Program 11R-2

Compact Mill For The Producer Or Small Mill Operation

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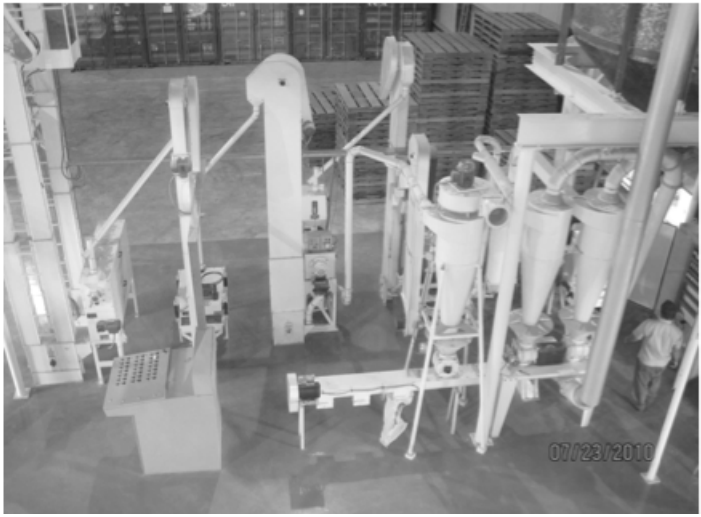
Objectives

Mills are using the compact systems for small or specialty lots that are not appropriate to run through a large production line. It is possible to obtain an economical, easy to operate rice mill, and the Farm-to-Fork(1) revolution has given producers the ability to enjoy the profits otherwise surrendered to middle men that reap the rewards of the harvest.

Consumers are paying a premium for high quality rice and food products that they can be assured are produced in the local area. Local production offers food security for a region, food safety in being able to identify the origin of the identity preserved varieties, support of local business enterprises, and reliably fresh, good tasting food for our families.

The traditional trend in the US is to produce large volumes (cwt. or lbs. per hour) of milled brown and white rice to reduce the cost of production. Rice of different varieties and origins are blended and the overall appearance, cooking qualities and taste, have been diluted for the sake of a low cost bag of rice in the supermarket.

Consequently, meals in the US market featuring rice as a component are limited.

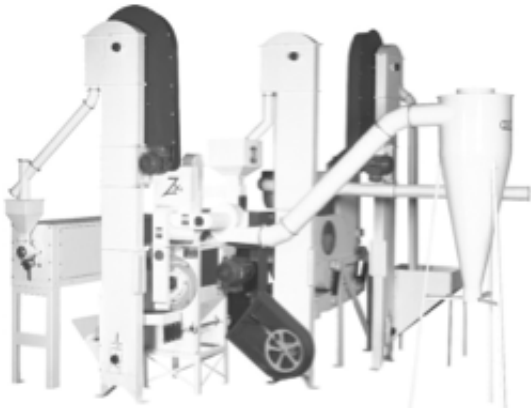


It is possible for an independent producer, and many of them exist today, to own a rice mill with a minimum investment in equipment and labor input. Zaccaria offer four sizes of pre-engineered compact mills that are complete and delivered ready to assemble. Additional accessory items such as rice enrichment applicators, color sorters, metal separators, by-product handling, and packaging equipment are available to suit your individual requirements.

Economical

Cost of the basic equipment package (after paddy input and before packaging)

Compact Mills	Budget Cost (FOB factory)
ZX-3 572 lbs./hour	$ 16,000.00
ZX-6 1133 lbs./hour	19,000.00
ZX-25 2750 lbs./hour	74,000.00
ZX-50 5720 lbs./hour	130,000.00

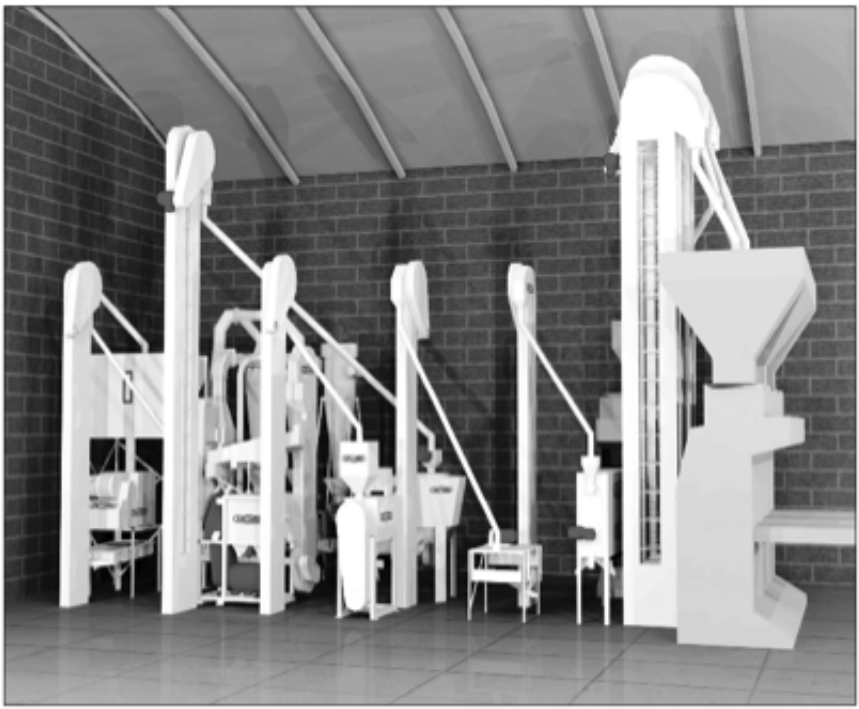


ZX-3 System

High Quality Final Product
High Head Rice Yield
Can produce white or brown rice
Can produce medium, short grain as well aromatic varieties
Easy to Operate with one person
Easy to Maintain

Space Requirements

The mill can be situated in a space as small as 7' x 13' x 10' tall (ZX-3)

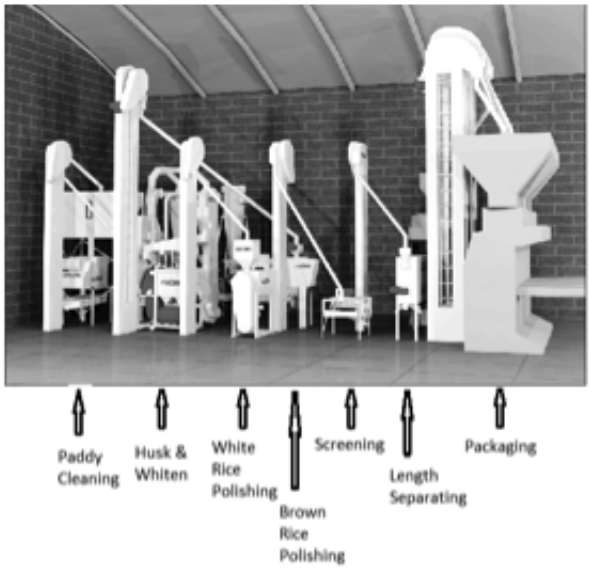


ZX-25 System (packaging equipment illustrated as the brown figures on the right)

The yields (percentage of whole kernels as finished product) are comparable to and the kernel finish can be as good or greater than a full, modern production mill. Considering the low cost investment, ease of operation, minimum personnel, flexibility in producing brown rice to "top quality" milled rice, and technical support from Dallas, Texas, the time may be right to consider a mill for every region of the rice production area. Those who enter the market first have the greatest opprortunity to establish a loyal following and brand recognition.

Independent millers can produce bulk rice products for others to package or invest in packaging and marketing, to gain brand recognition and greater profit opportunities.

Component Illustration



Options Available
Paddy Day Bin
Color Sorter
White Rice Enhancement Application Equipment
Jumbo Bag Weighing and Filling
Sew Bag, 20-100 lb., weighing and sewing
Small package filling (such as 1 or 2 lb. "pillow")
Motor Controls
Plant Automation
Paddy Milling Equipment for Small Samples

Notes: (1) **Farm-to-table** (or **farm-to-fork**) refers to the stages of the production of food: harvesting, storage, processing, packaging, sales, and consumption.] Farm-to-table also refers to a movement concerned with producing food locally and delivering that food to local consumers. Linked to the local food movement, the movement is promoted by some in the agriculture, food service, and restaurant communities. It may also be associated with organic farming initiatives, sustainable agriculture, and community-supported agriculture. Wikipedia; 7 October, 2014.

Upgrading The Antiquated Test Standards For Sampling Paddy Rice

Objective

White rice milling technology has evolved significantly over the decades while sample testing has not keep pace and does not offer the rice producers a fair evaluation of their paddy rice potential for meeting market requirements.

It is our position that the testing method should be performed in a way comparable with actual milling techniques and the final product evaluated to match consumer quality demands.

Background

A rice mill uses four basic techniques to determine whether rice is suitable for market sales;

1. Husking – removal of the kernel hull using rubber rolls.
2. Whitening/Polishing – using an abrasive stone for bran removal and kernel finishing.
3. Length separation – accurately controlling the percentage of broken kernels in milled (white) rice.
4. Whiteness meter – to determine the extent of bran removal.

HUSKING

Mills and some buying station utilize a simple rubber roll machine for husk removal, such as the unit illustrated below which is acceptable:

Unfortunately, some buyers are using the McGill style unit to hull and whiten in our opinion is unacceptable because it causes excessive broken kernels and a poor final finish on the whole (3/4 – 4/4) rice kernels.

WHITENING BY THE CURRENT McGILL METHOD

The McGill technology, endorsed by the USDA, uses rotary knives to remove the bran layers and relies on a counter weight and the time which brown rice remains in the machine to remove bran layers. The machine needs to be warmed up, by running a trial sample(s), so the initial hulling result is acceptable. After running samples the machine heats up and should be allowed to cool down to avoid excessive kernel breakage. It lacks aspiration so the machine operation is dirty and bran particles that adhere to the kernel are not extracted, making a "degree of milling evaluation" more difficult. Dependence on a "trained, seasoned, unbiased operator can be minimized.

BROKEN KERNEL SEPARATION

The unit method of measuring the percentage of brokens is especially crude and unpopular with test personnel:

The "shaker table" uses a sheet with holes mounted over a solid plate that can hold broken kernels. The hole perforation selected and the time the product is left vibrating in the machine determines the number of broken kernels that are retained as the whole kernels pass over the screens. The inaccuracy of this method is demonstrated by the independent evaluation conducted by trained industry professions in Stuttgart, AR in June 2014.

Sample	% Brokens Hand Picked	Zaccaria	*Hand Pick*	Shaker Table	*Hand Pick*
A	20.6%	20.7%	*0.1%*	14.7%	*-5.9%*
B	2.8%	2.8%	*0.0%*	1.7%	*-1.1%*
C	21.4%	20.2%	*-1.2%*	11.6%	*-9.8%*
D	3.3%	4.1%	*0.8%*	2.0%	*-1.3%*
E	2.6%	2.7%	*0.1%*	1.2%	*-1.4%*
F	19.5%	19.8%	*0.3%*	10.0%	*-9.5%*
G	15.6%	15.1%	*-0.5%*	7.6%	*-8.0%*
H	2.5%	3.3%	*0.8%*	1.4%	*-1.1%*
I	3.3%	5.3%	*2.0%*	1.9%	*-1.4%*
J	23.3%	24.5%	*1.2%*	17.9%	*-5.4%*
K	4.0%	3.9%	*-0.1%*	3.9%	*-0.1%*
Average Difference			*0.3%*		*-4.1%*
St. Dev.			*0.009*		*0.037*

These results indicate the degree of error present and those using the shaker table should immediately abandon it. The machine is inconsistent, and has an unreasonable percentage of whole head rice kernels end up in the waste and brokens in the head rice.

PAZ System

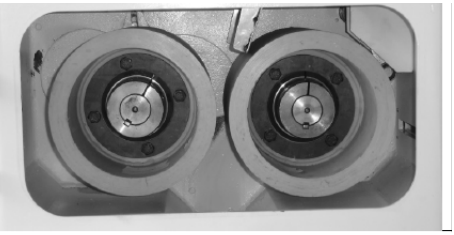
The best commercial alternative that has been tested and is in use by mills, rice research stations, rice seed companies, and others offers the closest replication of commercial milling techniques to produce a white rice product that is comparable to consumer rice standards.

The system is easy to use, and the controls are calibrated for easy replication between operators and among the full range of long, medium, short grain varieties.

The PAZ system, either the 100 gram or 500 gram (prototype stage) unit, offers a precision feed mechanism so the rubber roll husking process is standardized and allows the operators to consistently and uniformly remove the hull with minimum kernel breakage.

Stage One – Husk Removal

PAZ husker mechanism



Commercial mill rubber roll system

Stage Two – Bran Removal

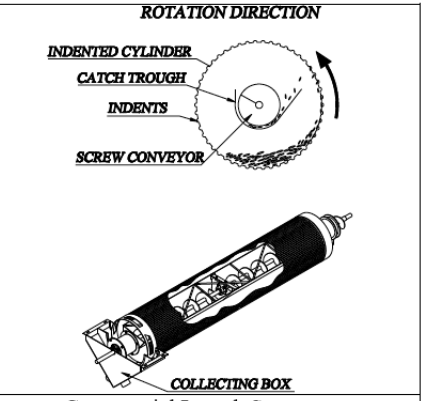
Whitening/Polishing is done with an abrasive stone housed in a perforated screen enclosure with a rubber brake to regulate mill stone pressure to facilitate precise control over how much bran is removed while minimizing the percentage of broken kernels and retaining kernel tips (representing about 10% of the average whole kernel weight).

Fine, calibrated adjustment of the pressure exerted to the kernels and the retention time in the whitening chamber will allow the operators to reliably replicate the precise degree of whiteness (bran layer removal).

Stage Three – Kernel Length Separation

The length separator is the same indented cylinder technology used in a modern commercial mill that allows quick and easy cylinder change for different varieties, is self-cleaning, and consumes a minimum counter space area.

PAZ Length Separator



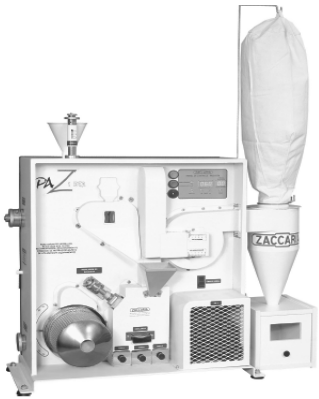
Commercial Length Separator

The PAZ has calibrated controls so the operators can consistently achieve the required milling standards, and variances between operators is minimized. The adjustable timer means the single operator does not have to stand by the machine constantly, and the cycle counter records the number of samples taken.

A greater number of samples can be managed. The sample testing cycle for the PAZ-100 system is as low as 60 seconds while the McGill system requires more than 4 minutes.

The PAZ system is clean, quiet, and safe for a laboratory setting atmosphere and requires very low power consumption.

The aspiration system provided allows for easy collection and disposal of the husk and bran while keeping the work environment clean. The PAZ produces white rice that has a much lower degree of bran that adheres to the kernel after polishing.



Model PAZ 1 (100 gram) All-in-One

PAZ 500 (gram) Husking Unit

PAZ 500 (gram) Polishing Unit

PAZ 500 (gram) Length Separation Unit

The controls on the PAZ 500 are simplified and offers the operator a number of advantages with new electronic control technology.

MBZ Whiteness Meters

Use of the whiteness meter for testing paddy sample milling gives us the opportunity to standardize testing throughout the industry. The percentage of broken kernels, while achieving the necessary degree of bran removal, can be done without subjective human intervention. In Brazil, where the producer/miller relationship is more conciliatory/appeasing, the farmers own their own set of PAZ sample milling unit and MBZ whiteness meters. Brazil produced 1,000,000 more metric tons (2,205,000,000 lbs.)

MBZ-2 Stationary Unit

The desktop whiteness meter will now allow the operator to easily, quickly evaluate the whiteness reading, transparency and polish (how effectively scratch marks are removed and ensure loose bran is removed, to give a smooth finish and enhance the appearance of the final product).

An accurate whiteness reading will verify the degree of milling and dictate any calibration/adjustments that are warranted on the milling equipment to maintain consistent results. The subjective judgment of the operator, for reasonably well, well, or hard milled, has been eliminated.

MBZ-2 Portable Unit

The portable whiteness meter will now allow the operator to easily, quickly take whiteness reading and verify the degree of milling and dictate any calibration/adjustments that are warranted to maintain consistent results by taking the instrument to the source. It is certainly the right machine when all the operator wants to measure is whiteness. The subjective judgment of the operator has been taken eliminated.

Measuring whiteness in the mill operation allows us to optimize each milling machine so we can better obtain uniformity in milling each kernel and optimizing the performance of each machine in the process. The result will be a better final product while reducing brokens to the absolute minimum (maximizing profits). The following chart represents a study using mill equipment technology and indicates the dramatic increase in the percentage of brokens at artificially higher whiteness values. Our field tests have found the average supermarket premium white rice product sold has an average whiteness value of 42. Note the percentage of broken kernels more than doubles between 40.9 and 45.7 whiteness value.

NOTE: Below Addendum B WHITENESS RELATIONSHIP WITH BROKENS AND WEIGHT.

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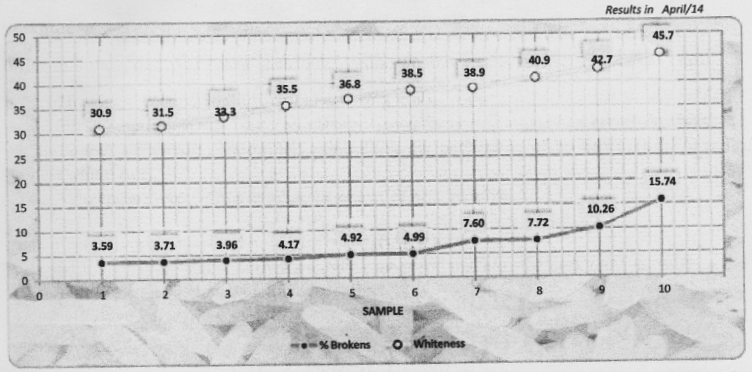
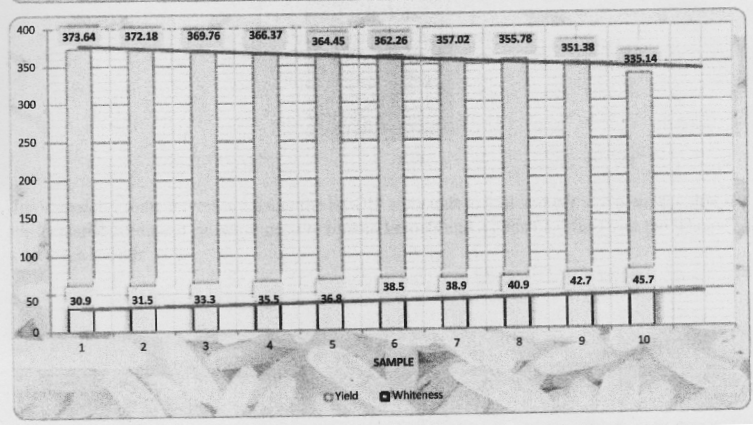
WHITENESS RELATIONSHIP WITH BROKENS AND WEIGH LOSS

Sample						
Brown Rice	*White*	Head rice				
400 g	Output	Whole Grains	% Brokens	Whiteness	Transparency	Polishing
1	373.64	359.77	3.59	30.9	2.23	51
2	372.18	358.81	3.71	31.5	2.35	55
3	369.76	355.13	3.96	33.3	2.68	64
4	366.37	351.1	4.17	35.5	2.91	75
5	364.45	346.52	4.92	36.8	2.96	81
6	362.26	344.19	4.99	38.5	3.03	89
7	357.02	329.9	7.60	38.9	3.14	92
8	355.78	328.32	7.72	40.9	3.30	101
9	351.38	315.33	10.26	42.7	3.34	110
10	335.14	282.40	15.74	45.7	3.64	124





Conclusion

The use of the PAZ laboratory rice mill and the MBZ whiteness meter will offer consistent, verifiable results for a wide variety of operators and test locations. The dispute over head rice yield and the duplication of sample testing can be eliminated. The entire process can be sped up and the operators can work in a safe, clean, and quiet environment.