MEASUREMENT SOLUTIONS FOR THE MINING INDUSTRY

Improve your production with cost-effective and robust measuring solutions



BERTHOLD

MINING & MINERAL PROCESSING

As a technology leader in radiometric measurement solutions, Berthold provides a wide range of analysers for the mining and mineral processing industry. Our portfolio includes non-contact measurement systems for level, mass flow, density, moisture, potassium, and solids content determination. These solutions provide reliable real-time process information for improved process control, higher plant efficiency, and reduced operating costs.

Contactless – the cost-effective solution

All measurement solutions are non-contact and therefore non-invasive and non-intrusive. Installed outside the process, they are unaffected by abrasive, corrosive, dusty, or sticky process media. This ensures reliable long-term performance with minimal maintenance requirements and no impact on the process itself.

- Easy installation
  - No process interruption
  - No modifications required
- Wear- and maintenance-free operation

Features

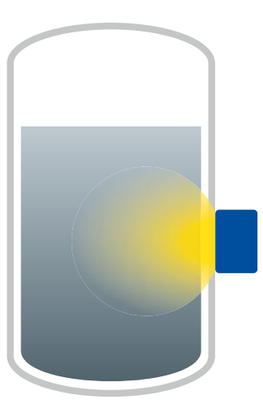
- Online measurement: real-time process information
- Excellent reading stability: no need for frequent recalibration
- Ruggedness: no moving parts
- High reliability: high accuracy with very good reproducibility
- Outstanding sensitivity: excellent results even with remarkably low source activities

The Applications

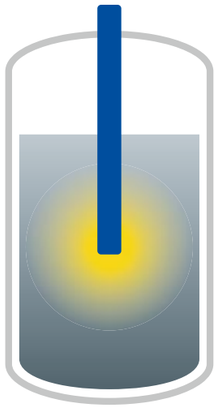
- Measuring the potassium content in the potash industry
- Measuring the density of slurries and suspensions
- Measuring the moisture in bulk solids
- Measuring the mass flow on conveyors
- Measuring the density for dredging applications
- Measuring the level in autoclaves
- Measuring the solids content in the thickener



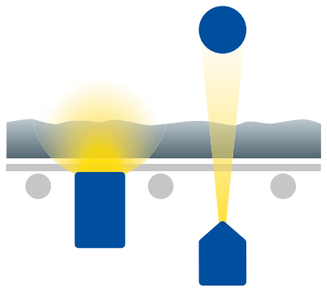




Surface mount probe



Insertion into dip tube



Conveyor belt mounting

MEASURING POTASSIUM CONTENT
IN THE POTASH INDUSTRY

Accurate measurement of the potassium content is essential in potash production, as it directly impacts product quality and process efficiency. Reliable real-time information enables optimized processing and supports consistent product composition.
Potassium concentration is measured by detecting the gamma radiation emitted by the naturally occurring radioactive isotope K-40. This measurement is particularly challenging because K-40 is present in very low concentrations within the ore. Detecting it requires highly sensitive measurement technology capable of suppressing the inherent background radiation in order to obtain an optimal signal-to-noise ratio. Berthold's radiometric potassium analyzer is specifically designed for this demanding application. Its high sensitivity and long-term stability ensure accurate and reliable potassium content measurements for effective process control and quality assurance.

Application Profile

- **Measurement task**
  Potassium content
- **Location**
  Potash production process
- **Berthold solution**
  Radiometric potassium analyser

Customer Benefits

- Real-time indication of potassium content and purification progress
- Continuous online measurement in %KCl or %K_2O
- Optimized process efficiency and product recovery
- Consistent product quality through reliable process monitoring

Special Features

- High sensitivity and excellent long-term stability
- Easy installation on existing vessels, tanks, or pipelines
- Internal (dip pipe) or external detector mounting options
- Remote evaluation unit installation in the control room possible
- Different detector types allow the optimal measurement solution



MEASURING THE DENSITY
OF SLURRIES AND SUSPENSIONS

Accurate control of slurries and suspensions is essential for efficient mineral processing and transport. Maintaining the optimal ratio of solids to liquid helps maximize throughput, reduce wear on pipelines and pumps, and avoid unnecessary water consumption. Continuous monitoring provides the real-time process information required to maintain stable operating conditions and optimize plant performance. Non-contact radiometric technology is ideally suited for abrasive, corrosive, or viscous media, where conventional sensors often reach their limits.
Berthold's measurement systems provide reliable information on density, concentration, and solids content directly in pipelines. Their exceptional long-term stability and maintenance-free operation support efficient process control and maximum process availability.

Application Profile

- **Measurement task**
  Density of slurries and suspensions
- **Location**
  At pipelines
- **Berthold solution**
  Radiometric density measurement

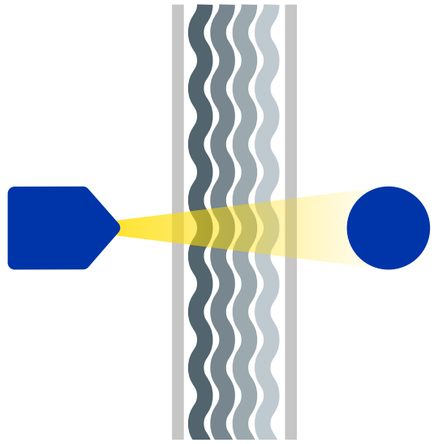
Customer Benefits

- Optimized process control through continuous density monitoring
- Increased lifetime of pipelines and pumps
- No disturbance of flow properties by the measurement
- Reliable operation without frequent recalibration
- One-point calibration possible

Special Features

- Non-contact, clamp-on installation outside the pipe
- Not affected by abrasive, corrosive, or viscous media
- High long-term stability and measurement accuracy





Standard arrangement ideal for medium and large pipe diameters

MEASURING THE MOISTURE
IN BULK SOLIDS

Accurate determination of the moisture content in bulk materials – such as ores, coal, concentrates, or aggregates – is essential in mining operations. In many cases, the moisture content influences the thermal control or stoichiometric balance of a process and significantly affects material handling, processing efficiency, and downstream processes such as crushing and screening. To ensure stable operations, online moisture measurement systems are crucial. Microwave-based solutions enable continuous, non-contact monitoring on conveyor belts, while neutron moisture measurement provides a reliable solution for storage environments such as bunkers, stockpiles, or silos. Both technologies deliver real-time moisture values, allowing precise adjustments to process parameters. This helps reduce material losses, optimize energy consumption, and improve process stability and throughput.

Application Profile

- **Measurement task**
  Moisture content of ore or virtually any mining-related bulk solid material
- **Location**
  In silos, chutes, or direct on conveyor belts
- **Berthold solution**
  Neutron moisture measurement *
  Microwave moisture measurement **

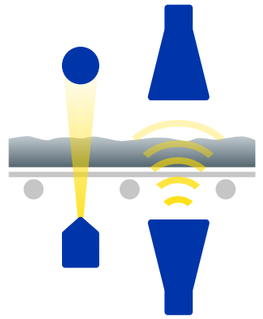
Customer Benefits

- Real-time moisture measurement on conveyors (microwave) and in storage (neutron)
- E.g. improved thermal control of blast furnace operations
- Optimized process control through precise moisture values for blending and material handling
- Known moisture content when offering or loading bulk materials

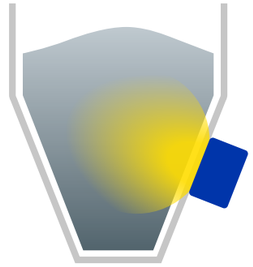
Special Features

- Continuous, non-contact measurement of the entire material cross-section on conveyor belts *
- Large measuring volume for representative moisture measurement in silos, bunkers, or chutes **
- Easy to install or retrofit on existing vessels or conveyors
- No need for frequent recalibration





Microwave moisture measurement with horn antennas and radiometric bulk density compensation



Neutron moisture measurement with surface probe on conveyor

MEASURING THE MASS FLOW
ON CONVEYORS

Conveyors are widely used in mining operations to transport bulk materials continuously over long distances. Accurate knowledge of the actual material throughput is essential for efficient process control, production planning, and optimized plant performance. However, obtaining reliable throughput information can be challenging. Conventional weighing systems are often affected by external influences such as varying belt tension, vibrations, or mechanical wear, which can compromise measurement accuracy.
Berthold's radiometric mass flow measurement systems provide accurate and continuous throughput monitoring using non-contact technology. Their outstanding long-term stability ensures reliable process information over many years of operation without the need for frequent recalibration.

Application Profile

- **Measurement task**
  Mass flow
- **Location**
  At conveyer systems
- **Berthold solution**
  Radiometric belt weigher /
  Mass flow measurement system

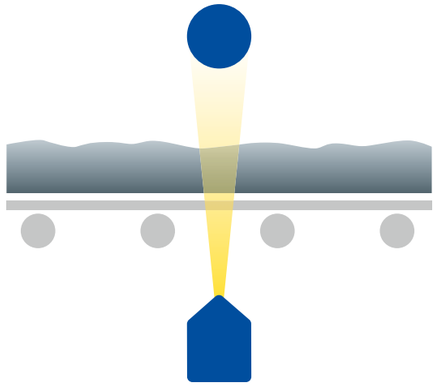
Customer Benefits

- Accurate real-time information on load and throughput
- Optimized process control and production efficiency
- Easy integration into existing conveyor systems
- Reliable operation without frequent recalibration

Special Features

- Not affected by varying belt tension, vibrations or bumps
- Suitable for all conveyor types and bulk materials
- High long-term stability and accuracy





Typical arrangement of a radiometric belt weigher to measure the bulk flow of e.g. overburden

MEASURING THE DENSITY
FOR DREDGING APPLICATIONS

Efficient dredging operations require continuous monitoring of the solids concentration in the transport pipeline. Maintaining the optimal balance between density and flow rate helps maximize production, reduce over-dredging, and lower operating costs. However, dredging applications are characterized by challenging process conditions such as vibration, changing particle sizes, varying material compositions, and harsh environmental influences. Reliable process information is therefore essential for stable and efficient operation.
Berthold's radiometric density measurement system provides accurate online monitoring of solids concentration directly on the pipeline. Its exceptional long-term stability and maintenance-free operation ensure reliable measurement results and high operational availability over many years.

Application Profile

- **Measurement task**
  Slurry density and solids concentration
- **Location**
  Dredging applications
- **Berthold solution**
  Radiometric density measurement system

Customer Benefits

- Real-time information on solids concentration
- Reduced over-dredging and operating costs
- Optimized process efficiency and production output
- No disturbance of flow properties

Special Features

- Non-contact measurement outside the pipeline
- Not affected by vibration, weather, or varying particle size
- High long-term stability and accuracy
- Easy installation without pipeline modification
- One-Point calibration possible



MEASURING THE LEVEL
IN AUTOCLAVES

Autoclaves are key equipment in the pressure oxidation (POX) of refractory ores, where ore slurry is processed at elevated temperature and pressure to liberate valuable metals. Reliable level monitoring is essential for safe process control, stable operation, and optimal utilization of the autoclave vessel. However, these processes operate under extreme conditions. Temperatures of up to 250 °C, pressures of around 35 bar, and vessel walls up to 300 mm thick make reliable level measurement particularly challenging. Under these conditions, conventional measurement technologies often reach their limits. Berthold's radiometric level measurement systems provide continuous and reliable level monitoring under these extreme conditions. Where conventional technologies reach their limits, radiometric measurement remains the only proven solution for dependable long-term operation. Installed externally and without direct contact to the process, it ensures long-term performance while supporting safe and efficient operation.

Application Profile

- **Measurement task**
  Continuous level in autoclaves
- **Location**
  At autoclaves e.g. used for pressure oxidation
- **Berthold solution**
  Radiometric level measurement systems

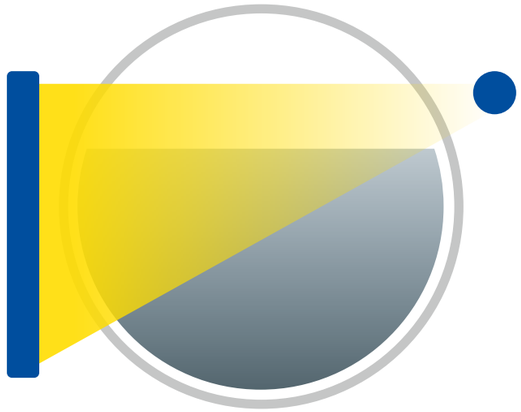
Customer Benefits

- Reliable level monitoring under extreme operating conditions
- Improved process safety and optimized autoclave utilization
- Non-contact measurement without corrosion issues
- Maintenance-free operation with high availability

Special Features

- Non-intrusive measurement
- Immune to interfering radiation with XIP or RID technology
- SIL2 / SIL3 certified option available





Standard point source / rod detector arrangement

MEASURING THE SOLIDS CONTENT
IN THE THICKENER

Large thickeners are used in mining operations to concentrate ores and minerals by separating solids from liquids. The concentrated slurry is removed via the thickener underflow and should maintain an optimal solids content to ensure efficient downstream processing. If the solids concentration becomes too high, pipes, pumps, and valves can clog or suffer excessive wear, leading to process disruptions and increased operating costs. Continuous monitoring of the underflow is therefore essential for reliable process control and stable operation.
Berthold's radiometric density measurement systems provide continuous information on solids content directly at the thickener underflow. The non-contact technology delivers reliable and highly reproducible results, enabling optimized thickener operation and long-term maintenance-free performance.

Application Profile

- **Measurement task**
  Density and solids content
- **Location**
  At the thickener underflow
- **Berthold solution**
  Radiometric density measurement

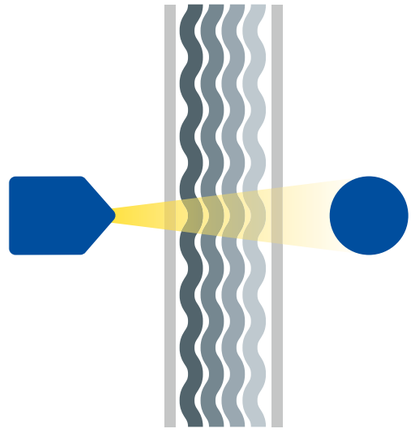
Customer Benefits

- Prevents clogging of pipes and pumps, ensuring smooth process flow
- Enables mass flow determination when combined with a flow meter
- Reduced operating and maintenance costs

Special Features

- Easy clamp-on installation on existing pipelines
- Non-contact, non-intrusive measurement
- Not affected by abrasive, corrosive, or aggressive process media
- No need for frequent recalibration





Typical arrangement of radiometric density gauge at underflow of the thickener



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.

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 when needed. 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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