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Rice millers

How analysing equipment should be used to increase profit

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This article explains how rice millers can effectively take advantage of laboratory analysing equipment or apparatus, such as the Milling Meter MM1D, one of the most basic and important pieces of analysing equipment, which will be described in detail later.

Satake strongly believes that smart application of analysing equipment can contribute to improving profit in the milling industry. Unfortunately, Satake has seen too many rice mills wherein analysing equipment were routinely operated incorrectly. Some rice milling facilities do not even possess any analysing tools. In these rice mills, milling machine adjustment can only be done with operators' knowledge and skills acquired from experience.

Furthermore, milling datas including incoming raw materials and final products' conditionss are often not captured quantitatively as well. Satake would like to propose a potentially lucrative procedure, based on collecting pertinent data from analysing equipment, for competitive advantages.

Satake analysing equipment

First and foremost, rice millers need to recognise the benefits of using analysing equipment. Laboratory equipment is not just tools to measure indices, provided on a QC checklist as routine work, it is directly connected to profit and could be considered a lucrative strategy. Sharing this point of view among managers and operators is the first step towards an effective implementation of analysing equipment. MM1D, for example, measures whiteness/milling degree, but also provides a tool to manage and help achieve a more profitable operation.

MM1D can measure whiteness/milling degree simultaneously for both brown and white rice. The range of whiteness degree is 0-100, where 0 is jet-black and 100 is as white as oxidised magnesium powder. It can determine the rice degree of whiteness. In Japan, whiteness degrees of brown and white rice are approximately 20 and 40 respectively. Please note, whiteness degree fluctuates with rice varieties and grain conditions.

On the other hand, milling degree range is 0 for brown rice and 100 for white rice, with all bran layer and germ removed completely, but leaving starch inside the grains untouched. The milling degree is derived from the measurement of both reflected light from rice and transparent light going through it.

Using a mathematical formula, a curve can be generated to show the relationship between whiteness and milling. It also provides the calculated milling degree that indicates how well the rice is milled.

The following is a summary of what needs to be considered when using a milling meter effectively. 1) Depending on varieties, there are high-low whiteness degree intrinsic tendencies. For example, the best whiteness degree for a certain variety A is 40, while for variety B it could be 38. Therefore, it is not appropriate to determine milling target in terms of whiteness degree, without considering the variety characteristics

2) After scratching (milling) the surface of brown rice, actual milling ratio can be measured, based on the weight of bran removed, directly proportional to whiteness degree. Once scratch encroaches on starch, whiteness degree rate-of-increase dwindles

3) If a starch layer is removed, rice will absorb excessive water,

Figure 1

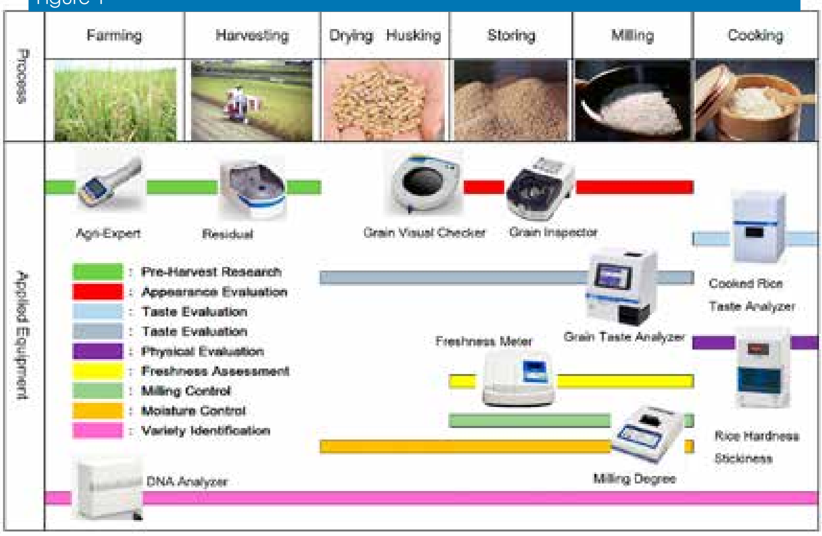


Figure 2

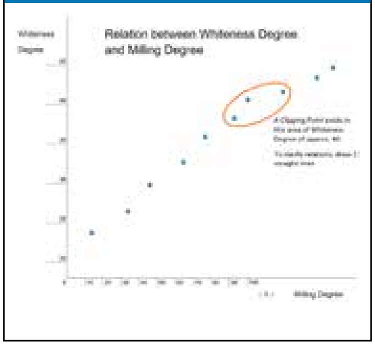
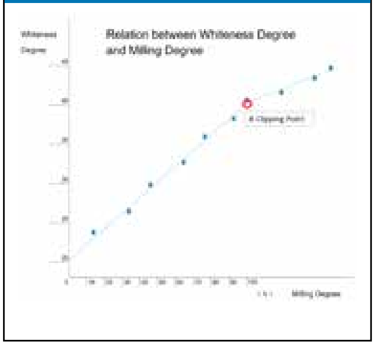


Figure 3



resulting in gooey texture affecting taste, because of starch diffusion into water during cooking

It is highly recommended to check (2) manually, if a friction type laboratory mill and a whiteness meter are accessible. First, prepare brown rice and put it gradually into the mill without any load. Measure periodically removed bran weight and whiteness degree. Then, plot all points from test results (see figure two). The dots illustrate a decrease in whiteness gradient when the whiteness degree is equal or exceeds approximately 40.

Once the dots are connected, you will realize that there will be two lines, with the first line starting from brown rice, which can be expressed in one straight line until a certain point, which shows that weight of rice is directly proportional to whiteness degree, and the second straight line with lower gradient once whiteness hits 40 (see figure three).

Apparently, the whiteness degree and actual milling degree have a linear relationship, in the early stage of milling. Once the milling process crosses over the border to the starch layer, the gradient starts to taper off. In other words, at this point, which is also called the clipping point, when rice milling reaches the starch layer, the rate-of-increase in whiteness is lower compared to an earlier stage of the milling process.

The clipping point would be the target for rice milling, since this is the point where maximum quantity of bran is removed and no starch is damaged. Ideally, if the clipping point is a known parameter, it would be the ultimate target for the milling process. By using the MM1D readings properly, we could avoid excess milling and produce consistent high-quality tasty rice, which will enhance the mill's profitability.

For many rice millers in China and Korea, the priority in rice milling operation is the finished rice appearance because it attracts consumers' attention. They value whiter rice over taste and quality. Many consumers are unknowingly purchasing potentially good rice but with inferior milled quality. Does it truly benefit the industry and the market?

As Japan experienced in the past, excessively polished and whiter rice will eventually be taken out by true quality rice with a superior taste. The market demand will eventually shift from whiter appearance to a more tasty and high-quality rice. Soon, current operation will no longer be effective, and profitability of the industry will suffer.

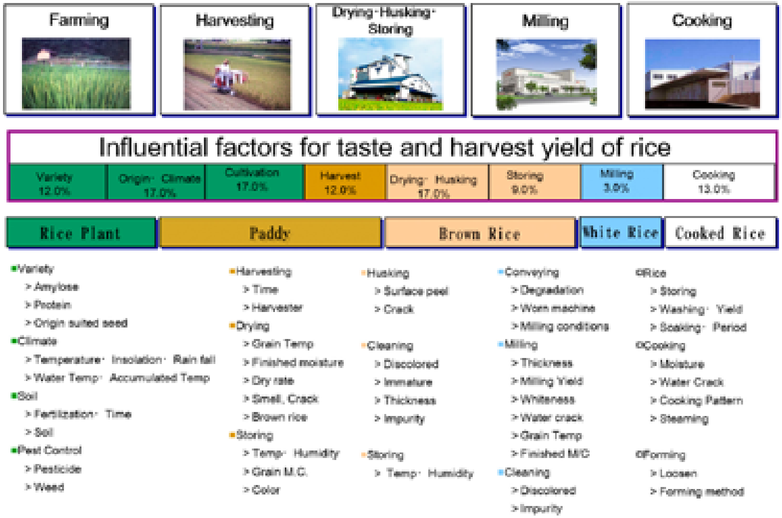
Only mills equipped with proper scientific milling operation management will be able to respond effectively to the market demand. The industry may also see additional benefits, such as easier milling operations and product quality control, to allow a more consistent production. Operation relying heavily on millers' experience can be significantly improved by scientific control and monitoring by using data from the laboratory equipment. The data will also show the variety and daily production lot differences, to help maintain the quality of their product.

Satake manufactures not only drying, milling, sorting and other post-harvest grain processing machines, but also pre-harvest analysing equipment and post milling machines, such as industrial cooker systems. The analysing equipment made it possible to operate processing machines under various processing conditions and raw materials with different characteristics.

History shows that processing machines were always developed in conjunction with laboratory equipment. For example, in many countries, dryers are being manufactured to dry paddy, however, uneven and unstable drying was a common problem. A few decades ago, Satake, by using single kernel moisture meters, solved the problem and can now supply dryers with minimum moisture content deviations.

Reasons why Satake believes in the importance of the 'pre' and 'post' harvest processes of rice is because it is detrimental to the production of consistent tasty quality rice. We are aware that we need to consider not only drying, husking and milling processes, but also all the other processes, from paddy seed to cooked rice. The following information shows important factors in each process and their influence on taste.

Figure 4



Indices for tasty rice production

The factors considered in various interactions can determine final taste. One mis-handled step in a process may degrade the latent taste of rice. Seeking the best efficiency in one section does not necessarily lead to the best in the overall process. For instance, if farmers, in order to achieve maximum profit, delay harvest to obtain larger crops, it would actually increase the amount of cracked paddy and lead to potentially unsatisfactory and tasteless rice afterwards.

In order to achieve the best quality in both technical and commercial terms, the parties involved in each individual process must know and understand the entire product flow from farmers to consumers.

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