NIR APPLICATION IN Flour Milling

Introduction to the Market

Process Control Analysis Points in a Flour Mill

There are multiple points in the flour processing procedure where accurate and timely analytical values can help control the process, saving money and improving yield.

Incoming wheat can be analyzed for protein, and moisture. Wheat is traded based on protein and moisture content. Optimizing the raw ingredients to the final product will produce higher quality final products with higher yield and less re-work.

Blending individual bins of wheat can help to obtain a target protein content. Analyzing the blend can confirm the composition of the wheat before the labor-intensive tempering and milling

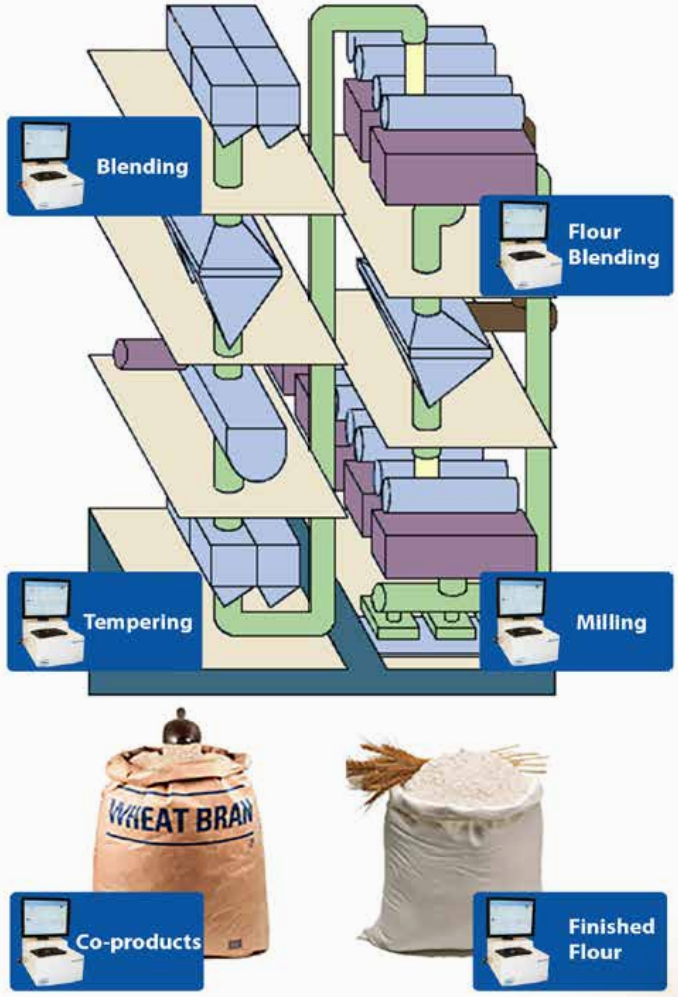
The **tempering** process introduces moisture to the wheat kernel to optimize the milling process. Ideally, the moisture is controlled within 0.5%. When wheat is at the optimal moisture, the milling process has a higher yield, uses less energy, and produces more consistent products and co-products.

In-process **milling** samples can be analyzed for ash and protein content to determine yield or sieve effectiveness and optimize the yield or quality.

To obtain a final product of a particular grade or characteristic such as protein or ash level, flour **blending** is frequently employed to ensure quality and uniformity. Blended flours can be analyzed in-process to verify the production, minimizing rework.

Co-products can be analyzed to determine the value and quality for use as an ingredient. Protein, fiber and moisture are typical constituents to measure.

Analysis of the **finished flour** verifies the proper quality and grade of the final product. Ash, protein and moisture as well as properties such as water absorption and extensibility can be measured.



Measuring Points and Parameters

NIR Can Be an Accurate and Reliable Tool for Process Control in Flour Mills

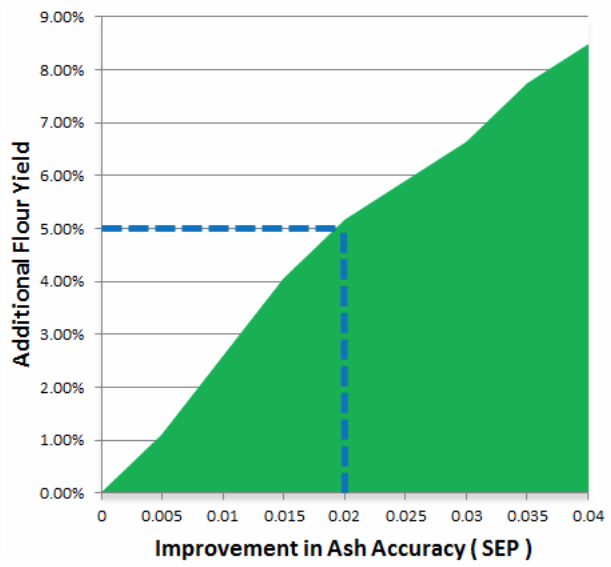
Historically, some of the first NIR analyzers used in flour mills were filter based instruments. These instruments use a small set of filters at set wavelengths to analyze samples and calculate the parameters of interest. This technology has stability and accuracy issues that limit its use for process control.

Based on a scanning monochromator, the SpectraStar™ is significantly more robust, accurate and reliable than the filter based instruments.

The benefits and features chart illustrates why the SpectraStar is the best fit for at-line process control.

Benefits and Features	Filter NIR	SpectraStar™
Better accuracy and robustness with more datapoints	up to 19	over 1000
Easier to maintain with fewer calibrations	20 to 100	2 - 5
Enhanced stability with less frequent biasing	Daily	Quarterly
Increased confidence with outlier prediction warning	NO	YES
Stability against temperature, particle size and humidity variation	LOW	HIGH
Suitable for process control	NO	YES

Value Proposition



The SpectraStar Flour Analyzer Value to Millers

The SpectraStar XL will make a direct contribution to your bottom line.

One of the most direct calculations to demonstrate the economic value of the XL analyzer is ash analysis. Ash content in finished flour indicates milling efficiency, with ash content increasing as more flour is extracted from the wheat. The closer a mill can be operated to the specified ash content, the more flour that can be produced.

The Unity Flour Analyzer produces extremely accurate ash values, allowing for much more precise control of the milling process. The chart at the right shows the additional flour yield that can be realized by using a SpectraStar XL compared to a method having an error of 0.04% (a best case scenario from other instrument types such as filter instruments).

At the typical XL ash error of 0.02%, the enhanced process control possible with the SpectraStar XL will result in an additional yield of approximately 5%.

Based on yield alone, the typical payback time for an instrument in a medium sized flour mill is less than 6 months.

In addition to additional yield efficiency, significant savings are realized through reduced laboratory costs, less rework and improved moisture control.

Unity Solutions to this Industry

SpectraStar™

Flour Milling Solutions

Unity Scientific offers a variety of ready–to-use solutions tailored to the flour milling industry. All of our flour analyzer packages start with the SpectraStar XL analyzer, an advanced, high performance at-line scanning monochromator. All SpectraStar XL models come standard with the following features:

- TRUE NIR™ Spectrometer for ultra-performance
- Advanced TRUE NIR detector and electronics for low noise and high repeatability
- 17" high resolution touch screen for intuitive, easy operation
- Fast Windows®7 computer with Solid State Drive for reliability and speed
- Sealed case for reliable operation at-line
- 5 W 10,000 hr lamp
- Unity Check Cell for daily performance validation

The flour analyzer packages are configured with a variety of sampling options and calibrations, allowing the user to select the analyzer package that will fit their needs.

The **US-1400-FLR1 Flour Analyzer Basic** is designed for the analysis of hard and soft flours and includes:

- SpectraStar 1400XL(Static) and medium sample cups US-MPCP-0001
- Unity calibrations for hard and soft flours
- 1 year free calibration support

The **US-1400-FLR2 Wheat and Flour Analyzer Basic** adds a rotating top window sampling system and larger sample cups for the analysis of whole wheat as well as finished flours. The Wheat and Flour Analyzer Basic includes:

- SpectraStar 1400XL(Rotating) and large sample cups US-LGOP-0001
- Unity calibrations for whole wheat and hard and soft flours
- 1 year free calibration support

The **US-2600-FL3 Flour Analyzer Deluxe** is configured with our extended range 1100 – 2600 nm SpectraStar 2600 XL analyzer and comes configured with INGOT® wheat and flour calibration from Aunir™. The Flour Analyzer Deluxe includes:

- SpectraStar 2600 XL(Rotating) and large sample cups US-LGOP-0001
- Full Ingot Calibration package for wheat and flour milling
- 1 year calibration support and guarantee from Aunir

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