



Adjusting the break system

Break extraction is dependent on the ideal break release schedule

by Mark Fowler



Maximizing the extraction of high-quality flour to create the optimum consumer product has long been the primary objective of the flour miller. Fine tuning the flow of wheat through the mill requires skill and a good understanding of how to optimize the separation of bran from the endosperm. The break system refers to the first passages in a mill diagram.

These passages open wheat kernels and separate the bran from the endosperm. Maximizing the extraction of endosperm from the bran is critical to maximizing flour production. Finished product quality and consistency is dependent on following a pre-determined break release schedule from

first break through to the end of the break system. The importance of measuring break release to balance the mass flow of product through the milling system is well understood by a trained miller.

The question of “How do you determine the optimal break release for the mill?” has been asked numerous times by young millers just starting out to the most seasoned millers questioning if it is possible to improve their current practices. When determining the optimal break release it is important to consider the mill stock with course participants from Nigeria. Photo courtesy of IGP.

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tant to understand the impact of each individual break release on the break system extraction.

DEFINING BREAK RELEASE

Break release is defined as the amount or percentage of a ground stock that passes through a pre-determined size screen. The purpose of the defining and measuring the break release is to balance the break system of the mill and generate a consistent distribution of stock throughout the remaining flow diagram. Break release is described based on the mill passage or stock from which the sample was taken, for example First Break or B1, Second Break or B2 and so on.

Break Release = (Amount of stock through the screen)/(Total amount of stock)

The best break release for any milling

TABLE 1: BREAK SYSTEM EXTRACTION

Break extraction = (Amount of stock released)/(Total weight of wheat to First Break)
Break system extraction = Total sum of Break Extractions

Passage	Break Release	Break Extraction	% to Next Passage	Cumulative Extraction
1 Break	35%	35.00%	5.00%	35.00%
2 Break	45%	29.25%	35.75%	64.25%
3 Break	50%	17.88%	17.88%	82.13%
4 Break	50%	8.94%	8.94%	91.07%
5 Break	30%	2.68%	6.26%	93.75%

Source: Mark Fowler

operation depends on several factors. Hardness, class or origin and moisture are a few of the wheat quality characteristics that must be considered. Mill diagram design considerations include the number of break passages, the linear inches or millimeters of roll length allocated to the break system as well as desired granulation of the end prod-

uct. Durum mills or hard wheat mills that want to produce a large amount of semolina or farina will generally have a more gradual break reduction to minimize the production of fine semolina or flour.

MEASURING BREAK RELEASE

Measuring break release is not a complicated procedure. However, each step of the procedure is critical to achieve the correct result. For repeatable, reliable results, each miller must check the break release using the same method. The process of measuring break release begins with collecting the sample from the roller mill. Variations in collecting the sample will result in variation in the test results. The basic procedure for collecting the sample starts with checking to ensure the mill is operating under the proper load.

The stock entering the grinding passage must be uniform across the length of roll. The sample should be taken equally from the left side and the right side of the roll and near the bottom of the roll nip or center of the rolls from front to back.

The sifter used to process the sample must be sized to sift the full sample collected. Sifting only a portion of the sample collected will result in incorrect results. Sifting time must be consistent as well. Variation in sifting time will result in inconsistent results. Training on the procedures to ensure everyone uses the same process for checking the break release is critical to obtaining

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meaningful results and keeping the mill in balance.

DEFINING BREAK SYSTEM EXTRACTION

Break release is defined and measured for each individual passage. The break release schedule for a particular mill or flow diagram is a listing of all the individual break releases. Break extraction is the amount or percentage of stock removed in the individual passage as compared to the total quantity of wheat delivered to the mill. The cumulative break extraction or the break system extraction is the total amount or percentage of stock removed in the combined break system passages as compared to the total quantity of wheat delivered to the mill. When determining the optimal break release schedule for the mill, it is critical to meet the ultimate objective, maximizing extraction of quality product.

For example, refer to Table 1 (page 116). In this table, the break release schedule is 35% for first break, 45% for second.

Break release and break extraction for first break is always the same. To calculate break extraction for second break, start with the percentage of stock to second break from first break.

For this example, 35% of the stock to first break was released from the bran and the remaining 65% went on to second break. As the break release for second break is 45%, the break extraction is 45% of 65% or 29.25% of the total wheat to first break.

The cumulative break extraction is 35% from first break plus the 29.25%

When calculating the break system extraction, it is important to know if the product to the fine breaks has been included in the break system extraction calculation.

from second break for a total of 64.25%. This is important to note if the mill diagram has double-high rolls in the break system. The break release measured for the second or bottom set of rolls is actually the cumulative break extraction for both sets of grinding rolls.

Another important factor to consider is the break system is often divided into coarse and fine breaks toward the end to better remove the endosperm or “clean” bran of different particle size. Many mills rely on the experience and judgment of the miller to set the fine break passages and will not have a defined break release for them. When calculat-

ing the break system extraction, it is important to know if the product to the fine breaks has been included in the break system extraction calculation.

SETTING THE BREAK RELEASES

We have established that break release determines the distribution, granulation and quality characteristics of ground

stock throughout the mill. Understanding the break system extraction is important to ensure maximum removal of endosperm from the bran. Several additional factors must be considered to set the break release schedule to create a repeatable distribution of stock from each break passage.

Wheat type or hardness is the single most important wheat quality characteristic in setting the best break release schedule.

When milling hard wheat, including durum for semolina production, the objective is to maximize the amount of coarse endosperm from the break sys-

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tem going to the purification or mid-dlings reduction systems.

The break releases are generally balanced throughout the primary break passage (first, second and third breaks), remove large chunks of endosperm and minimize bran breakage and flour production.

When milling soft wheat, flour production is the main objective of the primary breaks. The soft endosperm creates flour easier and the production of coarse endosperm is nearly impossible. Flour extraction is the most important target. Higher grinding pressures are used on first break and on the remaining primary break passages to help maximize flour production resulting in higher break releases as compared to hard wheat.

Changes in wheat quality characteristics such as kernel size and diameter may require adjusting the break release

schedule to meet extraction targets. Measuring the amount of coarse semolina production in addition to break release is important to setting the optimal break release.

DETERMINING BREAK RELEASE

While this article did not provide a numerical answer to the question as to what the optimal break release schedule is for a mill, hopefully, it did provide direction as to how important the right setting of the break release is to maintaining mill balance.

Consistency of the break release schedule in the mill is important to maintain the balance of the ground stock in the milling process.

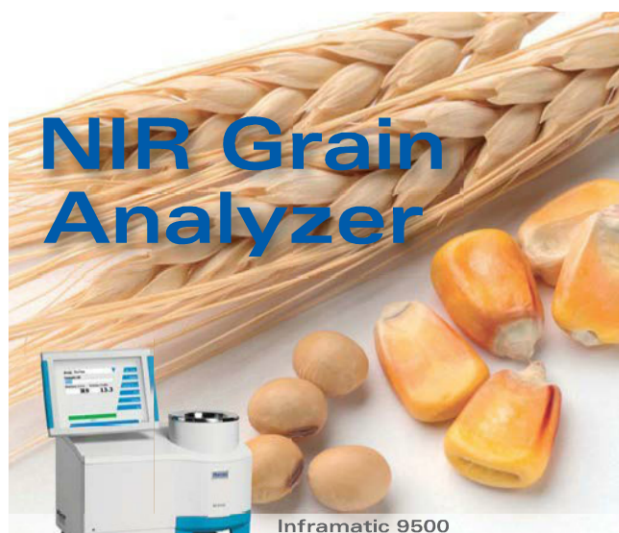
Keeping the right balance of ground stock within the designed parameters of the break system is critical to maximize mill performance. When the mill is not balanced, sifters choke up, pneu-

matic transport lines drop out, and rolls are not loaded correctly, causing inconsistency of the flour quality characteristics produced and unwanted variability in flour extraction.

Wheat hardness, origin and year-to-year differences in the wheat crop may change the optimal break release schedule to optimize the extraction of endosperm from the wheat kernel. Understanding the purpose for each break passage, testing the break release properly to keep the mill in balance maximizes flour extraction, and, in the end, increases the mill's overall profitability. **WG**

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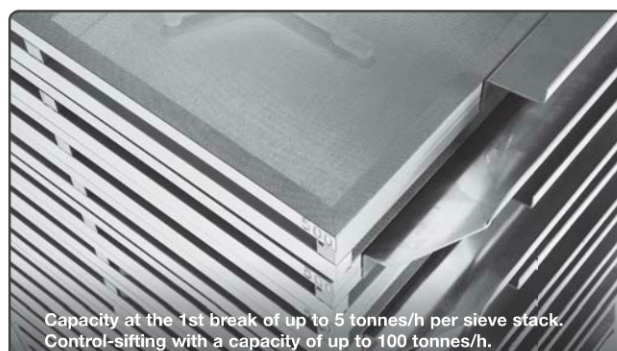
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