

MEASUREMENT SOLUTIONS FOR THE MINING INDUSTRY

Improve your production
with cost-effective and
robust measuring solutions



 **BERTHOLD**

MINING & MINERAL PROCESSING

As technology leader in radiometric measurements, Berthold provides a wide range of analysers and measurement solutions that have been specifically designed for the mining and mineral processing industry. Our product range includes non-contacting radiometric measurement systems for level, bulk flow, density and moisture determination.

Contactless – the cost-effective solution

All measurement solutions are contactless and non-intrusive. Thus, there is no exposure to process media and therefore, our products are unaffected by acidic, caustic, abrasive, dusty or sticky conditions.

- Easy mounting on existing installation
 - No down-time
 - No modifications
- Free of wear and maintenance

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





MEASURING POTASSIUM CONTENT IN THE POTASH INDUSTRY

Potassium content measurement for the potash industry is one of the most difficult and challenging measurements in the mining industry. It is however essential in the potash production process.

Potassium contains the radioactive isotope K-40. This isotope is only found in extremely small quantities in the ore itself. Thus, the detection of the K-40 requires a highly sensitive and superior stable measurement system, which must be capable to suppress the inherent background radiation in order to obtain an optimal signal-to-noise ratio. Berthold provides with the radiometric potassium analyzer the ideal device for this challenging task.

Application Profile

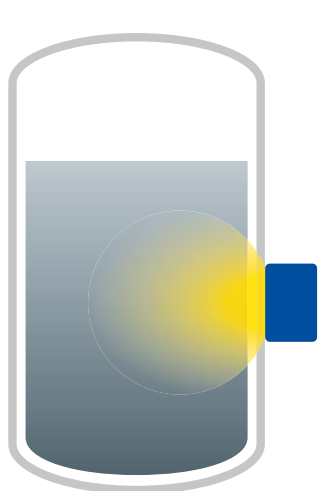
- **Measurement task**
Potassium content
- **Location**
Potash production process
- **Berthold solution**
Radiometric potassium analyser

Customer Benefits

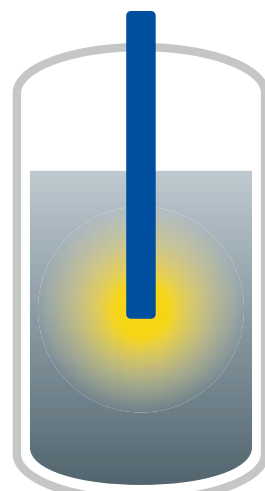
- Real-time feedback on potassium content and, thus, on material purification progress
- Online display in %KCl or %K₂O
- No corrosion, since detectors are available in stainless-steel

Special Features

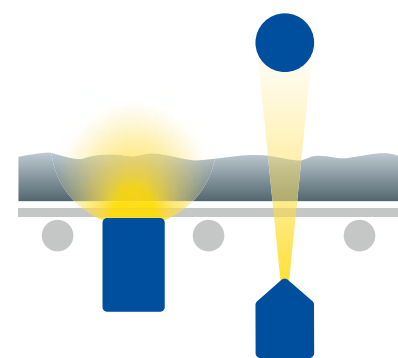
- Easy installation on existing vessels
- Mountable inside the tank or on the surface of tanks or pipes
- Evaluation unit can be installed in the control room, or in the wall housing on site
- Different detector types allow the optimal measurement solution



Surface mount probe



Insertion into dip tube



Conveyor belt mounting

MEASURING THE DENSITY OF SLURRIES AND SUSPENSIONS

Mineral slurries are often used to transport crushed material, concentrate or tailings suspended in liquid (often water) over long distances. To maintain the optimal transport in pipelines the ratio of solids and liquid needs to be kept in a tight concentration window. If the solid content is too high, the friction and therefore the stress on the pipeline and pumps would drastically increase. On the other hand, if the amount of water is too high, one would waste one of the most precious resources. Berthold provides for this application non-contacting and non-intrusive product density measurement solutions, which are therefore long-lasting and without future maintenance. The concentration, density and solid content of slurries and suspensions are measured continuously.

Application Profile

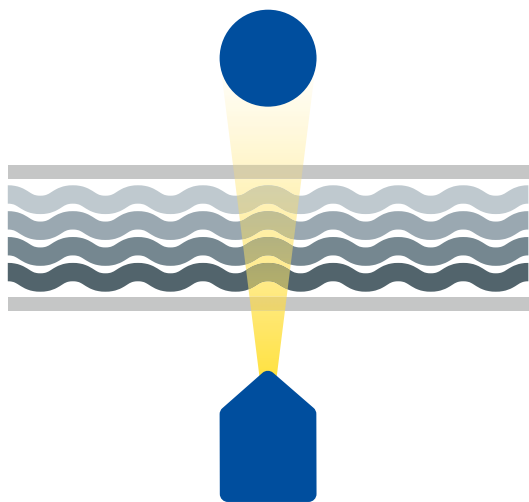
- **Measurement task**
Density of slurries and suspensions
- **Location**
At pipelines
- **Berthold solution**
Radiometric density measurement

Customer Benefits

- No disturbance in the flow properties by the measurement
- Ideal solution for process optimization which increases the lifetime of pipelines
- Small measuring ranges possible

Special Features

- Easy to install clamp-on system
- Not affected by aggressive process media, such as abrasive, corrosive and viscous slurries and suspensions



Standard arrangement ideal for medium and large pipe diameters

MEASURING THE MOISTURE IN BULK SOLIDS

The accurate information about the moisture content in bulk solids is of great importance for controlling many different processes. In many cases the moisture content of the material influences the thermal control or stoichiometric balance of a process. Here an online measurement can be installed in bunker or direct at a conveyor belt to provide real-time information about the moisture content. Furthermore, accurate moisture measurement is also often important when offering or loading bulk material by weight.

Application Profile

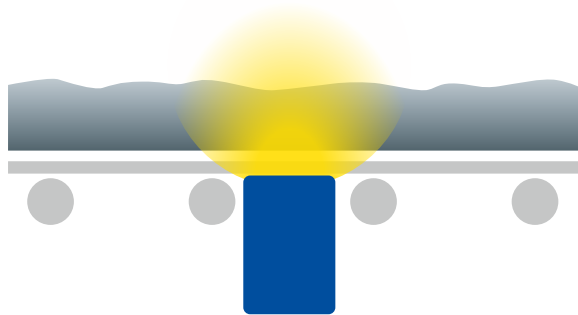
- **Measurement task**
Moisture content of ore or virtually any mining industry relevant bulk solid material
- **Location**
In silos, chutes, or direct on conveyor belt
- **Berthold solution**
Neutron moisture measurement system

Customer Benefits

- Improved thermal control the blast furnace operation
- Known moisture content when offering/loading bulk solid material

Special Features

- Large measuring volume provides representative measurement
- Easy to install or retrofit on existing vessels or conveyers
- No need for frequent recalibration



Moisture measurement with surface probe on conveyor

MEASURING THE MASS FLOW ON CONVEYORS

The use of conveyors in the mining and mineral processing industry is one of the most effective ways of transporting bulk materials (e.g. overburden) continuously over long distances. In order to optimize relevant processes, the amount of material transported by conveyors needs to be monitored and controlled. By combining the measured conveyor load with a velocity signal, accurate information of the bulk flow can be achieved. Using Berthold's bulk flow measuring systems, the mass flow of solids on conveyors can be measured continuously by means of contactless technology. The measurement performance remains very stable over years of operation. Thus, frequent recalibrations are not required.

Application Profile

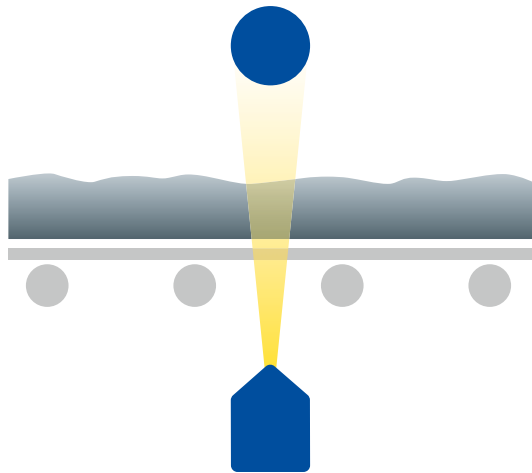
- **Measurement task**
Bulk flow
- **Location**
At conveyor systems
- **Berthold solution**
Radiometric belt weigher /
Bulk flow measurement system

Customer Benefits

- All-time control over current load and throughput
- Ideal solution for process optimization
- Without major modifications to the conveyor

Special Features

- Not affected by varying belt tension, vibrations or bumps
- No need for frequent recalibration



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

DENSITY MEASUREMENT FOR DREDGING APPLICATIONS

Berthold has the solution for this difficult measurement. The radiometric density measuring system is used for online monitoring of the solid concentration. Extreme measuring conditions like vibration, weather or varying particle size and composition don't effect the measuring performance. Due to the sophisticated stabilization of the detector performance, the highly accurate measuring results are guaranteed for many years of operation and no maintenance is required at any time. With thousands of systems in operation worldwide, Berthold's density measuring system has proven to be a reliable solution for dredging applications, providing high levels of accuracy and operational safety.

Application Profile

- **Measurement task**
Online monitoring of the density
- **Location**
Dredging applications
- **Berthold solution**
Radiometric density measurement system

Customer Benefits

- Real-time information helps to maintain the optimal ratio of density and flow rate
- Ideal solution to reduce over-dredging and operational costs
- Flow properties are not affected due to the non-contacting technology

Special Features

- Not affected by extreme conditions like vibration, weather, or varying particle size
- Easy installation without pipeline modification



MEASURING LEVEL IN AUTOCLAVES

Autoclaves are commonly used in the mining industry as pre-treatment solution. For example, in ore plants a process called pressure oxidation is used for extracting metals out of refractory ores. In order to enable the oxidation reaction, the refractory ore is fed to the autoclave as a slurry, where it is treated at elevated temperature and pressure. For this pre-treatment method, the level of ore slurry needs to be monitored continuously to guarantee a save and optimized procedure and utilization of the autoclave. Due to the temperature (200–250 °C) and pressure (approx. 35 bar) conditions the walls of those autoclaves are too thick (around 300 mm) to apply conventional measurement solutions. Radiometric level measurement is the only technology to provide long-term, reliable results under those extreme conditions and measures continuously the level.

Application Profile

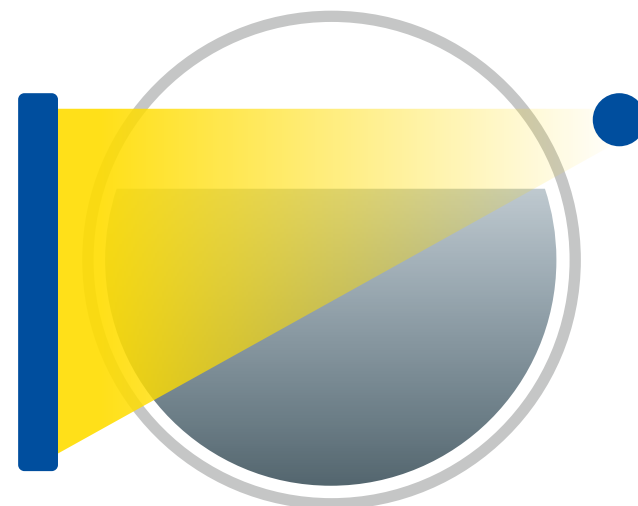
- **Measurement task**
Continuous level in autoclaves under aggressive conditions
- **Location**
At autoclaves e.g. used for pressure oxidation
- **Berthold solution**
Radiometric level measurement systems

Customer Benefits

- Reliable level control
- Process optimization: Improvement in safety and utilization of the autoclave
- Non-intrusive, hence no corrosion issues

Special Features

- Standard: point source / rod detector arrangement
- Immune to interfering radiation, XIP or RID facilitates operation during weld inspections
- SIL2 /SIL3 certified option



Standard point source /
rod detector arrangement

MEASURING THE SOLIDS CONTENT IN THE THICKENER

Large volume thickening tanks are used in mining to concentrate the ore or minerals contained in sludge. Solids settle at the bottom of the thickener and from there they will be removed from the vessel via an underflow outlet. The sludge leaving the thickener should have a fairly high solids content. However, pumps and pipes can become clogged if too many solids are withdrawn at once.

The solids content in the underflow is monitored continuously by the radiometric density measurement. The robust device provides reliable measurements with excellent accuracy and reproducibility over many years.

Application Profile

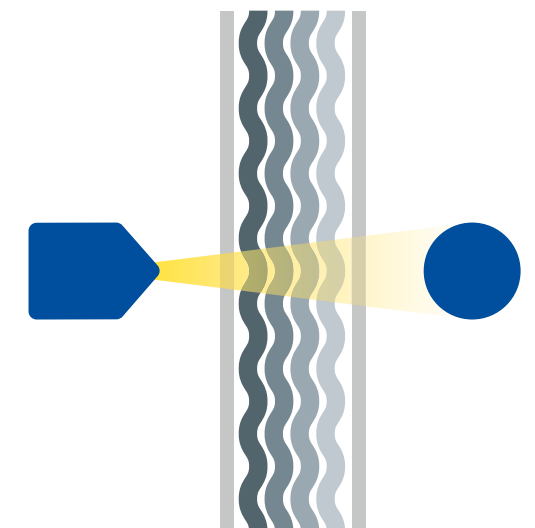
- **Measurement task**
Density and solids content
- **Location**
At the underflow of the thickener
- **Berthold solution**
Radiometric density measurement

Customer Benefits

- Prevents clogging of pipes and pumps, therefore ensures smooth process flows
- Perfect control of the feeding rate of the thickener, the rotation of the scraper and the addition of flocculant
- Together with a flow meter the mass flow exiting the thickener can be determined

Special Features

- Easy to install on the pipeline exiting the thickener by clamp-on system
- Not affected by aggressive process media



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. We know our business!

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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