

Monitoring the mixing step in flour milling industry

Real-time control of the mixing step in the flour industry is critical in order to ensure a consistent high final product quality as well as to improve the milling performance.

During this step, monitoring key parameters such as protein and moisture allows the millers to confidently operate closer to targets and thus, prevent expensive and time-consuming rework, and hence increase profit margins.

The installation of a BUCHI NIR-Online® process analyzer equipped with high resolution CCD camera after the mixer enables to monitor these target parameters and to screen the grain mixture in a fast, simple and reliable way.

1. Introduction

Top-quality flour provides the basis for making high-quality foods. In order to transform grains into flour of high quality, millers have to check their grain mixtures very closely.

Real-time information about the mixing step brings several benefits as i) it enables you to react immediately and make in-process adjustments, ii) to streamline and keep your production closer to the specified targets reducing the risk of variations in the final product, iii) to control the tempering, iv) to prevent expensive and time consuming rework, and v) to increase profit margins.

Rapid and accurate determination of the important quality attributes of the mixed grains, as well as real-time monitoring of the grain mixture using a high resolution CCD camera is essential to improve the amount of flour obtained from a given quantity of grain.

These determinations of quality parameters such as moisture and protein are usually performed using conventional chemical methods. These methods could be tedious, off-line, destructive, and time consuming.¹⁻³

The implementation of a BUCHI NIR-Online® process analyzer after the mixing step (Fig. 1) provides full characterization of the mixed grain. Within milli-seconds, several parameters (see Table 1) are continuously, simultaneously and accurately measured.

This application note highlights the BUCHI NIR-Online® process analyzer performance to monitor the grain mix composition.

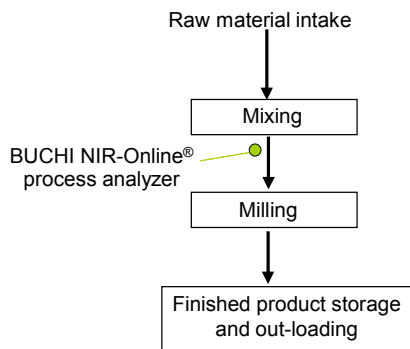


Figure 1. Flour milling process.

2. Measurement setup

BUCHI NIR-Online® process analyzer: X-Four (VIS/NIR/CCD Camera)

Wavelength range: 400-1700 nm

Measurement principle: Reflection

Interface to process: Flange



Figure 2. BUCHI NIR-Online® process analyzer.

3. Results

The BUCHI NIR-Online® process analyzer was found to be suitable for accurate measurements of the relevant parameters in grains mix (Table 1).

Table 1. Calibration performance.

Parameter	Range (%)	SEC
Protein	7.0-18.8	0.16
Moisture	7.0-20.5	0.17
Ash	0.80-2.6	0.05

SEC. Standard error of calibration (absolute)

Other parameters successfully monitored are starch, fat and gluten.

4. Conclusion

Results clearly show that an NIR-Online® process analyzer equipped with a flange is able to simultaneously control and measure multiple properties of grain mix in the flour industry.

Online measurements provide real-time analysis of critical-to-quality attributes, thus allowing immediate in-process adjustments and the optimization of the further production steps leading to maximized efficiency and profitability.

5. References

- ¹ISO 712: 2009. Cereals and cereal products -- Determination of moisture content, 2009.
- ²ISO 2171: 2007. Cereals, pulses and by-products -- Determination of ash yield by incineration, 2007.
- ³ISO/TS 16634-2:2009. Food products -- Determination of the total nitrogen content by combustion according to the Dumas principle and calculation of the crude protein content – Part 2: Cereals, pulses and milled cereal products, 2016.