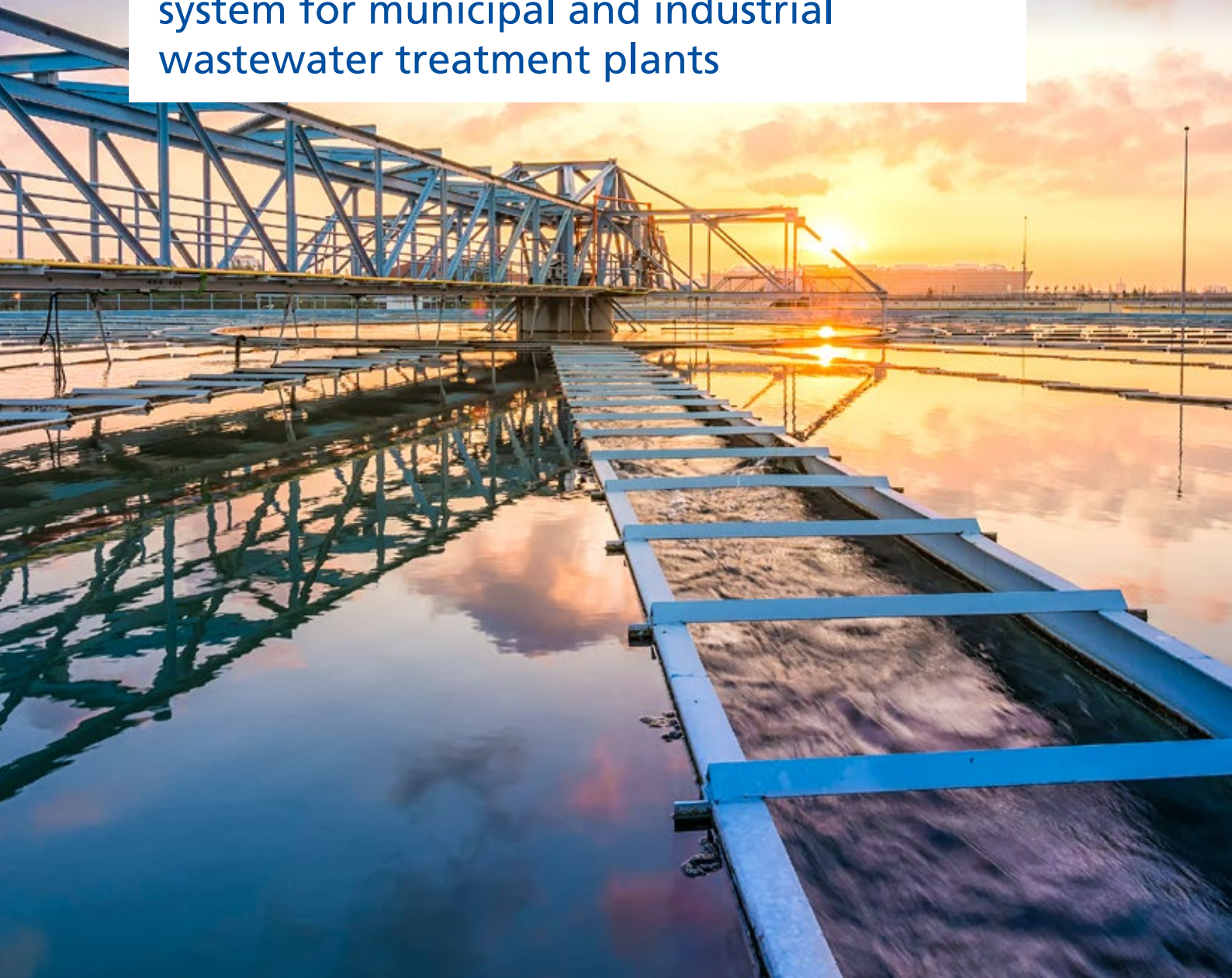


MEASUREMENT SOLUTIONS FOR WASTEWATER TREATMENT

Process optimisation with online measuring
system for municipal and industrial
wastewater treatment plants



 **BERTHOLD**

WATER TREATMENT

IN THE SEWAGE TREATMENT PLANT

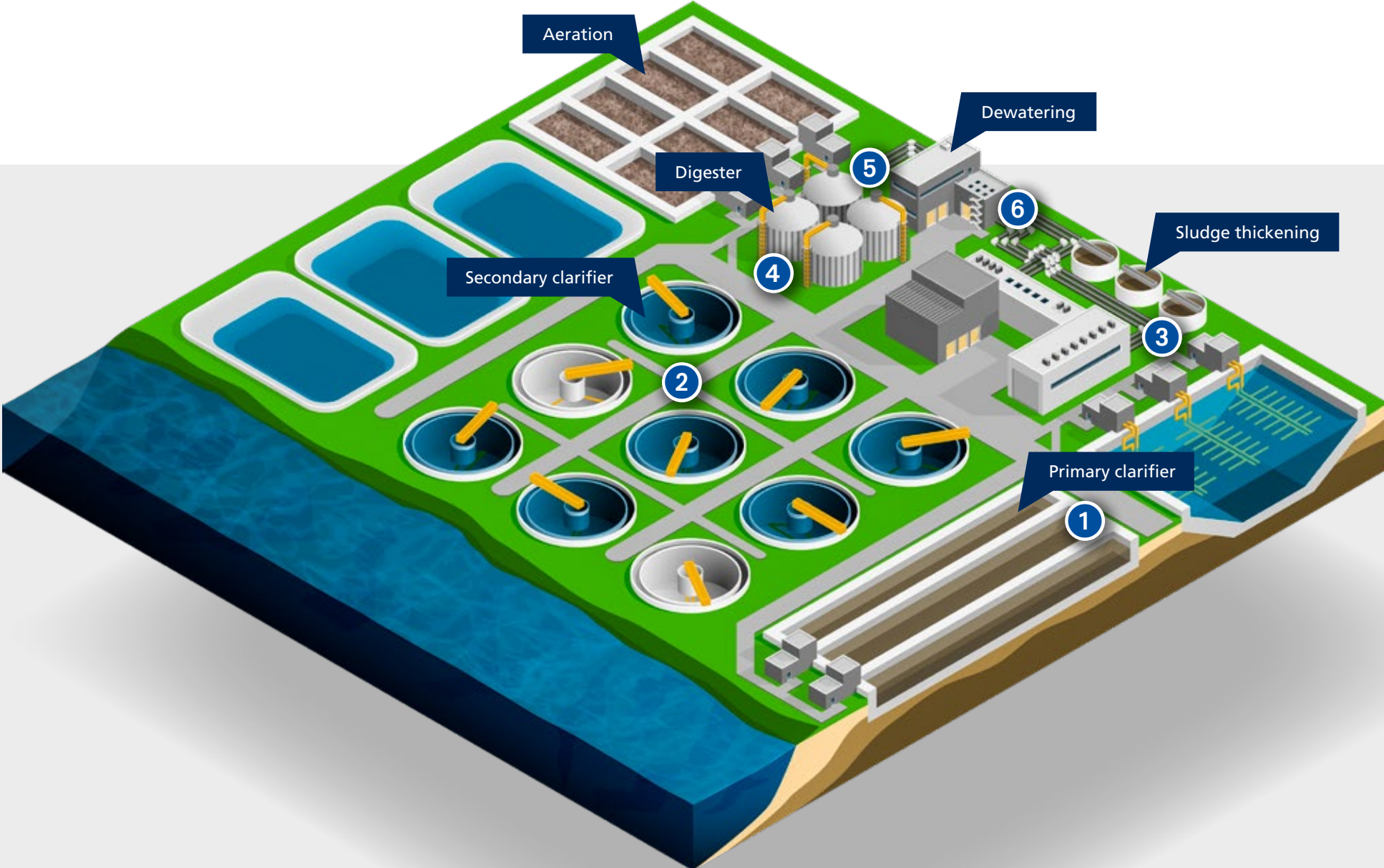
A wastewater treatment plant typically consists of mechanical, biological, and chemical treatment stages. These three processes produce various types of sludge that require special treatment.

The experts for measurement solutions

Berthold's microwave system is wear- and tear-free and thus perfectly tailored to applications in wastewater treatment. Regardless of whether information on the concentration of total solids or water content is required, all our devices distinguish themselves by their high accuracy and reliability.

Technical features

- Reliable online total solids measurement
- Representative output with microwave transmission measurement through entire pipe or through product stream
- No wear of components
- Precise measurement with only one calibration coefficient even with different sludges
- Automatic temperature compensation
- Maintenance-free measuring system



The Applications

- 1 Total solids concentration on primary sludge
- 2 Total solids concentration on secondary sludge
- 3 Total solids concentration during thickening
- 4 Total solids concentration at the digester
- 5 Total solids concentration at the sludge inlet for dewatering
- 6 Total solids concentration at the sludge outlet after dewatering



TOTAL SOLIDS MEASUREMENT ON PRIMARY SLUDGE

After gross impurities, grease and sand have been separated, organic matter and undissolved particles are transferred to a settling tank for sedimentation. The primary sludge produced here is transported either directly to the digestion tower or to the thickener for further treatment.

When transporting the sludge to the digestion tower, it is necessary to know the exact dry content, which thus leads to an exact calculation of the sludge load and an optimal anaerobic digestion process. Flocculants are added to further thicken the sludge which ensures maximised concentration.

Application Profile

- **Measurement task**
Total solids measurement on primary sludge
- **Location**
Sludge discharge downstream of the clarifier
- **Berthold solution**
Microwave system MicroPolar with FlowCell

Customer Benefits

- Determination of the actual dry content for further process steps
- Optimisation of the fermentation process
- Efficient pump utilisation
- Non-optical measurement, therefore unaffected by impurities

Special Features

- Expected accuracy < 0.2 wt.% solids content (standard deviation).
- Applicable for industrial or municipal wastewater



Schematic representation of the pipe installation with FlowCell

TOTAL SOLIDS MEASUREMENT AT THE SECONDARY CLARIFIER AND RETURN SLUDGE

Sludge activation and the secondary clarification are frequently the next process unit. After aeration, the sludge is fed into the secondary clarifier and settled. In this tank, different zones are formed, consisting of purified water and sludge layers. A portion of the sludge is returned for aeration and the heavy settled sludge (secondary sludge) is directed to the thickener. The measuring system monitors both the returned sludge concentration as well as the solids content. Reliability is not influenced by sludge composition or particle size.

Application Profile

- **Measurement task**
Total solids measurement in the return and secondary sludge
- **Location**
Return sludge pipe for aeration,
Sludge discharge for further treatment
- **Berthold solution**
Microwave system MicroPolar with FlowCell

Customer Benefits

- Increased efficiency of the biological stage
- Reliable determination of the dry substance of the excess sludge
- Non-optical measurement, therefore unaffected by impurities

Special Features

- Maintenance-free measuring system
- Expected accuracy < 0.2 wt.% solids content (standard deviation)



TOTAL SOLIDS MEASUREMENT DURING SLUDGE THICKENING

In this process step, the primary sludge of the primary clarification, as well as the excess sludge from the secondary clarification tank are collected and concentrated to a dry matter between 4 – 8 wt.% suitable for anaerobic digestion. This can be achieved either by using decanters or centrifuges or by gravity alone in the thickener basin. To achieve a better rate of dewatering, a flocculating agent is added to the sludge during dewatering. Prior to addition, the solids content is determined by microwave measurement to not only optimise the dosing but also to monitor solid content in the feed to control for constant solids loading.

Application Profile

- **Measurement task**
Total solids measurement on primary and secondary sludge
- **Location**
Collection pipeline before the thickener
- **Berthold solution**
Microwave system MicroPolar with FlowCell

Customer Benefits

- Reduce costs by optimising polymer and flocculant addition
- Non-optical measurement, therefore unaffected by impurities

Special Features

- Reliable measurement with only one calibration factor even with different slurries
- Automatic temperature compensation
- Maintenance-free measuring system



TOTAL SOLIDS MEASUREMENT AT THE DIGESTION PROCESS

After the sludge has been thickened, it is still biologically active. Through the anaerobic digestion process, digestion gas is produced with the help of microorganisms. After about 20 days in the digestion tower, the sludge is stabilised and removed from the process for further treatment. To run the process as efficiently as possible, it is necessary to know the exact dry content in the inlet, because the digester gas yield depends, among other things, on the dry matter. Berthold's microwave-based systems provide real-time solids content and enable reliable monitoring and optimisation of the digestion process.

Application Profile

- **Measurement task**
Total solids measurement prior to the digester
- **Location**
Feed to the digestion tower
- **Berthold solution**
Microwave system MicroPolar with FlowCell

Customer Benefits

- Precise determination of the dry content in the inlet of the digestion tower
- Increase in gas yield
- Reduction of heating costs by reducing the amount of water in the digestion tank
- Non-optical measurement, therefore unaffected by impurities

Special Features

- Representative measurement results by recording the entire material flow in the pipeline
- No wear of components



TOTAL SOLIDS MEASUREMENT DURING SLUDGE DEWATERING

The biologically stabilised sludge must be dewatered to a higher level of concentration for further treatment and disposal. To achieve optimum dewatering, high capacity centrifuges or decanters are used. With the addition of flocculants, this mechanical process can bring the sewage sludge to a dry content of 25 – 40 wt.%. Prior to the addition, the solids content is determined by a microwave measurement, which enables an ideal dosage adjusted to the sludge. This ensures considerable savings in flocculation aids and considerably reduced operating costs for dewatering.

Application Profile

- **Measurement task**
Total solids measurement during sludge dewatering
- **Location**
Inlet pipe for dewatering or outlet pipe for disposal
- **Berthold solution**
Microwave system MicroPolar with FlowCell

Customer Benefits

- Precise determination of the dry content in the inlet and outlet of the centrifuge
- Increase in sewage sludge yield
- Reduction in the use of chemicals
- Non-optical measurement, therefore unaffected by impurities
- Automation of the dewatering process
- Reduction of transport costs
- Electricity savings through shorter pumping times



BERTHOLD'S MICROWAVE SYSTEMS FOR SEWAGE TREATMENT PLANTS AND WASTEWATER



MicroPolar

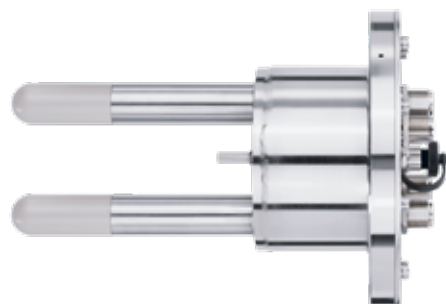
The heart of our microwave measuring systems is the transmitter. It is the result of many years of experience and know-how. We offer this unit for the following applications:

- Primary sludge
- Return sludge
- Secondary sludge
- Thickened sludge
- Stabilised sludge



FlowCell

- Covers the entire pipeline cross-section
- Nominal diameters from DN 50 to DN 150
- Standard connection variants
- Standard connection with weldable ends
- Exchangeable antennas
- Maintenance-free



Container Probe

- Sensor for installation in containers or pipelines
- Integrated Pt100 for temperature compensation
- Various flanges available
- Extremely abrasion-resistant plastic
- Replaceable end caps if necessary
- Integrated reference line for a trouble-free measurement



MICROWAVE MEASUREMENT THE MEASURING PRINCIPLE

The MicroPolar microwave measuring system uses the dielectric property of water. The measuring system generates microwaves that interact with the dipolar water molecules and causes them to rotate. This interaction causes an attenuation of the microwave energy, which can be detected as phase shift and attenuation. Since the phase shift and attenuation change is directly proportional to the water content, the concentration of the medium can be determined with high accuracy.

Berthold's superior multi-frequency technology provides very stable and reliable measurements that are unaffected by interfering reflections or resonances. The microwave power of a MicroPolar measurement system is so low (max. 10 mW) that the material being measured is neither heated nor altered in any way.



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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