



Process control raises productivity and profit margins NIR-Online for feed manufacturing

NIR-Online® In-line monitoring of moisture, fat and protein content of mixed feed by NIR process analyzers

Abstract

Every animal feed producer understands that moisture is synonymous with margin. The potential to maximize profits by controlling product moisture and other critical product attributes (e.g., protein and fat) can be achieved with in-line process analyzers.

Introduction

RKW in Kehl, Germany produces 75,000 tons of mixed feed annually. NIR-Online process analyzers installed at the end of the mixing unit have enabled the facility to quickly identify batches for which moisture is present below the permitted value, thus providing the opportunity to make in-process adjustments to protect margins and increase revenue.

1. The production process

New orders are started mid-day at the RKW Kehl production facility; beginning with a check of raw material availability for the upcoming orders. The feed is predominately composed of soy and maize cereals, with minerals, vitamins and amino-acid supplementation. Feed composition is obtained by the required moisture, fat, protein, crude fiber and starch of each recipe; due to the inherent variability of these nutrients in the incoming raw materials, the ratio of raw components needed to fulfill the nutrient profile of each recipe must be recalculated daily.

RKW Kehl has approximately 400 feed recipes in their database to satisfy the unique demands of farmers in the Baden area of Southwest Germany, and they expect that number to grow. "More and more customers feed their cattle, pigs, horses, poultry, small animals and pets with customized special mixtures," explained Mr. Hans-Peter Lühr, General Manager of RKW Kehl.

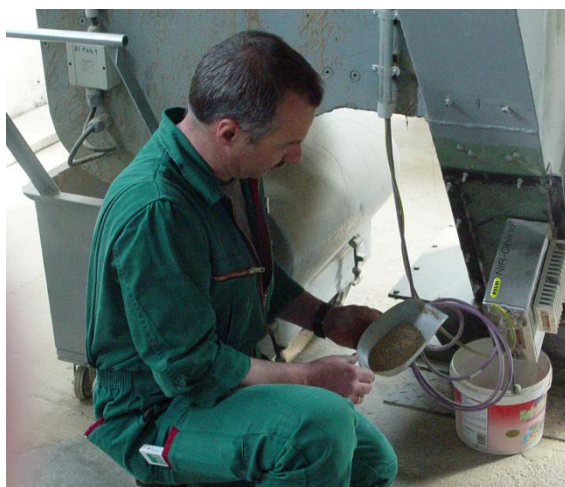


Figure 1: Mr. Lühr with a production sample from the mixer.

Heimtiernahrung GmbH, like RKW, is an affiliate of ZG Raiffeisen Karlsruhe and produces 10,000 tons of dry feed for cats and dogs, annually. Both affiliates use



the technical and human resources in Kehl. Like other mash companies, RKW Kehl and Heimtiernahrung GmbH check all incoming raw materials by drawing samples for analysis in the laboratory with a NIR-Online spectrometer.

2. Mixtures under scrutiny

Raw materials are selected, scaled and mixed according to ordered batch recipes using the process control system. RKW Kehl can produce approximately ten 3-ton batches in its mixing facility each hour. According to Hans-Peter Lühr, time has an important role: "Our biggest request is for customized mixtures which are produced on demand. This means that the elapsed time between production and delivery needs to be extremely short."

Quality control asks whether a feed mixture falls below a required protein or fat content, or if moisture needs adjusted to meet specifications. Prior to the installation of the NIR-Online process analyzers, the answers to these questions came from traditional laboratory analysis with long wait times. Now, the answers are streaming in in-line using the 200x200x135 mm NIR-Online device installed at a window at the end of the mixing unit.

The window serves as the interface between the NIR-Online sensor and the in-process blends. Near-infrared (NIR) light emitted from the sensors irradiates product at the window; the interaction of light with these materials results in absorption by the sample which is characteristic of its composition. Some of the irradiated light is reflected back to the diode array detector of the sensor, carrying with it the absorption information necessary to achieve quantification of the product attributes. Measurements are automatically collected every 30 milliseconds over the 20-minute production cycle, generating over 100,000 readings which can be visualized in process charts by personnel in the switch room. If preset parameters are over or under run, corrective adjustments are able to be made immediately.



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3. In-line control

Because the process can be stopped or adjusted early in production if specifications are not met, "the utilization of NIR-Online has minimized expensive rejects and complaints," said Mr. Lühr, as he described the financial advantages of the NIR-Online solution. "This benefit is further increased with the possibility of adjusting moisture content in real time."

The NIR-Online process software SX-Center calculates the difference between the in-line property measurement and the batch set point without stopping production, ensuring moisture addition is precisely controlled for each batch. "If we are able to converge within 0.5% of the moisture set point of a batch, we can sell more than 375 tons of additional mixed feed per year – a substantial benefit. "The investment in NIR-Online technology will be paid for in a few months", Mr. Lühr stated.

The Production Managers summarize their perceived benefits: "With NIR-Online devices, we are able to detect and compensate for very subtle and short-run variations in production in real time."



Figure 2: The central control room of the RKW plant where process information is analyzed.

4. Representative samples

A second NIR-Online device RKW Kehl is installed in the laboratory to analyze moisture in dog and cat feed. In this mobile device, an NIR-Online analyser is installed above a large sample dish. Other basic and quick moisture analysers are limited to relatively small sample sizes; the potential for those small samples to represent a large batch often comes into question. In contrast, the NIR-Online device can deliver a moisture result for samples as large as one liter in size; product is filled into a rotating tray to increase the sampling surface area, and measurements are completed within 40 seconds. "We can reach the exact set point for

moisture in cat and dog feed with NIR-Online analysis" Hans-Peter Lühr emphasized. "The balancing act between shelf life and quality product for the livestock is consistently achieved."



Figure 3: Laboratory quality control of intake raw materials

5. Complete documentation

Integration of the NIR-Online products with the existing process control system provides the opportunity for automatically generated, highly detailed process documentation. This feature enables companies like RKW Kehl to meet expectations for production quality while satisfying legal demands for traceability within the production process.

6. Contacts

For more detailed information please contact your local BUCHI representative or visit the website: www.buchi.com/nir-online .