MODERN RICE MILLING
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What is Rice Milling?

Rice milling is a process of removing the husk and the bran layers, and produce an edible, white rice kernel that is sufficiently milled and free of impurities.

Most rice varieties are composed of roughly 20% rice hull or husk, 11% bran layers, and 69% starchy endosperm, also referred to as the total milled rice.

In an ideal milling process this will result in 20% husk, 8–12% bran depending on the milling degree and 68–72% milled rice or white rice depending on the variety. Total milled rice contains whole grains or head rice, and brokens. The by-products in rice milling are rice hull, rice germ and bran layers, and fine brokens.

Terminologies commonly used in rice milling

**Rough rice:** It is also called paddy rice. It is dried to 18% moisture and consists the hull, bran and kernel.

**Brown rice:** It is also known as husked rice. It is the least processed form of rice with the husk removed. The bran layer gives the characteristic tan colour.

**Milled rice:** Commonly called white rice. This is the final milling

**Head rice:** Milled rice with length greater or equal to three quarters of the average length of the whole kernel. It is often expressed on a % paddy or rough rice basis (on 14% Moisture content basis)
Rice Milling Systems

A rice milling system can be a simple one or two step process, or a multi stage process.

- In a **one step milling process**, husk and bran removal are done in one pass and milled or white rice is produced directly out of paddy.

- In a **two step process**, removing husk and removing bran are done separately, and brown rice is produced as an intermediate product.

- In **multistage milling**, rice will undergo a number of different processing steps.

Depending on whether the paddy is milled in the village for local consumption or for the marketing, rice milling systems can be classified into two categories: (1) village rice mills and (2) commercial mills.

**Village rice mills**: Village-type rice mills can be found in rural communities and are used for service milling paddy of farmers for home consumption.

**Commercial rice mills**: The objectives of commercial rice milling are to produce edible rice that appeals to the customer. Rice that is sufficiently milled and free of husks, stones, and other non-grain materials and maximize the total milled rice recovery out of paddy and minimize grain breakage.
The Modern Rice Milling Process

1. Cleaning  
2. De husking or de hulling  
3. Whitening or polishing  
4. Grading  
5. Color Sorting
Rice Milling Process

**Step 1: Cleaning**

Cleaning equipment intended to remove foreign particles such as stones, immature grains, and other impurities from the input prior to the processing of the grains. Conventional cleaning methods often have high breakdown, immature grains are not removed while separating stones. They do not remove dust from the raw material and do not minimize wastage of paddy grains. Cleaning paddy prior to husking and whitening is crucial in attaining high milling recoveries.

Installing good cleaning machines, which have proper aspiration systems, will

- Make the rice mill look neat and hygienic
- Will save wastage of paddy along with stones
- Will minimize breakdowns
- Will increase the milling capacity
MILLTEC Cleaning Machinery

- Pre cleaner
- Classifier
- De stoner

Pre cleaner:

MILLTEC pre cleaner is of fully welded construction, rugged design, long lasting with inbuilt blower catering to the capacity from 2TPH to 20TPH. It has an inbuilt high-pressure blower for aspiration that enables the segregation of immature grains and removes up to 75% of immature grains during the cleaning process.

Classifier:
The inbuilt self-clean system ensures optimum efficiency during the production cycle. The machine is specifically designed and best fit for paddy, rice, dal and seeds. The machine also allows grading different sizes of a product.

De Stoner:

MILLTEC de stoner intended to facilitate the removal of stones, mud, and other foreign particles from input grains by separating impurities on the basis of their densities. These are designed to have a long operational life and are installed with closed circuit dust aspiration systems and lighting systems to enable easy viewing of the components of the equipment.
Rice Milling Process

Step2: De husking or de hulling

De-husking / Hulling is the process of removing the chaff (the outer husks) of rice grains. Conventional hulling machines have low shelling degree about 60 – 70%. These machine are not effective in separating paddy from brown rice and increase breakage of Rice. These conventional machines do not separate admixture of Rice and will have low Rubber Roll life.

Installing pneumatic type rubber shellers, super efficient paddy separators in de husking section of your rice mill

- Will increase the milling capacity at least by 5%
- Less recirculation of paddy and rice, will reduce breakage of rice
- Will enhance the rubber roll life & reduce expenses on consumables & down times
- Will remove admixtures like oversize rice kernels & removes immature grains at brown rice stage and thus enhancing not only the quality but also the milling capacity
MILLTEC De-husking / Hulling Machinery

1. **Pneumatic Sheller**
2. **Tray separators**
3. **Husk separator**

**Pneumatic Sheller**

MILLTEC Pneumatic Sheller is intended to facilitate the easy removal of husks from paddy grains. It is equipped with automatic systems that control the pressure exerted by the rollers, as well as the correct feed rate for the input grains. These are capable of removing husks with a 95% level of accuracy.

**Tray Separator**
MILLTEC Tray Separator is designed for high capacity inputs and enable our customers to efficiently separate brown rice from paddy. These can be customized by customers to suit their speed requirements and can provide three distinct types of desired output on the basis of the customer’s requirement.

**Husk separator**

Husk Separator is used to aspirate husk/light particles from the product stream. An inbuilt fan blows the air across the product stream to take away light weight particles.
Rice Milling Process:

Step 3: Whitening or polishing

The whitening and polishing process removes the bran from rice, making it consumable and delivers the finish suitable for market requirements. Millers using conventional polishers have always complained of low whiteness/glassiness, very high broken percentage and more maintenance / down times.

The solution lies in installing vertical whiteners and water jet (silky) polishers, which in turn

- Enhances whiteness, increase Head Rice Yield by reducing breakage drastically
- Enhance the appearance of rice kernels by imparting glossiness which fetch the rice millers a premium price
- Minimize breakdowns / down times
MILLTEC Whitening and Polishing Machinery

- Rice whitener
- Elite series rice whitener
- Silky polisher

**Rice whitener:**

**MILLTEC Rice Whitener** incorporates advanced techniques for whitening of brown rice. It uses the vertical abrasive grinding wheel and follows top to bottom working principle

**Elite series rice whitener:**

The elite series of whitener comes embedded with advanced technique of whitening of brown rice combined with ease of maintenance
Silky polisher:

MILLTEC Water Jet (Silky) Polisher machine is used for polishing the rice surface by spraying water through the mixing chamber and by creating friction among the rice grains using milling rollers.
Rice Milling Process:

Step 4: Grading

Grading of rice is done according to the size of the grain kernel (full, half or broken). Grading allows to achieve a better yield of good head rice and retain broken rice for further processing. Conventional rice mills, use screens to separate broken from head rice. The perforations often get clogged thereby broken are not separated from head rice effectively.

Use of thickness graders like sifters & length graders in rice grading section,

- Will effectively separate broken from head rice
- Also one can control the percentage of broken rice in head rice consistently
MILLTEC Grading Machinery

6. Rotary sifter
7. Length grader
8. Thickness grader

Rotary sifter:

MILLTEC offers a high capacity Rotary Sifter which can segregate input rice into different categories. The machine is specifically designed and best suited for rice.

Length grader:

MILLTEC Length Grader is widely used for the separation of broken rice from full rice and long rice. The machine is specifically designed to suit Basmati Rice, Raw Rice, Steam Rice, Parboiled Rice, and Boiled Rice.
MILLTEC Thickness Grader is used to separate different thickness grains in Brown rice/Polished rice. The material is processed through revolving cylindrical screens that are efficient for separating admixture of oversized or undersized grains.
Rice Milling Process:
Step 5: Color Sorting

Advanced color sorters using technology and lighting to remove impure grains from the input on the basis of their color, rather than on the basis of their length or weight. Color sorting machines are equipped with several features such as auto sorting control systems, image capturing systems capable of storing up to 200 profiles to enable our customers to alter settings to suit their specifications, and a quality ejector system to monitor the quality of the output. The usage of anodized chutes for the passage of input grains prevents the blockage of the system, ensuring the smooth flow of grain.

By installing color sorting machines, which are
- precise and integrated with level control systems,
- capacitive sensors,
- touch screen interface,
- cabinet cooling vertex systems

will increase the productivity and make sorting work quickly and efficiently. MILLTEC color sorter is accurate and efficient with an excellent sorting capability for all kinds of grains.
MILLTEC Color Sorting Machinery

- M1000 SERIES Color Sorter (Monochrome ReRe Sort)
- MR3000 SERIES Color Sorter (Monochrome ReRe/Rev Sort)
- MT5000 SERIES Color Sorter (Trichromatic)
- MV7000 SERIES Color Sorter (Multichromatic)

**M1000 SERIES Color Sorter (Monochrome ReRe Sort):**

- Double vision system (2048 pixel CCD cameras) allows checking on both sides, detecting even the slightest difference with 0.1mm resolution

**M1000 SERIES Color Sorter Features**

- Suitable for any type of Rice & Grains (Wheat, Dal) with ReRe Sorting Option.
- The electronic Hardware’s like FPGA & DSP latest Technology for interfacing & Controlling.
- Auto Calibration.
- Image Capturing & Ejection Analysis (Graph, Display).
- Double vision system (2048 pixel CCD cameras) allows checking on both sides, detecting even the slightest difference with 0.1mm resolution.
- Product Scanning Speed 13000 lines/sec.
- Lighting system: Programmable & Adjustable Brightness Blue or Red LED lighting system. Life Span 50,000 hrs.
- 0.8ms Speed of Solenoid valves, up to 1250 Ejections/sec. Life span for 8 billions of cycles (800 Crore Cycles). Individual Ejectors technology.
- 15” Touch Panel with Linux based Software system with 200 Programs possible to store.
- Chute Heater facility.

**MR3000 SERIES  Color Sorter (Monochrome ReRe/Rev Sort)**

Mono chromatic 2048 Pixel High Speed  CCD cameras for excellent scanning rate.

**MR3000 SERIES  Color Sorter Features**

Suitable for any type of Rice & Grains (Wheat, Dal) with Re Re Sort, Reverse Sorting option.

- The electronic Hardware’s like FPGA & DSP latest Technology for interfacing & Controlling.
- Auto Calibration.
- Image Capturing & Ejection Analysis (Graph, Display).
- Double vision system (2048 pixel CCD cameras) allows checking on both sides, detecting even the slightest difference with 0.1mm resolution.
- Product Scanning Speed 15000 lines/sec.
- Lighting system: Programmable & Adjustable Brightness Blue or Red LED lighting system. Life Span 50,000 hrs.
- 0.8ms Speed of Solenoid valves, up to 1250 Ejections/sec. Life span for 8 billions of cycles (800 Crore Cycles). Individual Ejectors technology.
- 15” Touch Panel with Linux based Software system with 200 Programs possible to store.
- Sorter Can be Controlled by Android Mobile through Wi-Fi Technology.
- Innovative Centralised Cloud system for machine Health check-up using Sim card.
• Reverse Sorting and Size Sorting technology.
• Chute Heater facility.

**MT5000 SERIES Color Sorter (Trichromatic)**

0.8ms Speed of Solenoid valves, up to 1250 cycles/sec. Life span for 8 billions of cycles (800 Crore Cycles). Individual Ejectors technology

**MT5000 SERIES Color Sorter Features**

• DIGITAL IMAGE SORTING TECHNOLOGY.
• The True Trichromatic Sorter for suitable Rice, Pulses and less than 5mm Grains
• We can select Good & bad based on image we can sort effectively.
• Double vision system (6144 pixel RGB CCD cameras) allows checking on both sides, detecting even the slightest difference with 0.01 mm resolution.
• Product Scanning Speed 20000 lines/sec.
• Sorter Can be Controlled by Android Mobile through Wi-Fi Technology.
• Innovative Centralised Cloud system for machine Health check-up using Sim card.
• Reverse Sorting & Size Sorting technology.
• Lighting system: Programmable White & Blue LED lighting system. Life Span 50,000 hrs. Suitable for Multi Products Sorting.
• 0.8ms Speed of Solenoid valves, up to 1250 cycles/sec. Life span for 8 billions of cycles (800 Crore Cycles). Individual Ejectors technology.
• 15” Touch Panel with Linux based Software system with 200 Programs possible to store.
• Chute Heater facility.
MV7000 SERIES  Color Sorter (Multichromatic)

Auto intelligent digital image sorting technology. Maglev tech based 0.8ms Speed of Solenoid valves, up to 1250 cycles/sec. Life span for 10 billions of cycles (1000 Crore Cycles)

MV7000 SERIES  Color Sorter Features

- AUTO INTELIGENT DIGITAL IMAGE SORTING TECHNOLOGY.
- The True Trichromatic Sorter for suitable Rice, Pulses and less than 5mm Grains.
- Double vision system (16200 pixel RGB CCD cameras) allows checking on both sides, detecting even the slightest difference with 0.01 mm resolution.
- Product Scanning Speed 30000 lines/sec.
- We can select Good & bad based on image we can sort effectively.
- Real time Analysis of Impurity & Capacity (Online).
- Sorter Can be Controlled by Android Mobile through Wi-Fi Technology.
- Innovative Centralised Cloud system for machine Health check-up using Sim card.
- Reverse Sorting, Shape & Size Sorting technology.
- Maglev tech based 0.8ms Speed of Solenoid valves, up to 1250 cycles/sec. Life span for 10 billions of cycles (1000 Crore Cycles). Individual Ejectors technology.
- 15” Touch Panel with Linux based Software system with 200 Programs possible to store.
- Chute Heater facility.
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Our Services
Rice Milling Solutions
Parboiling & Dryer
Yield Management System
Silica Extraction
Co – Generation Plants
Whitening & Polishing
Sorting & Grading Plants

Our Products
Packaged Boiler
Parboiling & Dryer
Raw Paddy Dryer
Dal Dryer
Pre Cleaner
Flow Balancer / Measurer
De Stoner
Pneumatic Sheller
Tray Separator
Thickness Grader
Water Jet Polisher
Pearler / Polisher
Rotary Sifter
Length Grader
Color Sorter
Packing Machine

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References:
https://en.wikipedia.org/wiki/Rice
http://www.knowledgebank.irri.org/training/fact-sheets/postharvest-management/item/modern-rice-milling-fact-sheet
https://www.researchgate.net/figure/Flow-chart-for-rice-milling_fig1_51171771