Save resources, reduce costs

Continuous in-line measurement of total solids for optimizing sludge treatment with Proline Teqwave MW 300/500

Endress+Hauser

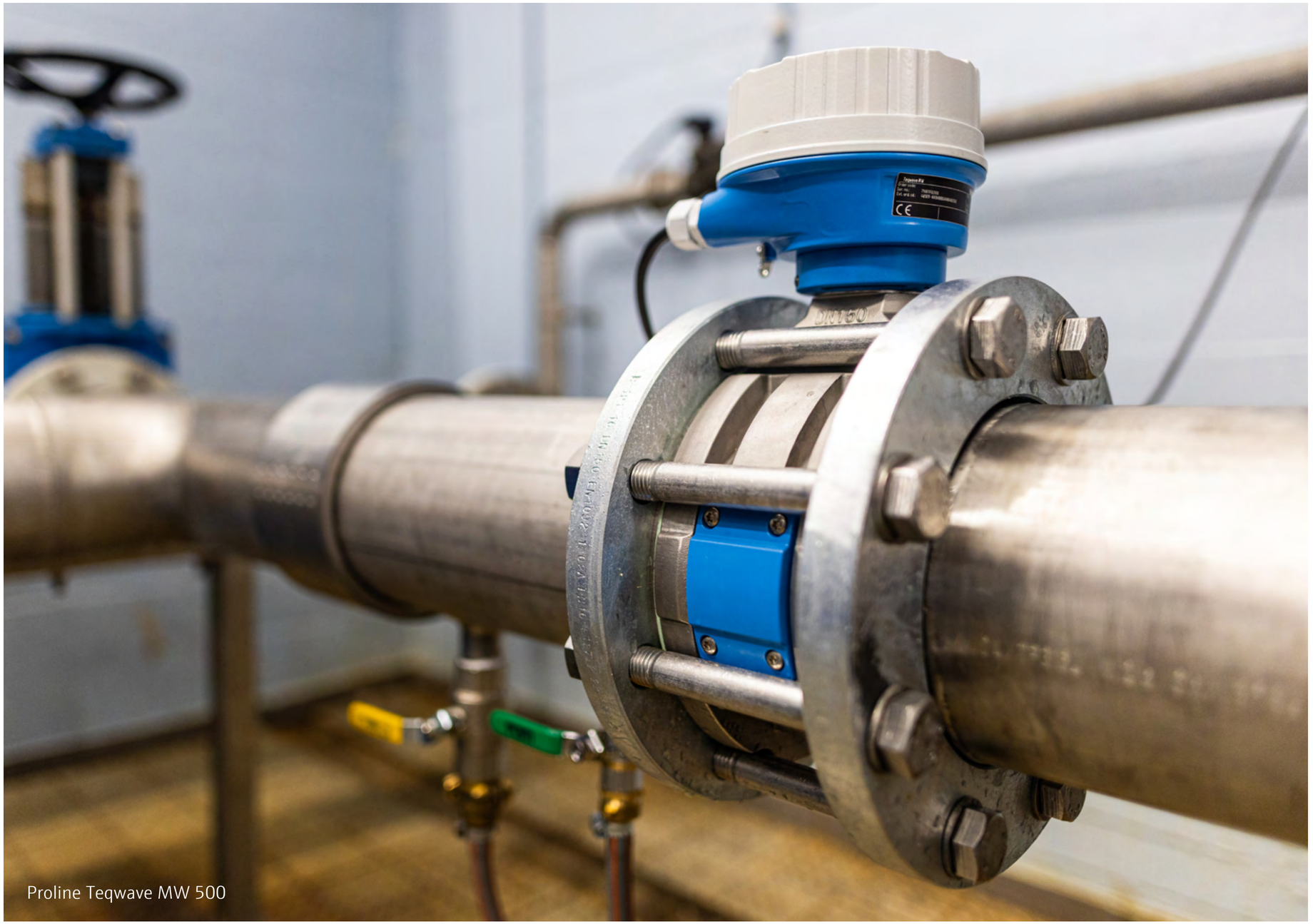
Proline Teqwave MW 300/500

How can sludge treatment processes be optimized and thus resources and costs be saved?

The in-line measuring device Proline Teqwave MW 300/500 from Endress+Hauser determines the total solids content of wastewater in waste-water treatment plants directly through micro-wave transmission. It offers a clear advantage over the time-consuming process of determining the total solids content in the laboratory. The continuously available measured values and short response times enable optimizations in the process from primary sludge to dewatered sludge. Thanks to real-time measurement, problematic operating conditions can be detected early.

Teqwave MW 300 product website

Teqwave MW 500 product website



Proline Teqwave MW 500

Benefits at a glance

The customer needs are at the center of our device development. Great value is put on tackling their unique challenges so that we can maximize customer benefit.

Teqwave MW 300/500 therefore features a variety of advantages and functions from which customer processes could benefit.

Integrated load rate calculation
Continuous calculation of the load rate (e.g., in kg/h, lb/h, etc.) in wastewater when combined with a flowmeter

Permanent in-line measurement
Real-time monitoring and control of the process based on the total solids content without interruptions or time delays caused by laboratory samples

Optimized phase separation
Increased total solids content through more efficient pump control and thus reduce energy consumption

Fewer lab probes
Decreased number of time-consuming laboratory analyses for process control

Reduced build-up
Minimized build-up on the sensor thanks to a polished measuring tube and extend required cleaning intervals

Less flocculant
Dosing of flocculant according to the current total solids and thus around 20 percent less material consumption in typical applications

Latest technology
High-tech, easy-to-set-up measuring technology with web server (optional WLAN) and Heartbeat Technology

Lower disposal costs
Reduced transport and disposal costs for burning thanks to an increased total solids content (less water) in dewatered sludge

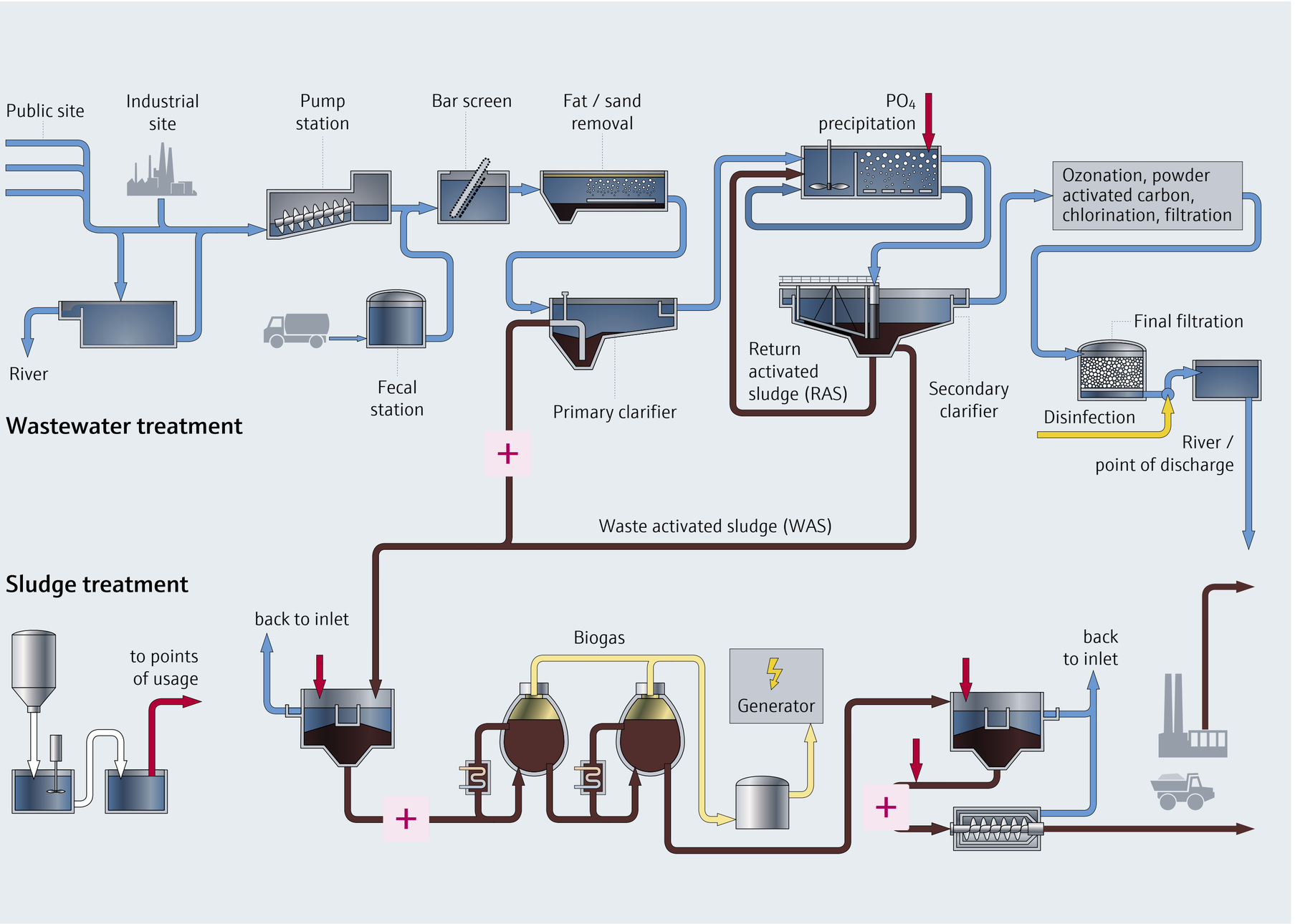
Challenges in wastewater

As in many companies, in addition to operational safety, cost efficiency plays an important role in wastewater treatment plants. A key to this is monitoring the total solids content in wastewater in the different process steps. Continuously available measured values make it possible to optimize separation into solid and liquid components while also increasing operational safety.

Wastewater treatment plant operators can respond quickly to changes in the total solids content in wastewater thanks to the in-line measurement with Teqwave MW 300/500. This is an advantage compared to lab probes, which only return results for process optimization after a delay. Processes can run both autonomously and safely thanks to measurement in real time.

Applications in wastewater

Teqwave MW 300/500 can be used at multiple points in wastewater sludge treatment to determine the current total solids content in wastewater. The measuring points are highlighted in the overview (+).

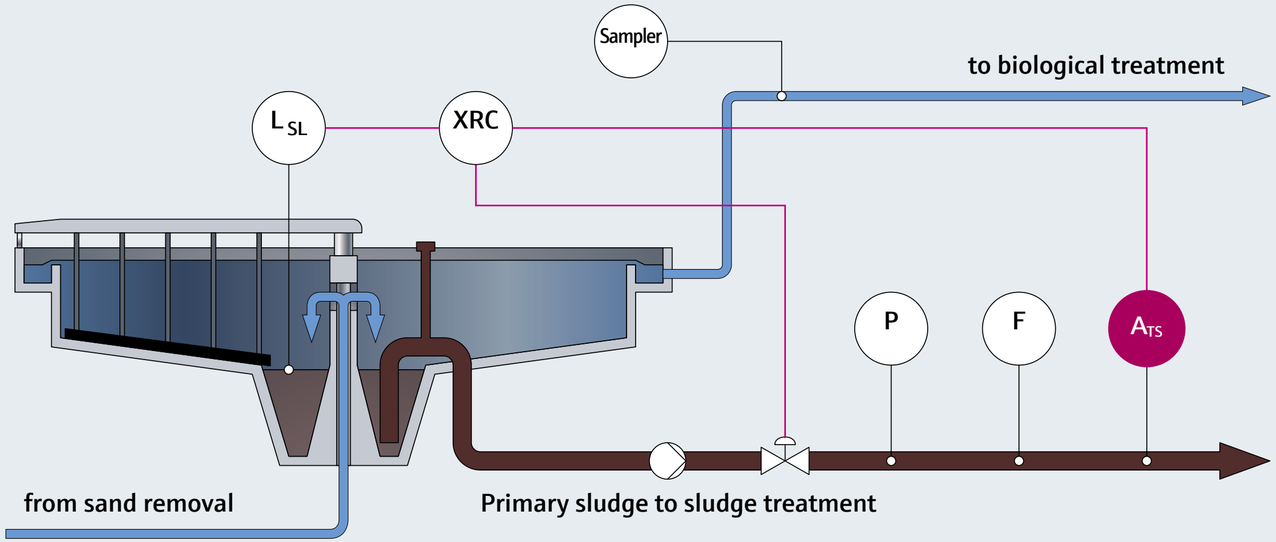


- Primary clarifier
- Digester
- Dewatering

Primary clarifier

Primary sludge settles on the bottom of the primary clarifier due to the reduced flow velocity and is pushed by a scraper into a collection chamber. It is then pumped to the sludge treatment area using water. This usually happens in regular intervals of equal length, during which the current total solids content of the sludge mixture is unknown. As a result, the water portion may be significantly increased due to excessive pumping processes, making the later phase separation difficult.

In addition, there is increased formation of build-up in the piping, which makes reliable results for in-line measurement more difficult and requires more frequent cleaning intervals.



Your challenge
Measuring task: Total solids measurement
Measuring point: Primary sludge
Fluid: Sludge mixture
Process temperature: 0 to 40 °C (3 to 104 °F)
Process pressure: Up to 3 bar (44 psi)
Typical total solids content: 1 to 3% TS (10 to 35 g/l)

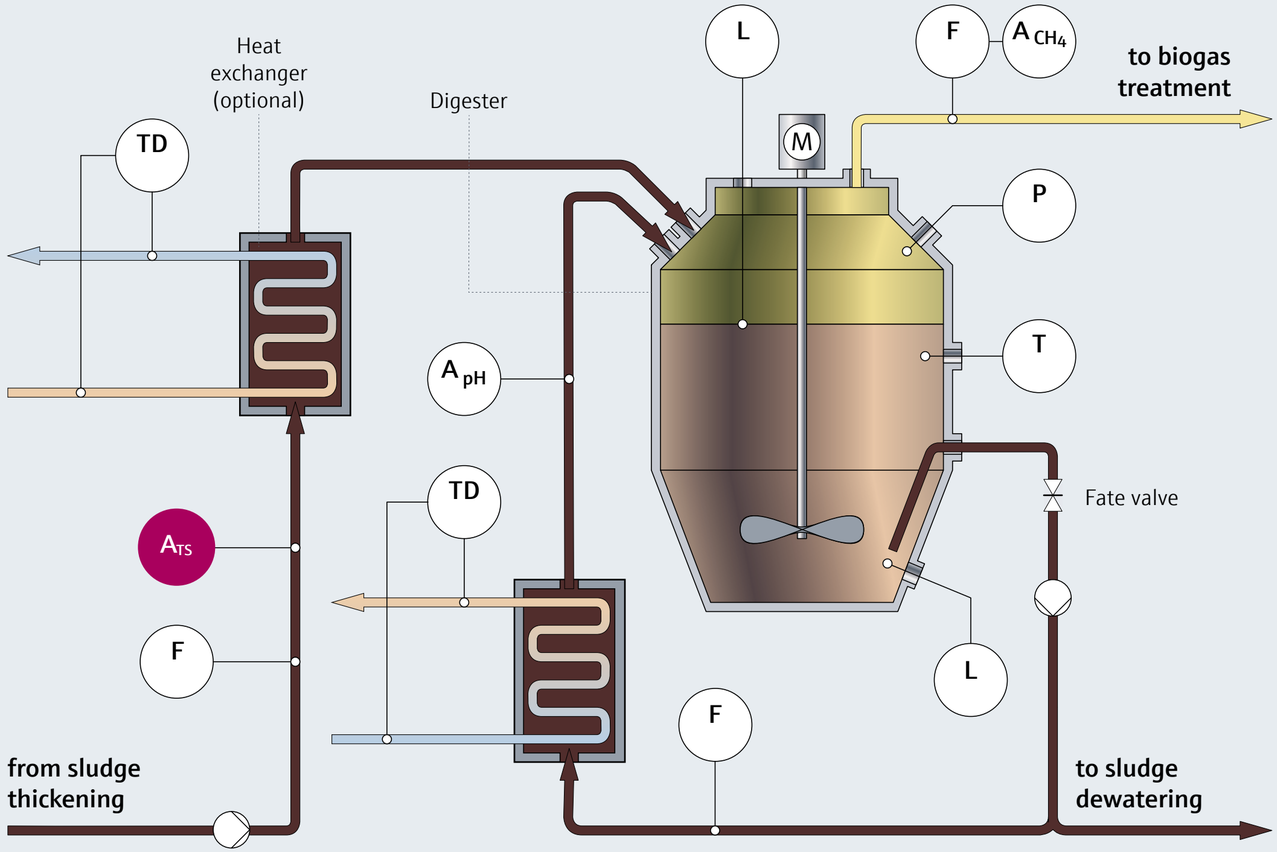
Our answer
To prevent the process from being interrupted too soon or too much water from being pumped into the sludge treatment, Teqwave MW continuously determines the total solids content in the fluid. When a defined threshold value is reached, the pump is switched off. This optimizes pump performance and saves energy. The polished measuring tube reduces build-up and, thanks to Heartbeat Technology, the functional integrity of the device can be verified at all times. In turn, this means that the calibration intervals can be extended and thus the process availability can be increased.

Primary clarifier
Digester
Dewatering

Digester

Raw sludge coming from the primary clarifier tank and biological treatment is concentrated into a condensed sludge product here. Flocculants are added to the process for this purpose. They ensure that smaller particles are combined into larger flakes, which can be separated more easily from the liquid portion of the mixture. The flocculant is dosed according to experience values and regular laboratory analyses of the total solids content.

In the digester, the stabilization and reduction of the sludge quantity is then the focus.



Your challenge

Measuring task: Total solids measurement
Measuring point: Concentrated sludge before the digester
Fluid: Sludge mixture
Process temperature: 0 to 40 °C (32 to 104 °F)
Typical total solids content: 3 to 5% TS (30 to 50 g/l)

Our answer

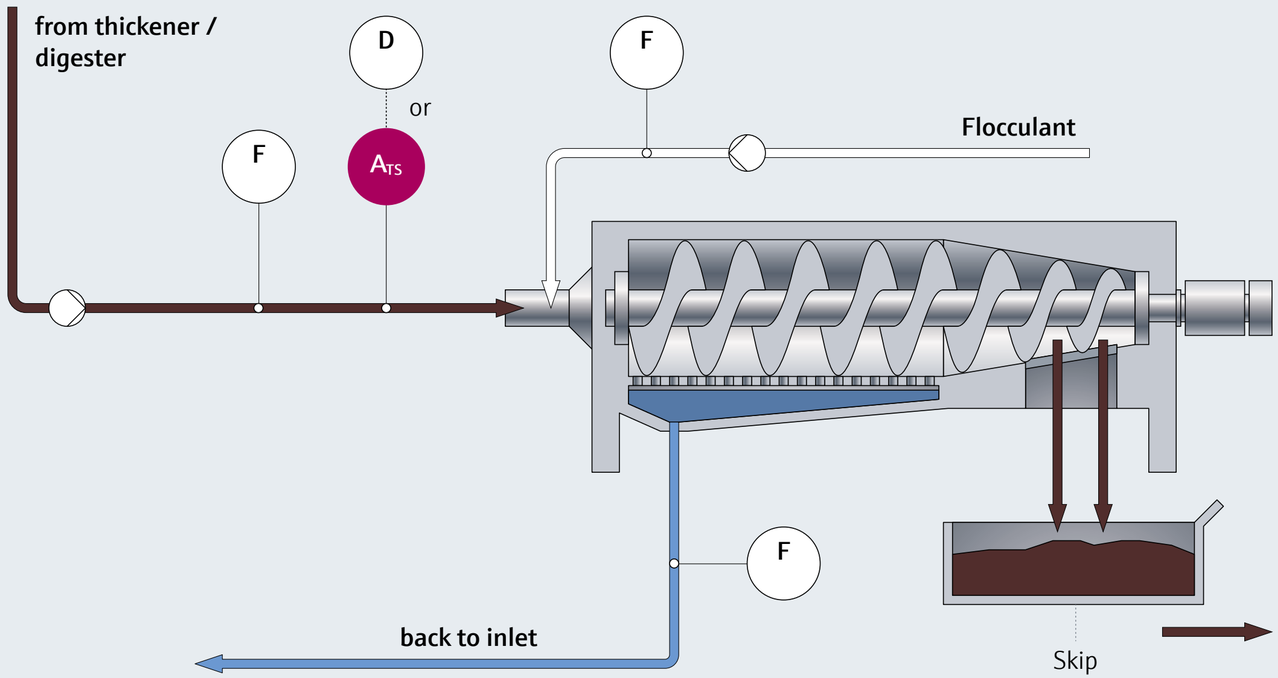
For an optimal digesting process, in-line measurement with Teqwave MW ensures that not too much water is fed into the sludge treatment. The flocculant is also dosed according to the current total solids content in the fluid, which allows for around 20 percent less material to be used. Another advantage: The higher total solids content reduces the required heat and allows more biogas to be produced. As a result, efficiency is increased and energy is saved.

Primary clarifier
Digester
Dewatering

Dewatering

The dewatering process is designed to draw as much water from the condensed but still fluid sludge as possible before combustion in order to reduce weight-based transport costs before burning. In the centrifuges downstream of the measuring point, water is pressed out of the sludge.

Flocculants are introduced beforehand to improve the clarity of the centrate. At the same time, they also increase capacity, improve the flow properties of the discharged solids and significantly increase the total solids content.



Your challenge
Measuring task: Total solids measurement
Measuring point: Digested sludge before dewatering
Fluid: Sludge mixture
Process temperature: 0 to 40 °C (32 to 104 °F)
Typical total solids content: 25 to 30% TS (250 to 300 g/l)

Our answer
Thanks to continuous in-line measurement with Teqwave MW, flocculants are no longer dosed based on the flow rate alone. The current total solids content is referenced to optimize the flocculant dosage in real time. This makes it possible to use around 20 percent less material in typical applications.

Primary clarifier
Digester
Dewatering

The measuring principle of microwave transmission

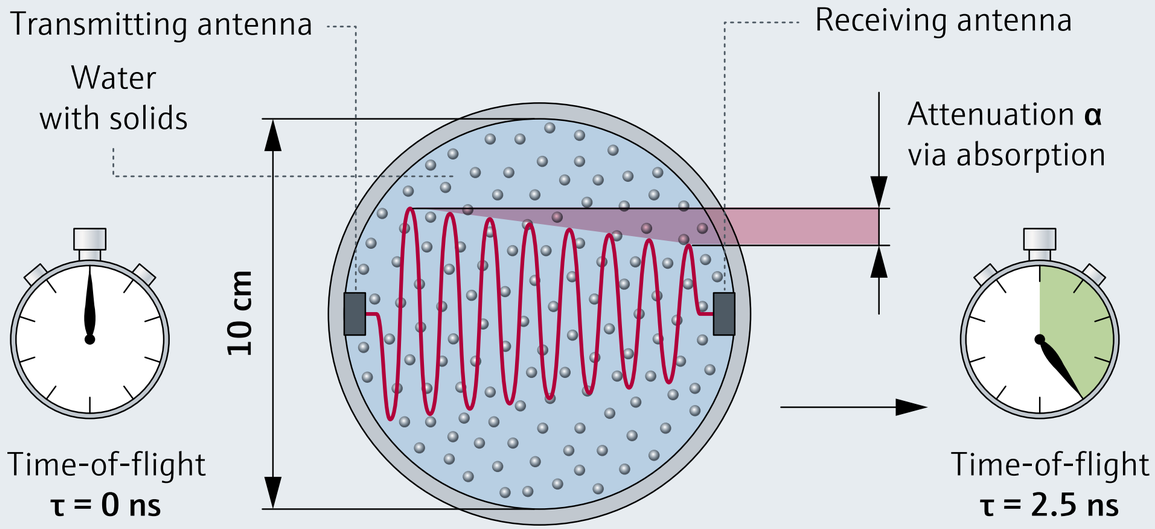
For determining the total solids content, Teqwave MW uses the measuring principle of microwave transmission.

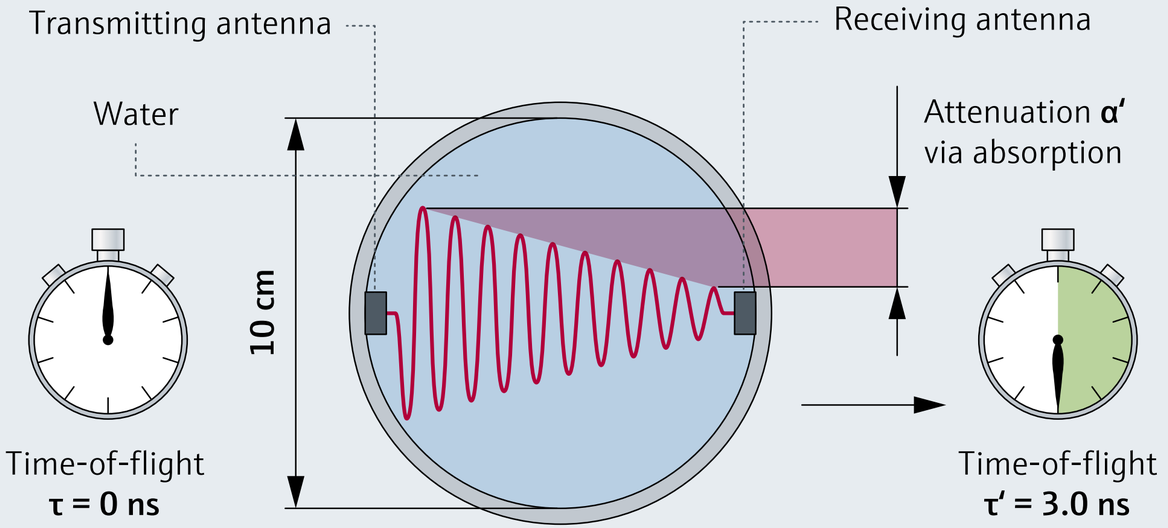
Two antennas installed in the sensor emit microwaves, and in turn receive them from the opposite side. To compensate for temperature-dependent effects, the temperature of the fluid in the pipe is also measured.

When microwaves are then sent through the fluid the transit time and absorption are measured. The permittivity, i.e. the ability to be polarized by electric fields, can be calculated from these values.

The propagation speed of the waves is greater in fluids with a high total solids content compared to pure water. This is because the polarization properties of its molecules give water a high permittivity: The water molecules within wastewater sludge absorb the microwaves more strongly and slow down their time-of-flight. On the other hand, the total solids typically present in sludge exhibit lower permittivity, meaning the time-of-flight is correspondingly shorter and the attenuation of the waves is less.

Using a mixing model stored in the device, the current total solids content in the medium can be determined based on the differing permittivity.





▶ Watch the video on the measuring principle

Technical data

Overview

The Teqwave MW sensor boasts functions and features which have clear advantages in sludge treatment. The shape and size of the sensor also make it easy to center the device in the pipe. The transmitters of the Proline 300/500 product line set the standard for process instrumentation.

Learn more about the technical data of the sensor and the transmitters on the following pages.

The Teqwave MW 300/500 measuring system meets EMC requirements in accordance with IEC/EN 61326. It is compliant with the requirements of the EU and ACMA guidelines and is labeled with the CE or RCM symbol.

Teqwave MW
Sensor

- Polished measuring tube to reduce build-up and extend cleaning intervals
- Simple installation and centering in the pipe thanks to special design

Proline 300 (compact)
Transmitter

- Menu guidance using wizards for simple set up of the unit and reliable comparison with laboratory values
- Remote display for flexible operation available as an option
- Heartbeat Technology for device verification in ongoing operation
- Integrated calculation of the load rate in combination with a flowmeter
- Integrated web server and WLAN (optional) for easy operation

Proline 500 (remote)
Transmitter

- Function and operation like Proline 300
- Reduced complexity with a maximum of three additional, freely configurable I/Os
- Remote installation: Up to 300 meters between sensor and transmitter
- Heartbeat Technology for device verification in ongoing operation
- Integrated calculation of the load rate in combination with a flowmeter

Teqwave MW

Sensor

The Teqwave MW sensor offers repeatability of up to ±0.01% TS for the total solids content and ±0.5 °C for the fluid temperature. More details on the technical data can be found on the right.

Teqwave MW

Proline 300

Proline 500

Design	Wafer
Nominal diameter	DN 50 to 300 (2 to 12")
Materials	▪ Measuring tube: Stainless steel, 1.4408 in acc. with DIN EN 10213 (CF3M in acc. with ASME A351) ▪ Antennas: Wetted parts: Ceramic Antenna holder: Stainless steel, 1.4435 (316L) Temperature sensor: Stainless steel, 1.4435 (316L)
Process connections	ASME Cl. 150, EN (DIN) PN 10/16, JIS 10K
Process temperature	0 to 80 °C (32 to 176 °F)
Total solids content	0 to 50% TS, 0 to 500 g/l (0 to 31 lb/ft³)
Process pressure	20 bar (290 psi)
Ambient temperature	–20 to 60 °C (–4 to 140 °F)
Degree of protection	IP66/67 (Type 4X enclosure)
Repeatability	▪ Dry matter concentration: ±0.02% TS (DN 50 to 80), ±0.01% TS (DN 100 to 300) ▪ Fluid temperature ±0.5 °C (33 °F)
Approvals	Hazardous area: ▪ ATEX, IECEx, cCSAus, NEPSI, INMETRO, UKEx ▪ PED, CRN

Subject to modifications and amendments

Proline 300

Transmitter

The compact version Proline 300 has the option of integrated WLAN and an integrated web server for easy operation and provision of additional process and device information. Read more about the technical data on this page.

Display	▪ 4-line, backlit display with touch control (external operation) ▪ Optional: with remote display
Operation	Configuration via on-site display, web server, optional WLAN and various operating tools (DeviceCare, FieldCare, HART handheld terminal, etc.)
Housing material	Aluminum
Power supply	AC 100 to 230 V (50/60 Hz); DC 24 V (50/60 Hz)
Ambient temperature	Standard: –40 to 60 °C (–40 to 140 °F)
Degree of protection	IP66/67 (Type 4X enclosure)
Outputs **Inputs** **Communications**	▪ Port 1 (communication): HART (4–20 mA), Modbus RS485 ▪ Port 2/3 (freely selectable): Current outputs (4–20 mA), pulse/frequency/switch outputs, status inputs, current inputs (4–20 mA), relay outputs, freely configurable inputs/outputs (I/O)
Approvals	Hazardous area: ▪ ATEX, IECEx, cCSAus, NEPSI, INMETRO, UKEx ▪ Radio approval

Subject to modifications and amendments

Teqwave MW
Proline 300
Proline 500

Proline 500

Transmitter

The remote version Proline 500 is available with an aluminum or polycarbonate housing. Read more about the technical data on this page.

Display	4-line, backlit display with touch control (external operation)
Operation	Configuration via on-site display, web server, optional WLAN and various operating tools (DeviceCare, FieldCare, HART handheld terminal, etc.)
Housing material	Aluminum, polycarbonate
Power supply	AC 100 to 230 V (50/60 Hz); DC 24 V (50/60 Hz)
Ambient temperature	Standard: –40 to 60 °C (–40 to 140 °F)
Degree of protection	IP66/67 (Type 4X enclosure)
Outputs **Inputs** **Communications**	▪ Port 1 (communication): HART (4–20 mA), Modbus RS485 ▪ Port 2/3/4 (freely selectable): Current outputs (4–20 mA), pulse/frequency/switch outputs, status inputs, current inputs (4–20 mA), relay outputs, freely configurable inputs/outputs (I/O)
Approvals	Hazardous area: ▪ ATEX, IECEx, cCSAus, NEPSI, INMETRO, UKEx ▪ Radio approval

Subject to modifications and amendments

Teqwave MW
Proline 300
Proline 500

People for Process Automation

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