

Case Study Filtration for Wastewater Treatment

WIKA Pressure Sensor With Diaphragm Seal Enables Breakthrough Filtration for Wastewater Treatment Customer

The wastewater treatment equipment market was worth over \$35 billion in 2015, and is expected to reach more than \$55 billion by 2023. Increasing demands for water, alongside a trend in recycling and reusing this precious resource, are two reasons for the growth. End-user industries – power generation, pharmaceuticals, paper, oil & gas, food & beverage and general industrial – are also driving the water treatment industry.



The Client's Specific Goals

A leading water filtration equipment manufacturer designed an advanced self-cleaning filtration system, but it needed an equally innovative pressure sensor solution to make it work. It's not easy to accurately measure pressure in particle-laden, contaminated media. WIKA's pressure experts worked closely with the OEM to come up with a custom solution that saves end users time and money.

The proposed filtration system required that technicians clean the filters at pre-determined intervals. There are two problems with this method, both of which come at a cost to the end user:

1. If the filters weren't too dirty, the workers would have wasted their time.
2. If the filters were too dirty, the wastewater treatment system would have been working inefficiently for quite some time.

Challenge: Automating a Labor-Intensive System

A global manufacturer and supplier of advanced filtration technologies set out to address this fundamental problem with a game-changer: a self-cleaning filtration system. It would save end users money by eliminating the need for a technician to manually clean the filter. And by not letting the filters become too clogged, the system would ensure that the water treatment plant runs efficiently at all times.

To bring this device to life, however, the engineers needed a high-quality sensor that could monitor the differential pressure across inlet and outlet to accurately enact the filter's self-cleaning mechanism. Standard pressure sensors did not work well, as they were not protected from the solids and particulates found in wastewater. Clogged sensors give inaccurate and/or erratic pressure readings, which activated the self-cleaning mechanism at incorrect times – enabling the cleaning mechanism when throughput was actually adequate and cleaning was not needed, or not enabling it when throughput was down.

The manufacturer needed a pressure sensing solution that is highly accurate, rugged, configurable, and enables remote monitoring. That's when they contacted WIKA USA.



Solution: Pressure sensor with flush-mount seal for particle-laden media

WIKA engineers developed a differential pressure sensor solution to help the manufacturer optimize operation of the self-cleaning function. Originally, the engineers approached WIKA for a sensor with very high accuracy that could monitor the difference in delta pressure. However, the sensor they requested used an NPT (national pipe thread). The problem is that when an NPT is used with a diaphragm seal, the seal can be distorted or crushed, which reduces accuracy or causes irregularities in the sensor, which would in-turn could activate the cleaning sequence when not required.

After consulting with the manufacturer, WIKA engineers came up with this recommendation: two S-11 flush pressure transmitters with integrated diaphragm seals, placed on the inlet and outlet components of the filter.

As pressure-controlled feed water enters the filter, the water velocity across the fine mesh membrane of the filter initiates cross-flow filtration. Solids or particulate up to 15 microns are filtered out and drop into a collection chamber. Heavy solids remain in the chamber while other particles flow into the recirculation pipe that leads back into the feed inlet feedwater flow.

The two S-11 pressure transmitters measure the difference of the feedwater flow pressure at the inlet and outlet of this process. When the pressure difference reaches the maximum level, it indicates the filter needs to be cleaned and alerts the self-cleaning mechanism. The pressure of the feedwater flow drives the cleaning assembly, activating the mechanism within the unit, which cleans the filter screen using coarse bristles to eliminate buildup. Measuring the differential pressure with two S-11 transmitters maintains the precision of the filter's cleaning mechanism, optimizing the overall efficiency and longevity of the filtration system.

The S-11 is ideal for this application because it features an integrated flush-mount diaphragm seal. This pressure sensor is specifically designed for measuring media that are viscous, paste-like, adhesive, crystallizing, contaminated, and particle-laden. These types of media, especially ones full of fats, oils, and grease, normally clog a pressure channel in a conventional process connection. But the flush mount seal of the S-11 protects the measuring instrument, thereby making it a robust, accurate option for wastewater. This low-maintenance pressure sensor is also guaranteed to perform in critical applications with frequently changing media.

Results: Higher accuracy, better performance

The S-11's optimized design enables better overall filter performance. The custom solution WIKA proposed ensures the filter's key benefits are consistent and accurate, including:

- The filter's cross-flow filtration with forced settling.
- Solids collection in a single device.
- The ability to continuously self-clean.

For wastewater treatment applications, the clogging potential is high for pressure sensors. That's why the S-11's flush-mount diaphragm seal is vital to high accuracy. In addition, clog protection increases the longevity and usefulness of a pressure sensor – saving time and money.

Other special features of the S-11:

- Highly resistant to pressure spikes and vibration
- Piezoresistive sensor and thin-film sensor technology
- 4-20 mA 2-wire output signal (others available)
- Stainless steel case and wetted parts

WIKA's custom pressure sensor solution was designed to the customer's specific requirements, including size,

required accuracy, and electrical specifications. The manufacturer was thrilled with WIKA's custom solution and has incorporated it in its advanced filtration system. In fact, its engineers were so pleased with the outcome that they plan to use a similar pressure sensing solution for future applications.

WIKA offers a complete line of [pressure sensors](#) – ideal for not only wastewater treatment, but also for refrigeration and air-conditioning applications, food & beverage, mobile working machines, medical gases, and the semiconductor industry. In addition, WIKA develops custom solutions to meet users' specific needs. For more information, [contact WIKA](#) today.

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