Monitoring meat processing using BUCHI NIR-Online® process analyzer

The meat industry copes with a manifold of challenges including economical pressure, increasing legal food safety regulations and customer awareness regarding product quality and nutritional value. Therefore, BUCHI NIR-Online® provides reliable and cost-effective online monitoring solutions along the entire production chain.

1. Introduction

BUCHI NIR-Online® offers several process analyzers for the installation throughout the complete meat production chain ranging from raw material intake, various processing steps and quality control of the final product. Installation points include e.g. over conveyer-belt, directly in pipes (MDM) or vessels, and machines like deboners, grinders or mixers (Fig. 1).

Analyzing the product by using BUCHI NIR-Online® process analyzers means rapid, continuous and non-destructive measurements of the chemical composition. Key parameters such as fat, protein, and moisture are measured simultaneously at each installation point. In addition, parameters, such as collagen, or other food ingredients like starch or sodium chloride can be measured. Indirect parameters such as pH value, water activity or sensory characteristics show high potential as well. Overall, time-consuming analyses based on wet-chemistry in the lab are reduced to a minimum [1].

NIR-Online® solutions allow operators to correct process deviations in real-time, to avoid costly raw material give-aways like lean meat, and at the same time enables a more consistent production according to recipe specifications.

BUCHI NIR-Online® process analyzers are based on diode array technology, thus do not contain any moving parts which enables the installation at tough environmental conditions and fast product flow rate.
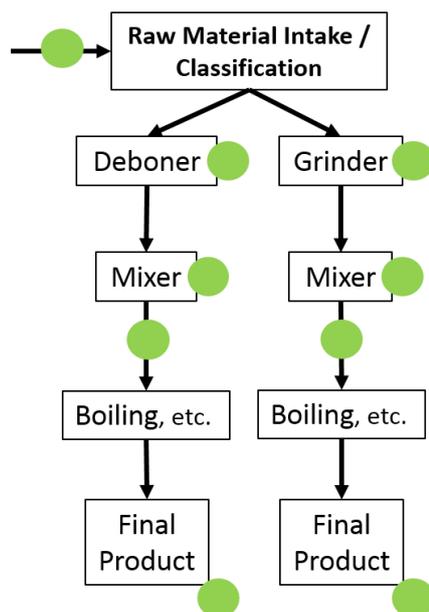

Figure 1. General flow chart of meat processing steps.

2. Measurement setup

BUCHI NIR-Online® process analyzer: X-Three

Wavelength range: 400-1700 nm

Measurement principle: Reflection

Interface to process: X-Cell (flow cell, Fig. 2b)

Interface to process: X-Light (conveyer belt, Fig. 2c) with stand-off distances up to 100 cm

Figure 2a. NIR-Online analyzer

Figure 2b. NIR-Online analyzer connected to flow cell

Figure 2c. NIR-Online analyzer X-Light

3. Results

The BUCHI NIR-Online® process analyzers were found to be suitable for accurate measurements of relevant chemical composition of meat products like moisture, protein, and fat at different process steps (Table 1).

Table 1. Calibration performance minced meat at mixer.

Parameter	Range [%]	SEC
Protein	14.3-19.5	0.1
Moisture	9.0-71.3	0.3
Fat	2.5-29.3	0.7

SEC. Standard error of calibration (absolute)

Other parameters that can be successfully monitored by NIR in meat products (e.g. sausage meat or burger patties) include color, pH, sodium chloride, starch, and collagen content.

4. Conclusion

Results clearly show that a BUCHI NIR-Online® process analyzer is able to simultaneously measure multiple properties of meat products at different process steps. Online measurements provide real-time determination of meat products composition, thus allowing optimal differentiation of product quality leading to maximized efficiency and profitability.

5. References

[1] AOCS. 2016. Official Methods of Analysis of the AOAC International (OMA). 20th ed.