Measuring Moisture on Pressed Pulp

Microwave Transmission Measurement for Process Optimization and Quality Improvement

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Microwave measuring systems

Berthold Technologies microwave measuring systems are capable of measuring concentrations, dry mass or moisture content in various products during the ongoing process on conveyor belts, in chutes, pipelines or containers. There is a broad range of applications for these microwave systems – from the food industry to power plants to mining and paper factories. Also, a wide selection of sensors and technical features, such as dynamics, frequency, etc., is available.

Measurements with microwaves – Function description

The microwaves irradiate the material being measured, causing the free water molecules to rotate. This rotation causes a slowing down (phase shift) and attenuation (dampening) of the irradiated microwaves. The Micro-Polar Box detects these two measuring effects as a measure of the concentration, compensating for influences of the product type and the purity of the sugar solution. The multi-frequency technology allows measurement at several individual frequencies per measuring cycle, ensuring a stable and reliable measurement after the plausibility analysis.

Product examples

- Sugar beet chips
- Wood chips and pellets
- Wood fibers
- Sand
- Lignite and hard coal
- Fertilizers
- Hay and straw
- Tobacco
- Starch pellets and starch
- Gypsum
- Clay masses
- Cereals
- Chipboard chips
- Potato chips

Berthold Technologies has been offering solutions for non-contact measurement of fill level, density, concentration, mass flow and moisture in containers, pipes, conveyor belts or in the air for more than 60 years. As a world technology leader in the field of radiometric measuring systems, Berthold products feature outstanding measuring performance and reliability. In addition, microwave measuring systems for moisture and concentration are part of the Berthold portfolio. The main fields of application are in chemical, steel and power plants, refineries, as well as in the paper, glass and food industry.

- for 60 years
- 330 employees worldwide - 250 employees in Germany
- Turnover: approx. 75 million Euros
- Export share: 80 % - 7 sales organizations worldwide

The company has its origin in the sugar factory and refinery Aurach, founded in 1912. Today, Schweizer Zucker AG (SZU), headquartered in Frauenfeld, is the only company in Switzerland to process sugar beets and to supply the Swiss market with sugar and the resulting feedstuffs. SZU employs around 240 people and generated sales of 200 million Swiss francs in 2015/2016. SZU processes an average of over 1.7 million tons of sugar beets per year in its two factories. It produces between 250,000 and 300,000 tons of sugar annually.

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- 240 employees
- Turnover: 200 million CHF
- Processing of 1.7 million tons of sugar beets annually
- 250,000 to 300,000 tons of sugar annually
Measurement task

After the extraction of the sliced beets (chips), pressed pulp is produced in a sugar factory which is sold as feed at a specified dry substance (DS) content.

For process optimization and quality improvement, the dry substance content of the pressed pulp should be determined online as precisely as possible. A prerequisite for an accurate control of the dry substance content is a reliable, long-term stable measurement of the dry substance content.

Challenge

Various on-line systems (capacitive probe and NIR) have been tested over several years to measure the dry substance content. The desired long-term stability of the measurement was not achieved by any method.

The total moisture of the pressed pulp consists of a superficial and an inner moisture, the composition of which frequently varies. Therefore, the total moisture should be measured by a system that integrally measures the total moisture in a defined volume. A uniform layer height can be achieved on a conveyor belt with scrapers; however, the bulk density of the pressed pulp varies as a function of the fluctuating chip quality.

Solution

A representative sample size is compacted in a defined manner in order to determine the water content using a precise microwave transmission measurement.

Berthold offers a microwave system with a suitable sample container in which the samples are measured accordingly. A device for the constant feeding and defined compaction of the pressed pulp in the sample container was designed and built in the Aaiberg sugar factory. The jointly developed system automatically takes samples every 15 minutes and measures these in the defined sample volume between microwave transmitting and receiving antenna.

Customer benefits and advantages

- representative measurement
- more frequent measurement compared to manual sampling
- early detection of disturbance at the press station
- constant silaging of pressed pulp
- no unnecessary transport of water

Outcome

The measurement of moisture was done automatically, the setting of the addition of water was done manually from the control system over the entire last campaign. In control measurements, the dry substance content deviated from the target size by a maximum of 0.3% DS; the target value was exceeded by 0.1% DS on average over the entire campaign. The water supply will to be automated starting with the coming campaign.