There's too much starch in that bran!

The detection of residual starch in bran

by Thomas Ziolko, Bühler AG

Too much residual starch in bran means foregoing profit for millers. Bühler offers two ways out of the 'residual starch dead end' with its online measuring technology: the NIR Multi Online Analyzer MYRG or the Online Color and Speck Measurement MYHB. Both methods measure and report an increase in residual starch without loss of time making prompt correction possible.

In the grain milling industry the term extraction rate describes the amount of flour that can be made from 100 kg of grain. In modern milling operations, yield calculators continually monitor production and determine the degree of extraction. The goal of every miller when producing white, low-ash flour is to separate as much of the endosperm from the husk (bran) as possible. Bran is considered a by-product in milling and can be used as an additive for feed or sold as it is.

Optimum extraction rate

Flour particles that stick to the bran as residual starch in the separation process are considered a loss by the miller. The higher the extraction rate, the higher the yield and thus also the miller's profit.

However, it should be noted that as the extraction rate increases, more edge and husk particles are released from the grain along with the flour starch. With a higher extraction rate, the flour becomes darker and has higher ash content. Millers will do everything they can to achieve the optimal extraction rate based on the desired type of flour and customer requirements. This includes trying to avoid too high of a residual starch content in the bran which means lower yields.

Of course, other parameters that influence the baking properties must also be taken into consideration.

Polarimetric determination

But how can the miller determine whether 'his' bran has too much residual starch?

An initial indication is that yield drops or the ash content in the flour is low. If the miller determines this is true, he can use polarimetric starch determination according to Ewers (ISO 105020:1997) in the lab to determine the residual starch content in the bran. This method dissolves the raw starch in the test sample in hot, diluted hydrochloric acid.

After precipitation of the spurious substances, the optical rotation of the raw starch solution is polarimetrically measured and the starch content is calculated based on the rotation angle.

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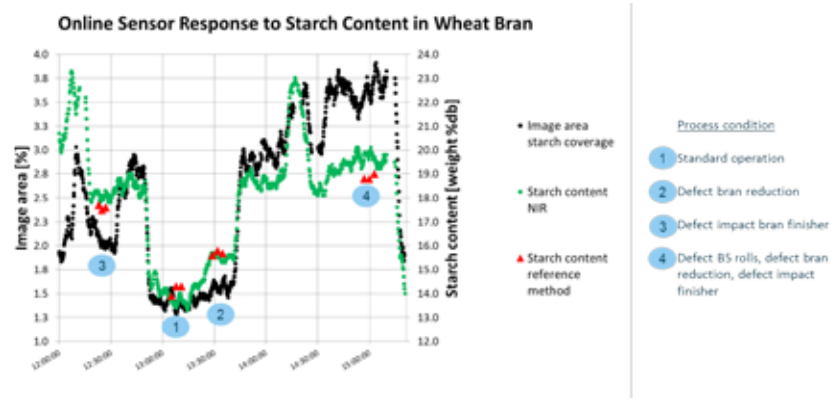
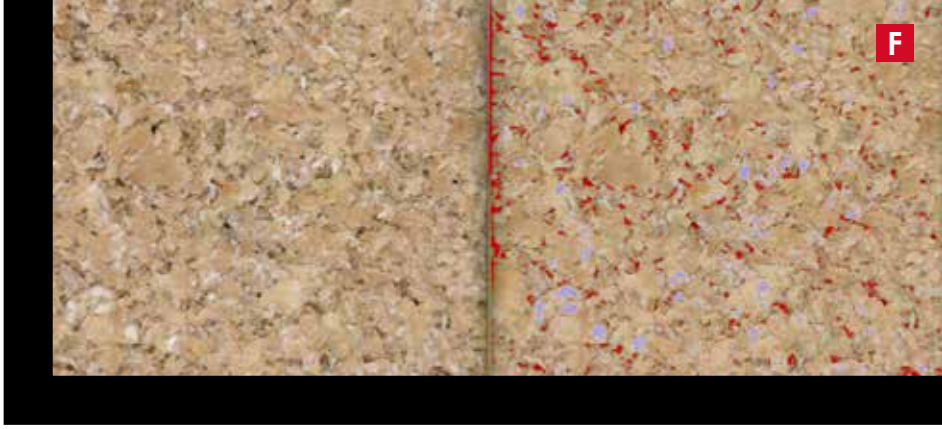
This is an old method and has its pitfalls: A conventional value results because other optically active carbohydrates (particularly water soluble ones) can be detected as well. It is also time-consuming and requires chemicals, which is why very few millers use this method regularly. Sometimes the samples are sent to an external laboratory.

The reverse way is also a possibility: The ash in the bran is

Modification of the processes in grinding with influence on the starch content of the bran





measured. Most millers simply eyeball whether there is too much starch in the bran - the lighter it is, the more residual starch it contains.

Changing the grinding gap

What should the miller do when he determines that there is too much residual starch in the bran? An immediate measure is to check the back passages in the grinding process and see if the rollers are too high and thus the grinding gap too large. If that is not the case, the overall settings for the passes are not right.

For instance, if the grinding gap in the front passes is too big, then the back passages are overloaded. They will not be able to loosen the remaining residual starch. In this case, checking the overall settings of all roller mills becomes inevitable.

Online measurement technology

Bühler offers two ways out of the 'residual starch dead end' with its online measurement technology: the NIR Multi Online Analyzer MYRG or the online color and specks measurement MYHB. Both online methods are suitable for determining the residual starch in bran. The quantitative NIR method aims for a high degree of conformity with the official reference method ISO 105020:1997. Its use is particularly recommended if a NIR Multi Online Analyzer MYRG is already present in the mill.

In this case, an additional NIR sensor is sufficient. The color and specks measurement MYHB is used when there is no MYRG system available. It can be a cost-effective alternative to qualitative monitoring of the bran.

Calculation example

How much can the yield be increased if the residual starch in the bran is permanently monitored online?

Statistics show: For a well-managed mill, yields can be increased by about 0.5 percent. For a poorly managed mill, improvements in yield can be up to three percent.

What does that mean from a financial point of view?

Let's assume that the mixing bran has a residual starch of 19 percent. With proper intervention, this can be reduced to 16 percent. The three percent residual starch recouped corresponds to a total yield of 0.66 percent at a bran yield of 22 percent.

If a ton of wheat is ground, the final measurement is an additional 6.6 kilograms. These 6.6 kilograms, as part of the bran, have a value of 0.60 euros but, as flour, it can be sold for 2.64 euros. The difference for the miller is 2.04 euros per ton. If the mill capacity is 220 t/24 hrs., that is an additional revenue of 450 euros per day or EU€160,000 per year.

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