Application Note
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Monitoring soybeans quality

BUCHI NIR-Online® process analyzer:
Protein, Oil content, and Moisture with NIR

1. Introduction

Quality monitoring of whole soybeans at the raw material intake brings several benefits e.g., prevention of entry of out-of-specification material, quality segregation, authentication of raw material, etc.

Rapid and accurate determination of whole soybean composition is of critical importance in order to decide how to store and process the raw material. Based on the accurate measurements of moisture, protein and oil content, soybeans can be stored at different silos or optimally pretreated for the subsequent production steps. Knowing the right values of key control parameters gives rise to optimizing production process for maximum quality and profit.

With the installation of a BUCHI NIR-Online® process analyzer at the raw material intake, the composition of whole soybeans is monitored and documented in a fast, simple, and reliable way.

2. Equipment

- BUCHI NIR-Online® process analyzer: X-One (NIR only)
- Wavelength range: 900 – 1700 nm
- Measurement principle: reflection
- Interface to process: Flange

3. Application

Pivotal in the soybean crushing process is information concerning the quality of the incoming raw material. Soybeans will be sorted according to moisture level in different silos and subjected to drying treatment. Exact oil level will serve as a base for paying the right amount to the farmers. In addition, it affects the production planning and optimization of the manufacturing process to reach the highest yield, quality, and profit.

The traditional laboratory methods for soybean analysis requires considerable time and incorporates large quantities of solvent [1 - 3].

The implementation of a BUCHI NIR-Online® process analyzer at the raw material intake step (Fig. 1) provides full characterization of soybeans quality. Within milli-seconds, several parameters (see Table 1) are continuously, simultaneously, and accurately measured.

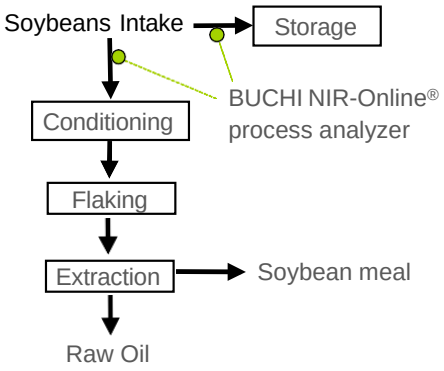

Figure 1: Soybean crushing process

4. Result

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

Table 1: Calibration performance.

Parameter [%]	Range	SEC
Protein	32.0 – 39.2	0.30
Oil content	18.0 – 21.8	0.25
Moisture	8.0 – 18.0	0.15

SEC: Standard error of calibration (absolute)

Other parameters successfully monitored are fiber, ash, and acidity.

5. Conclusion

Results clearly show that an NIR-Online process analyzer equipped with flange is able to simultaneously measure multiple properties of whole soybeans. Online measurements provide real-time analysis of critical-to-quality attributes, thus allowing immediate optimization of the crushing conditions leading to maximized yield and quality of the end product.

6. References

[1] Official Methods and Recommended Practices of the American Oil Chemists' Society, AOCS Ac 2 - 41, 2009.
[2] Official Methods and Recommended Practices of the American Oil Chemists' Society, AOCS Ac 3 - 44, 2011.
[3] Official Methods and Recommended Practices of the American Oil Chemists' Society, AOCS Ac 4 - 91, 2011.