MEASUREMENT SOLUTIONS FOR THE SUGAR INDUSTRY

Optimize your production process with improved quality and efficiency

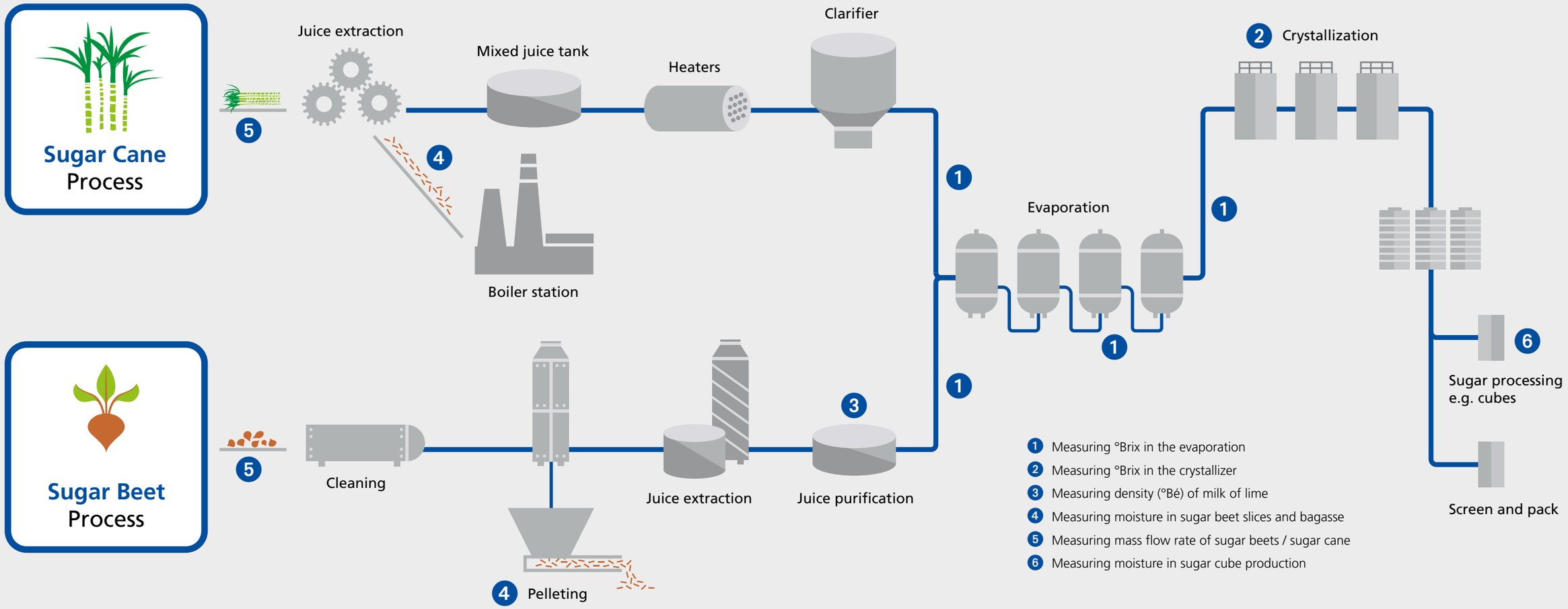
BERTHOLD

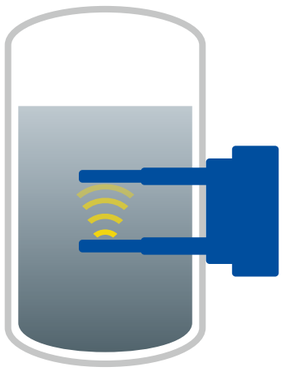
SUGAR INDUSTRY
THE APPLICATIONS

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.

Technical Features

- Reliable and continuous online concentration measurement
- No wear and tear of components as with other technologies
- °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.
- Maintenance-free system





Schematic representation of a tank installation with container probe

Schematic representation of a pipe installation with FlowCell

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 number of 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 sugar content and allow for reliable control of the evaporators.

Application Profile

- **Measurement task**
  °Brix concentration of different juices
- **Location**
  At the inlet, recirculation, or outlet of each evaporator
- **Berthold solution**
  Microwave system, e.g. MicroPolar LB 565 with FlowCell or container probe

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, recirculation, or outlet of each evaporator
- Microwave FlowCell installed in the pipeline
- Highly representative results due to proven and state-of-the-art microwave measuring technology

MEASURING °BRIX
IN THE CRYSTALLIZER

The thick juice is heated in the crystallization process under vacuum conditions. When a certain concentration is reached, the juice is seeded with tiny sugar crystals to enhance the growth of uniform crystals. With the microwave measuring systems from Berthold, the juice concentration (°Brix) is monitored throughout the crystallization process and a precise determination of the seeding point can be determined. 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. Even after the final crystallization stage the °Brix concentration of the massecuite is still measured. In this case the system is positioned after the pump at the outlet pipe, after the product has passed through the pump.

Application Profile

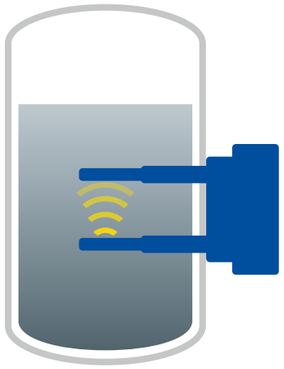
- **Measurement task**
  °Brix concentration of sugar juice and massecuite
- **Location**
  Discontinuous and continuous crystallizers – vertical and horizontal; e.g. in each compartment, massecuite outlet
- **Berthold solution**
  Microwave System, e.g. MicroPolar LB 565

Customer Benefit

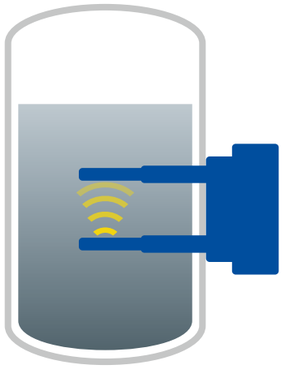
- Very precise and repeatable determination of seeding point
- Uniform sugar crystals and improved quality
- Reliable control during whole crystallization process
- Continuous production, without process downtime

Characteristics

- Side or bottom installation of container probe in crystallizer tanks, compartments or outlet pipe
- High resolution through focused measurement signal
- Integrated temperature control for operation in batch process
- Robust sensor elements with integrated flushing, ideal for continuous processes



Schematic representation of an installation with container probe in a cooking pan



Schematic representation of a tank installation with container probe

Schematic representation of a pipe installation with FlowCell

MEASURING DENSITY OF MILK OF LIME IN THE PURIFICATION PROCESS

After extracting the raw juice from sugar beets, the juice passes through a purification stage called carbonation. In this purification process milk of lime and carbonation gas are 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 helps sugar mills worldwide to control the concentration of milk of lime by an online measurement – either in the pipeline or in process tanks such as 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 565 with FlowCell or container probe

Customer Benefit

- Online 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
- Very accurate and repeatable measurement
- Installation options for pipes and tanks

MEASURING MOISTURE
IN SUGAR BEET SLICES AND BAGASSE

After sugar extraction, bagasse or beet pulp remains as a byproduct. 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 moisture 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

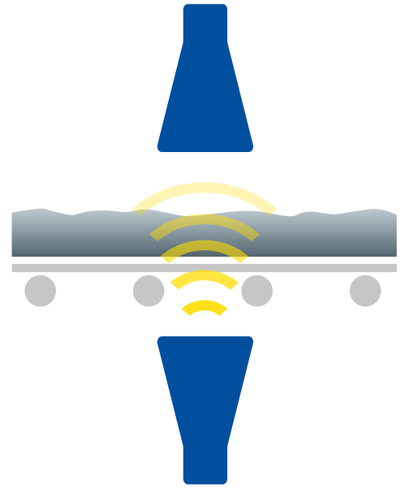
- **Measurement task**
  Dry substance / moisture of bagasse, sugar beet pulp, beet slices or pellets
- **Location**
  Measurement on a conveyor or a chute prior of after drying and processing
- **Berthold solution**
  Microwave system, e.g. MicroPolar LB 567 with horn antenna

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

- On-line determination of dry substance
- Highly representative as the entire cross section is measured
- Compensation of varying height or bulk density available for enhanced measurement performance



Schematic repesenation of the microwave measurement on the conveyor belt

MEASURING THE MASS FLOW RATE
OF SUGAR BEETS OR 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 the 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 recalibration 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 472

Customer Benefit

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

Characteristics

- 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 recalibration

Schematic repesenation of the bulk flow measurement on the conveyor belt

MEASURING MOISTURE
IN SUGAR CUBE PRODUCTION

When sugar cubes are produced a certain amount of water is added to the sugar crystals. To guarantee a smooth production process the moisture content of the sugar crystals 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 measuring system based on microwave measuring 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

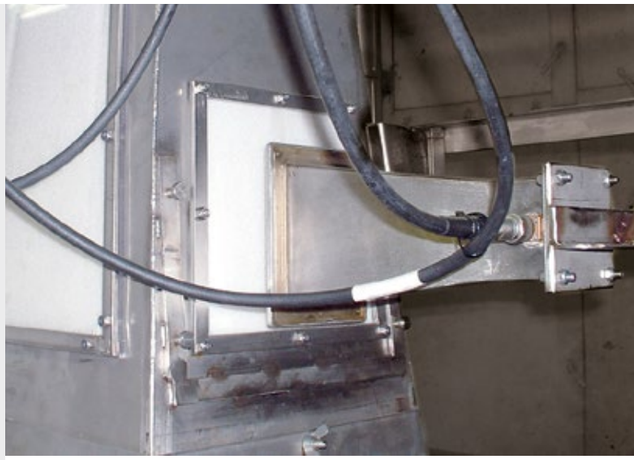
- **Measurement task**
  Moisture of sugar crystals
- **Location**
  Chute installation, prior to the forming machine
- **Berthold solution**
  Microwave system, e.g. MicroPolar LB 567 with horn antenna

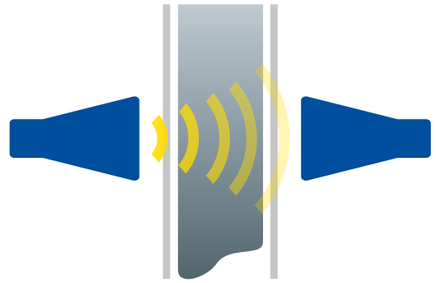
Customer Benefit

- 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
- Accurate and long-term stable





Installation on a shaft or chute with horn antennas

THE BERTHOLD MICROWAVE SYSTEM
FOR THE SUGAR INDUSTRY

FlowCell

- Microwave measurement covers the entire pipe cross-section
- Nominal sizes from DN 50 to DN 150
- Common connection variants
- Replaceable antennas, also availabel with 3A certification
- EHEDG certification

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 PEEK caps (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 PEEK caps (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

THE EXPERTS
IN MEASUREMENT TECHNOLOGY

Berthold Technologies stands for excellent know-how, high quality and reliability. The customer is always the focus of our solution.
Using our varied product portfolio, our enormous specialized knowledge and extensive experience, we develop suitable solutions together with our customers for new, individual measurement tasks in a wide variety of industries and applications. Berthold Technologies is specialised in radiometric process measurements for 75 years. More than 30 years ago Berthold expanded their portfolio and introduced microwave technology to the sugar industry. Today sugar mills worldwide depend on measurement solutions from Berthold. Our expertise in microwave technology is one of our core competences – the vast amount of systems in operation in the sugar industry worldwide speaks for itself.

We are here for you – worldwide!
The engineers and service technicians from Berthold Technologies are wherever you need them. Our global network assures you fast and above all competent and skilled assistance in case of need. No matter where you are, our highly qualified experts and specialists are ready and waiting and will be with you in no time at all with the ideal solution for even the most difficult measurement task.

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