



Solutions for the Sugar Industry

°Brix, Dry Substance, Density
and Moisture Measurement

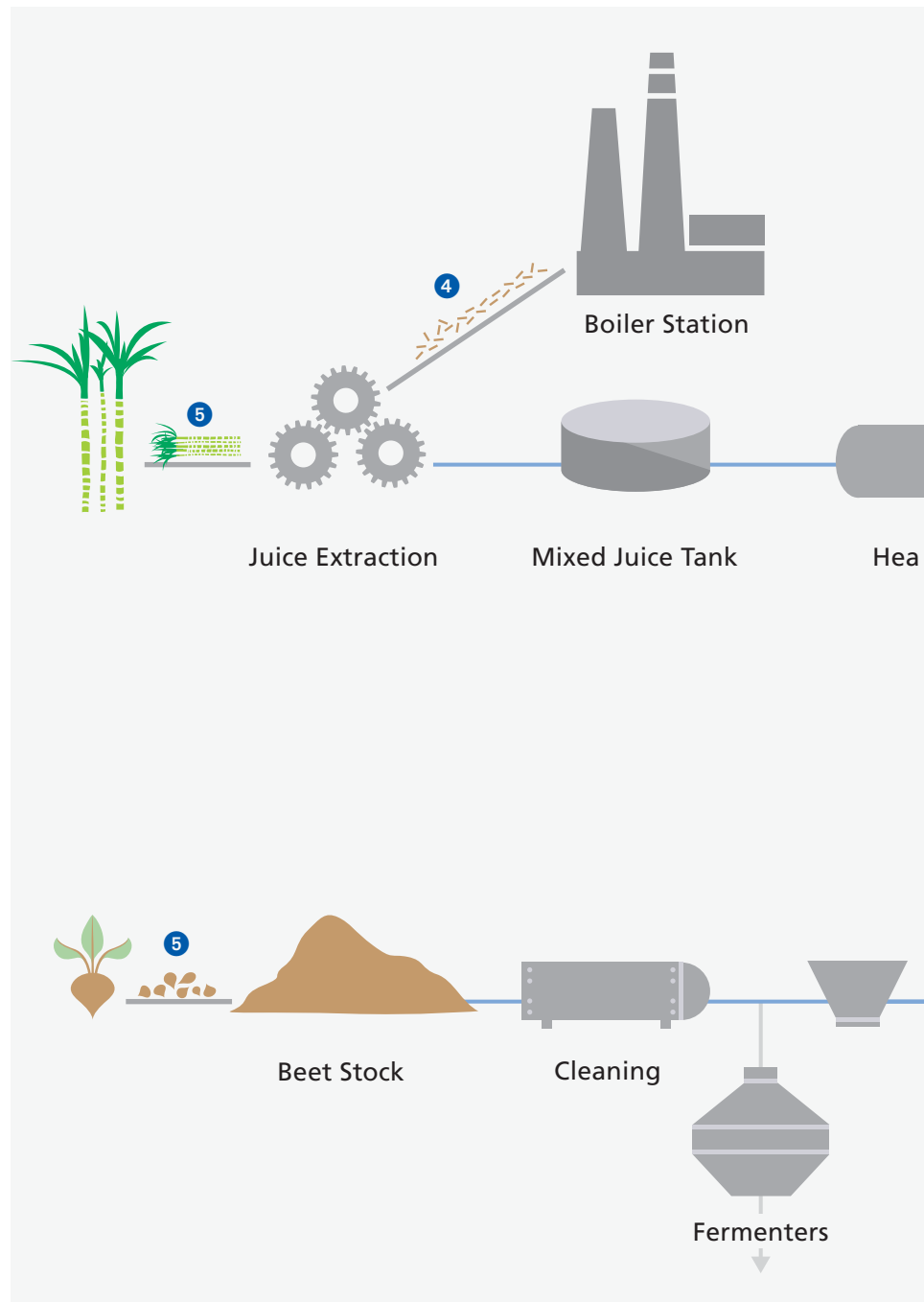
APPLICATIONS IN THE SUGAR INDUSTRY

Sugar Beet and Sugar Cane Processing

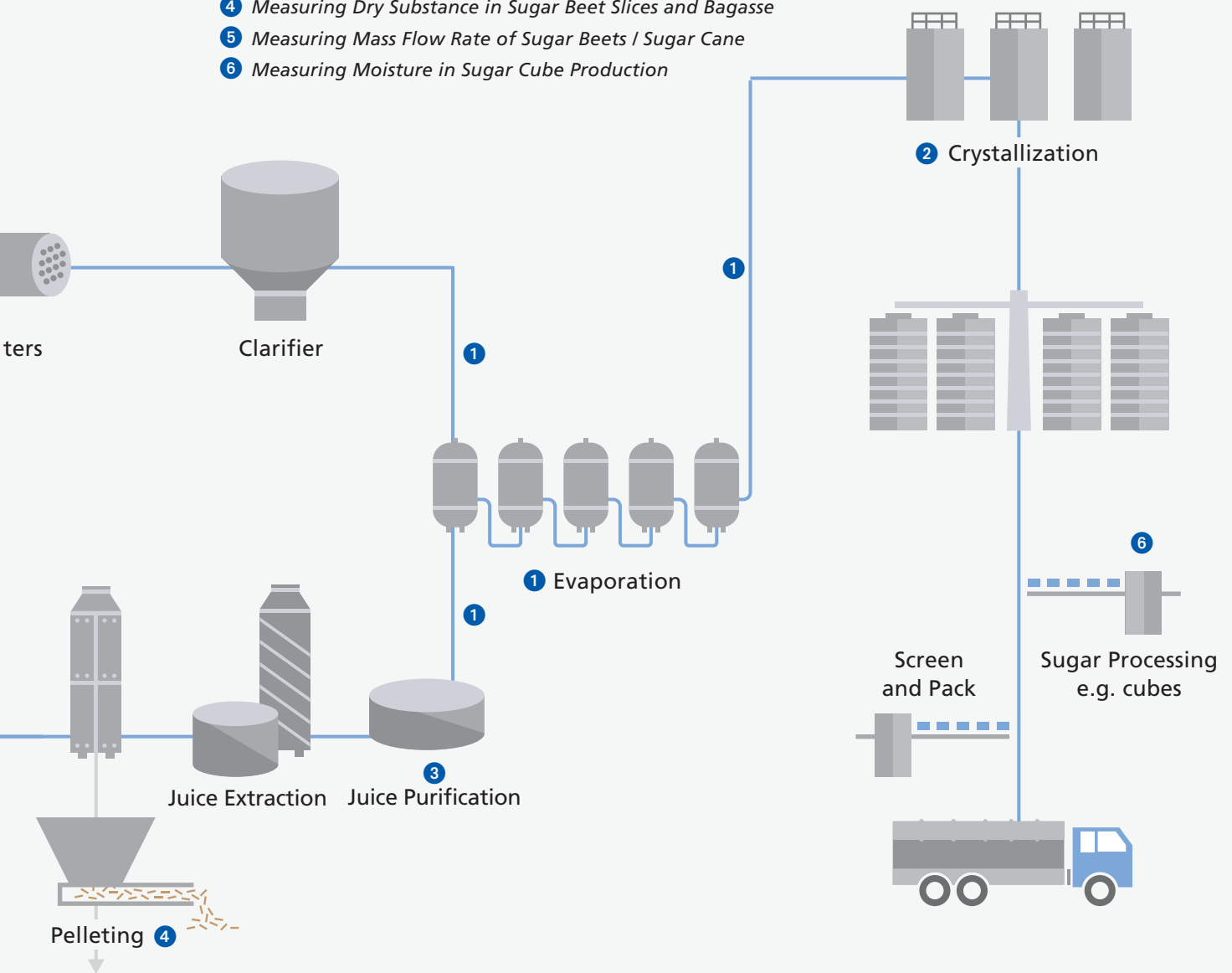
Berthold Technologies measurement solutions are perfectly tailored for applications in the sugar industry. Renowned sugar mills all over the world rely on the Berthold measurement systems. The vast amounts of systems that are successfully in operation are the best reference for the reliability and good quality of our products.

They are applied in multiple process steps in the course of the sugar manufacturing process. Regardless of whether information about the °Brix value, concentration, density or the moisture content is required, all our instruments show outstanding accuracy, reliability and do not require regular maintenance.

- °Brix measurement of raw, thin and thick juices, in the crystallizers, seed magma (pied-de-cuite), mixers, in solution and on molasses
- Solid matter content measurement on raw and industrial milk of lime
- Moisture content measurement of crystallized sugar during sugar cube production as well as of pressed pulp, dry pulp or bagasse.



- 1 Measuring °Brix in the Evaporation
- 2 Measuring °Brix in the Crystallizer
- 3 Measuring Density (°Bé) of Milk of Lime
- 4 Measuring Dry Substance in Sugar Beet Slices and Bagasse
- 5 Measuring Mass Flow Rate of Sugar Beets / Sugar Cane
- 6 Measuring Moisture in Sugar Cube Production



MEASURING °BRIX IN THE EVAPORATION

The extracted thin juice passes through multiple effect evaporators which boil off the water and produce syrup known as thick juice. The thick juice which is produced can either be used for immediate crystallization or be stored in large storage tanks.

The evaporation process increases the solids content of the juice from 16% to 65%. Typically the water is boiled off in a series of six evaporator vessels. After each stage of evaporation the °Brix content of the sugar juice is measured. The microwave based systems from Berthold provide real-time information on the °Brix and allow for reliable control of the evaporators.

Application Profile

- **Measurement task**
°Brix concentration of different juices
- **Location**
At the inlet / outlet of each evaporator
- **Berthold solution**
Microwave System, e.g. MicroPolar LB 565 with Flow Cell

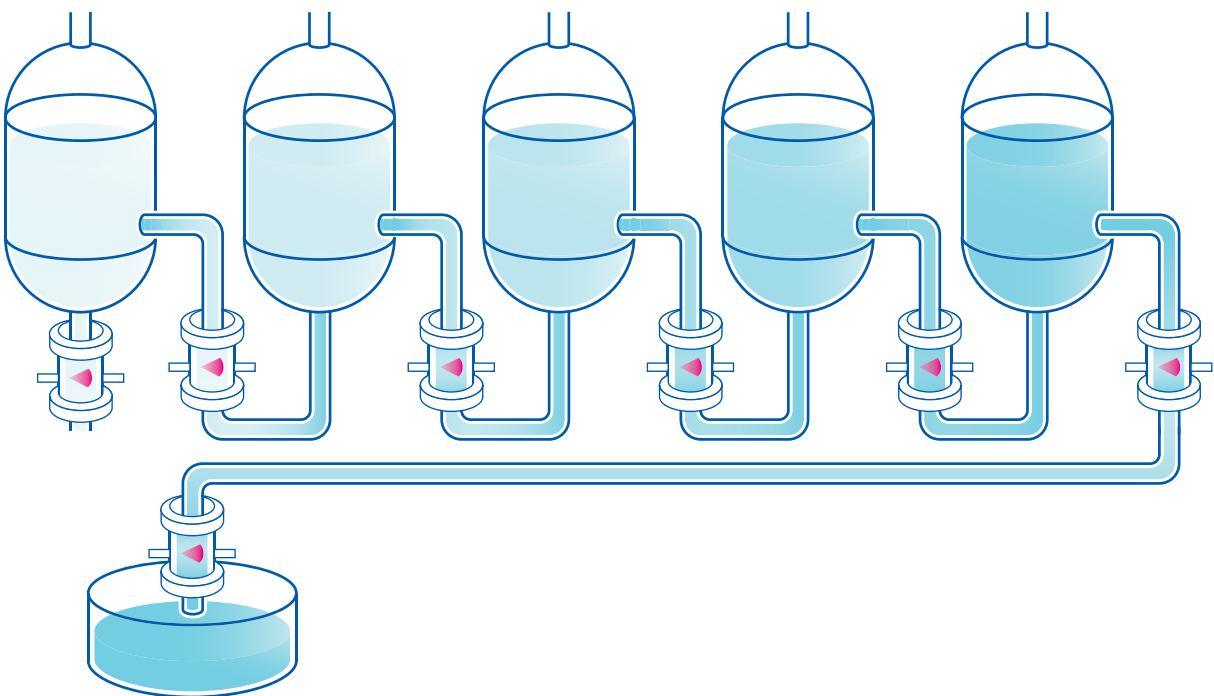


Customer Benefit

- Reliable control of the individual evaporation stages
- High throughput
- Ideal utilization of heating energy
- Optimized thickening of syrup

Characteristics

- Located at the inlet or outlet of each evaporator
- Microwave Flow Cell flanged into the pipeline
- Continuous online concentration measurement
- Highly representative results due to proven and state-of-the-art microwave transmission technology
- Pre-calibrated system
- Maintenance free probe and evaluation unit





MEASURING °BRIX IN THE CRYSTALLIZER

The thick juice is heated in the crystallization process under vacuum conditions to produce massecuite. When a certain concentration is reached, the juice is seeded with tiny sugar crystals to promote the growth of larger, uniform crystals. With the microwave measuring systems from Berthold, the juice concentration (°Brix) is monitored throughout the crystallization process, allowing for precise determination of this seeding point. The systems are applied in all crystallization stages. Due to the robust device and the superior sensor flushing, the measuring systems have proven time and time again that they work reliably and trouble-free even in continuous operating conditions. After the final crystallization stage the °Brix concentration of the massecuite is measured. In this case the system is positioned at the outlet pipe, after the massecuite has passed through the pump.

Application Profile

■ Measurement task

°Brix concentration of sugar juice and massecuite

■ Location

Discontinuous and continuous crystallizers – vertical and horizontal; e.g. in each compartment, massecuite outlet

■ Berthold solution

Microwave System, e.g. MicroPolar LB 565 with container probe (regular or flushing)

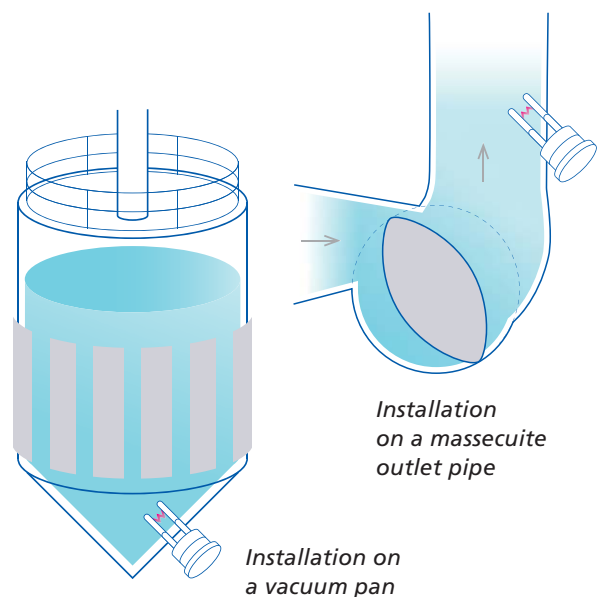


Customer Benefit

- Very precise and repeatable determination of seeding point
- Uniform sugar crystals and improved quality
- Reliable control during whole crystallization process
- Continuous production, without process downtime

Characteristics

- Side or bottom installation of container probe in crystallizer tanks, compartments or outlet pipe
- High resolution through focused measurement signal
- In batch mode integrated temperature control
- Pre-calibrated system
- Robust sensing elements with integrated flushing, ideal for permanent operation in continuous crystallizers
- Maintenance-free system



MEASURING DENSITY OF MILK OF LIME IN THE PURIFICATION PROCESS

After extracting the raw juice from sugar beets, the juice passes through an important purification stage called carbonation. In this purification process milk of lime is added as a reactant. The quality of the milk of lime has to be monitored in several stages to achieve better purification results and an optimized process. The Berthold measurement system based on microwave technology help sugar mills worldwide to control the density of milk of lime through an online measurement - either in the pipeline or in process tanks like classifiers.

Application Profile

- **Measurement task**
Density of milk of lime (e.g. in °Bé)
- **Location**
Several stages throughout purification
e.g. in the classifier, pipelines or tanks
- **Berthold solution**
Microwave System, e.g. MicroPolar LB 566
with Flow Cell or container probe

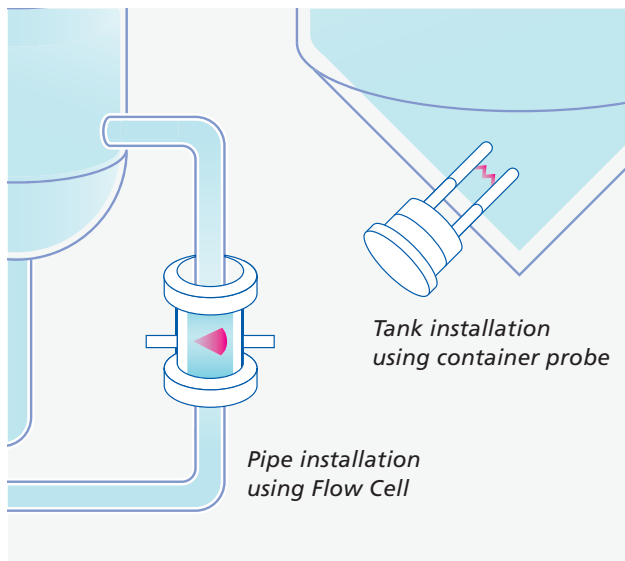


Customer Benefit

- Online, accurate density measurement
- Precise and representative real-time data for improved process control
- Optimum purification results
- Cost efficient use of lime stone

Characteristics

- State-of-the-art microwave measurement
- No maintenance required
- Very accurate and repeatable measurement
- Installation options for pipes and tanks





Customer Benefit

- Accurate determination of dry substance / residual moisture content
- Reliable control of downstream processes
- Precise and representative real-time data
- Compliant to product quality requirements and customer contracts

Characteristics

- Non-contacting, non-intrusive measurement using state-of-the-art microwave technology
- On-line determination of dry substance
- Highly representative through transmission technique – the entire cross section is measured
- Compensation of varying height or bulk density available for enhanced measurement performance
- Maintenance-free operation, without wear and tear

MEASURING DRY SUBSTANCE IN SUGAR BEET SLICES AND BAGASSE

After sugar extraction, bagasse or beet pulp remains as a by-product. They are further processed either as a source of energy to generate power and heat or to produce feed for dairy cattle and fatlings. Both bagasse and beet pulp contain a certain amount of water, which needs to be measured in order to ensure continuity and high quality of the downstream processes.

The Berthold microwave systems are applied to determine the dry substance online and non-contacting, on conveyor belts or chutes. Thus the customer receives representative, in-situ moisture information for optimized process control. Due to the non-contacting method, the measurement components are not subject to wear and tear – resulting in maintenance-free operation and long operational life.

Application Profile

■ Measurement task

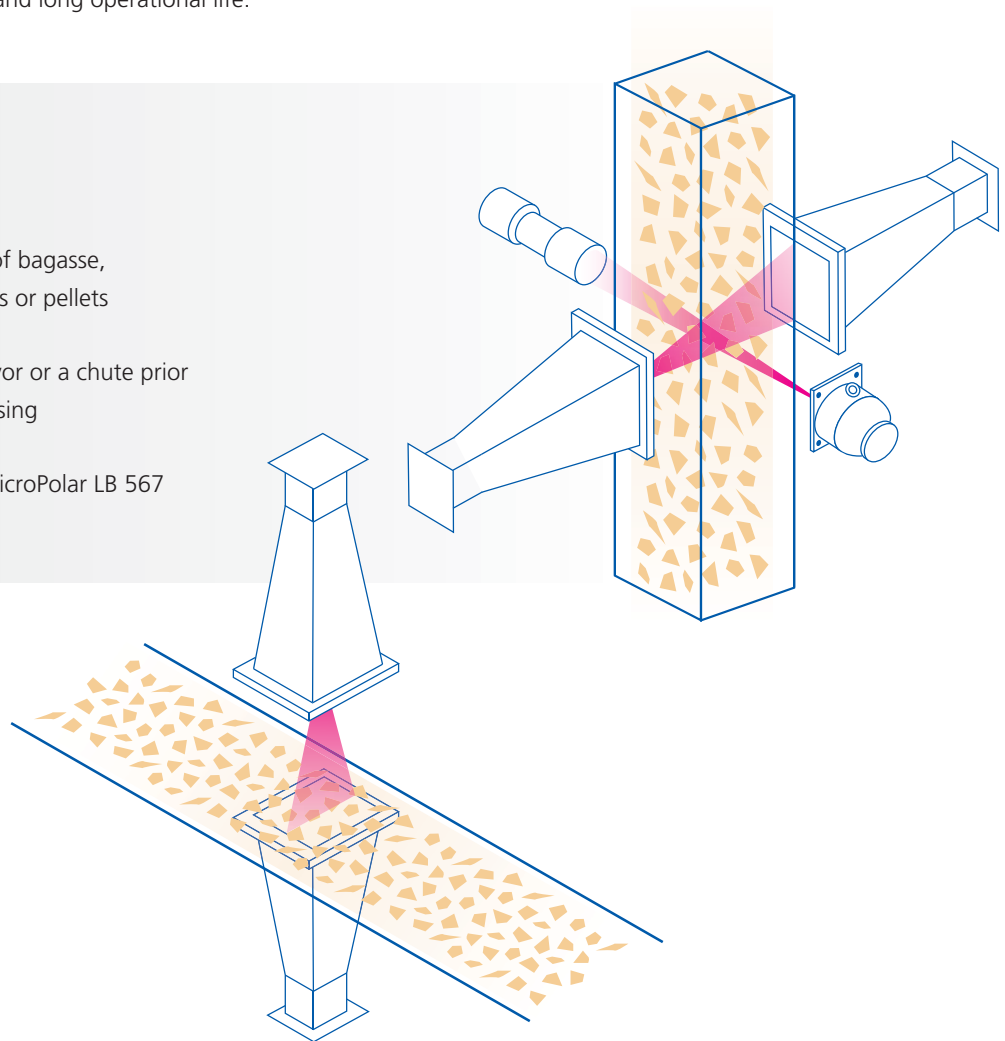
Dry substance / moisture of bagasse, sugar beet pulp, beet slices or pellets

■ Location

Measurement on a conveyor or a chute prior of after drying and processing

■ Berthold solution

Microwave system, e.g. MicroPolar LB 567 with horn antenna



MEASURING MASS FLOW RATE OF SUGAR BEETS / SUGAR CANE

The ratio between raw material feed and additives needs to be balanced to ensure smooth and efficient production process. Therefore the amount of sugar beets or sugar cane is measured as it enters the production site. Typically a radiometric belt weigher is installed prior to chipping and washing plants. It measures the mass flow of the sugar beets / sugar cane very reliably by using non-contacting, non-intrusive radiometric technology. A further application is found directly after unloading of the beets or cane to control the amount of delivered products. When compared to conventional belt scales the radiometric system offered by Berthold has proven to be a superior long-term solution with no need for re-calibration or maintenance.

Application Profile

- **Measurement task**
Mass flow of sugar beets or cane
- **Location**
Before entering the chipping and washing process or directly after unloading
- **Berthold solution**
Radiometric belt weigher, e.g. LB 442

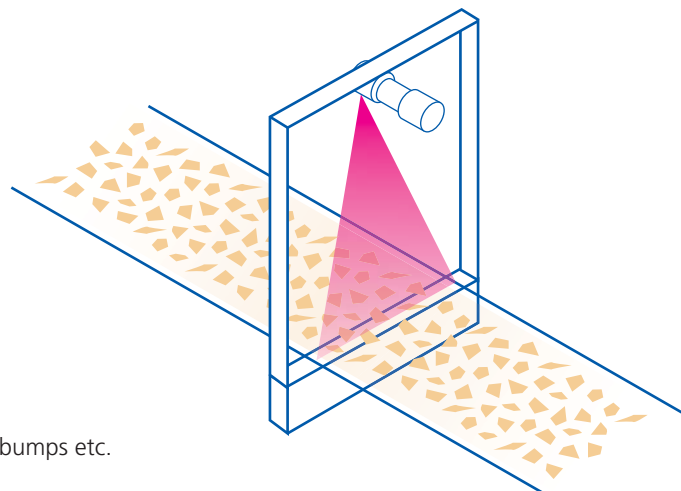


Customer Benefit

- Improved control on the amount of beets or cane entering the process
- Optimum control of beet delivery
- Lowest cost of ownership

Characteristics

- Non-contacting measurement
- Not affected by varying belt tension, vibrations, bumps etc.
- No moving parts
- Easy to install on existing conveyors
- Stable and repeatable measurement, without the need for re-calibration
- Maintenance-free



MEASURING MOISTURE IN SUGAR CUBE PRODUCTION

When sugar cubes are produced a certain amount of water is added to the sugar powder. To guarantee a smooth production process the moisture content of the sugar powder must be precisely constant at 1.8%. If the moisture is too low, the cubes might break, if the moisture content is too high the sugar can get stuck inside the machine. After forming the cubes the water is removed again down to a level of 0.4%. The Berthold moisture system based on microwave transmission technology is used to measure the moisture content of the sugar before it enters the forming machine. Thus the operator can reliably monitor the water content through real-time data and trends, guaranteeing ideal manufacturing conditions.

Application Profile

- **Measurement task**
Moisture of sugar powder
- **Location**
Chute installation, prior to the forming machine
- **Berthold solution**
Microwave System, e.g. MicroPolar LB 567 with horn antenna

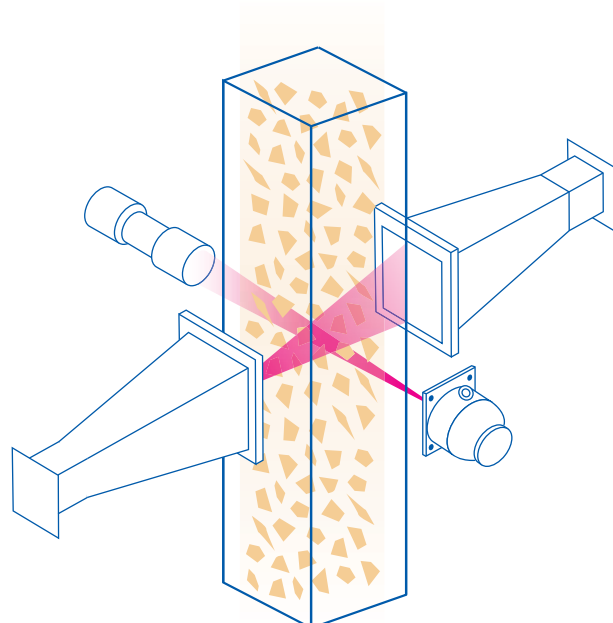


Customer Benefit

- Precise addition of water
- Precise and representative real-time data
- Ideal and smooth cube forming process
- Increased yield
- High quality cubes

Characteristics

- Microwave measurement on a chute
- Non-contacting, non-intrusive measurement, with the antennas mounted outside the chute
- No wear and tear, no maintenance required
- Accurate and long-term stable



THE BERTHOLD MICROWAVE SYSTEM

For the Sugar Industry



Flow Cell

- Sensor for pipe installations
- Measures the entire cross section of the pipe
- Robust design
- From DN 50 to DN 150
- Adapter for ASA connections available
- Internal lining made of abrasion-resistant PTFE
- Easy to clean



Container Probe

- Sensor for installation on tanks and vessels
- Probe for batch processes, mainly used in discontinuous crystallizers
- Pt100 for temperature compensation
- Various flanges available
- Abrasion-resistant polymer pins (exchangeable)
- Integrated reference line for disturbance-free measurement



Container Probe with flushing device

- Sensor for installation on tanks and vessels, including a flushing device (mainly used in continuous crystallizers)
- Allows cleaning of the probe in the course of the process
- Fast signal recovery after flushing
- Abrasion-resistant polymer pins (exchangeable)
- Integrated reference line for disturbance-free measurement



Horn Antenna

- Non-contacting, non-intrusive sensor for conveyor belt and chute installations
- Optimal focussing of the microwaves
- Robust design
- High shock and vibration resistance
- Easy to install on existing lines, without process downtime
- No wear and tear



Evaluation Unit

The heart of our measuring systems is the evaluation unit. It is the result of long-term experience and know-how. We offer this unit for the sugar industry in two different versions supporting different dynamic ranges. This enables us to use the ideal technology, depending on the respective application and requirements.

- Up to 4 different products can be calibrated
- Direct data entry
- Automatic on board calibration
- Robust stainless steel housing
- Easy to use sample-taking function
- Different user levels
- Integrated plausibility check: measured values are continuously compared with reference values
- Memory tool for easy data import and export



Berthold Technologies has specialized in online process measurements for more than 60 years. Berthold only applied radiometric technology in the sugar industry in those days, until 30 years ago Berthold introduced the microwave technology to the sugar mills. Today we have dedicated microwave systems which are perfectly tailored to the demand of our customers in the sugar industry.

The expertise in microwave technology is our core competence – our products and technology always a step ahead. Working with our customers in the sugar industry means developing solutions for each individual application.

Our global network of sales and service experts is ready to support you through all stages of your project – around the corner and around the world!

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