearance between discs.
- Feed hopper at the centre and discharge at the periphery.

Merits

- Suitable for a wide range of grain sizes.
- Can handle both dry and moderately moist paddy.
- Relatively robust and durable.

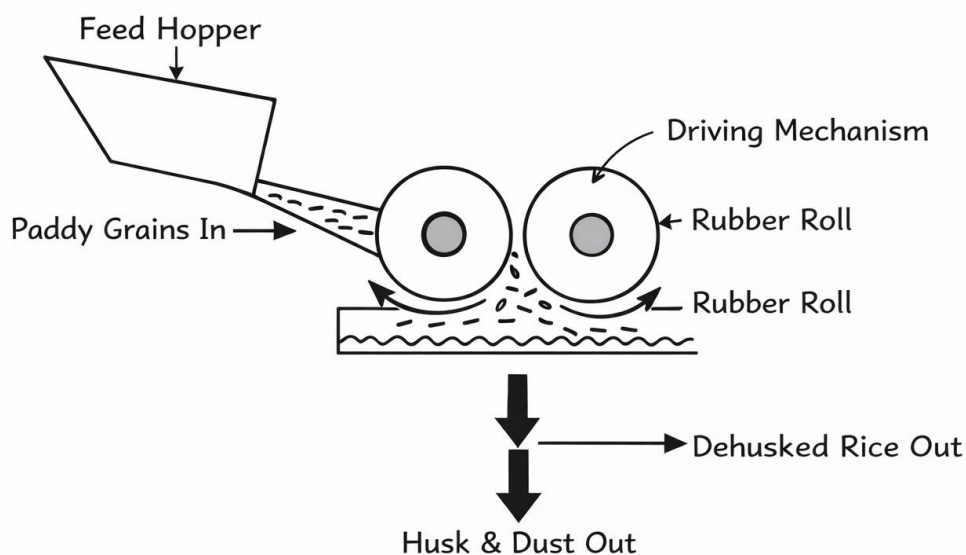
Demerits

- **High breakage:** Abrasive action can damage the bran and kernel, leading to lower head rice yield.
- **Heat generation:** Friction can heat the grain, potentially affecting quality.
- Higher power consumption compared to rubber roll shellers.
- Uneven wear of discs requires frequent maintenance.
- Largely replaced by rubber roll technology in modern mills.

Method 3: Rubber Roll Dehusking (Most Common)

Working principle

- Paddy grains pass between two counter-rotating rubber rolls rotating at different speeds.
- One roll rotates faster than the other (speed differential of 1.2:1 to 2.5:1).
- The differential speed creates a shearing action on the husk.
- Simultaneously, the rolls compress the grain.
- The combination of shear and compression removes the husk without excessive force on the kernel.



Construction

- Two parallel rubber rolls mounted horizontally.
- One roll is fixed; the other is adjustable to control clearance.

- Rolls are cooled by air or water to dissipate heat.
- Feed mechanism to ensure uniform grain flow across the roll width.
- Aspiration system to remove loose husk.

Merits

- **Gentle on grain:** Produces higher head rice yield (less breakage) compared to other methods.
- **Adjustable:** Clearance and speed differential can be optimized for different paddy varieties and moisture levels.
- **High efficiency:** Shelling efficiency of 85–95% in a single pass.
- **Low breakage:** Typically <1% grain damage when properly adjusted.
- Suitable for both raw and parboiled paddy.

Demerits

- **Rubber wear:** Rolls wear out over time and require periodic re-grooving or replacement (typically after 100–200 tons of paddy).
- **Heat sensitivity:** Prolonged use without cooling can generate heat, damaging rubber and affecting grain quality.
- **Moisture sensitivity:** Not suitable for very high-moisture paddy (above 18%) as it clogs and reduces efficiency.
- Higher initial cost than disc shellers.
- Requires skilled adjustment for optimal performance.

Factors Affecting Dehusking Performance:

Factor	Effect
Moisture Content	Optimum: 12–14% for rubber roll. Too high → clogging; too low → increased breakage.
Roll Speed Differential	Higher differential increases shear but may increase damage.
Roll Clearance (Nip)	Must be slightly less than grain thickness. Too tight → breakage; too loose → low efficiency.

Roll Hardness	Harder rolls last longer but may cause more damage. Softer rolls are gentler but wear faster.
Feed Rate	Uniform feeding across roll width ensures even wear and consistent efficiency.