

Ultrasonic sensor cleaning reduces maintenance in a high-fouling wastewater application

Continuous turbidity and TSS monitoring with YSI IQ SensorNet



Industrial wastewater discharge

A large industrial and municipal wastewater treatment facility needed dependable final-effluent turbidity and total suspended solids (TSS) measurements under severe fouling conditions. Biofilm and mineral deposits accumulated rapidly on conventional optical sensors, requiring operators to perform manual cleaning almost every day.

The facility evaluated [YSI IQ SensorNet VisoTurb](#) and [ViSolid](#) sensors with integrated [UltraClean ultrasonic cleaning](#). In this challenging application, the VisoTurb sensor operated reliably for more than four weeks between manual cleanings, while the ViSolid sensor operated for more than six weeks – substantially reducing maintenance while improving the reliability of continuous process data.

The facility

The wastewater treatment plant serves a major industrial corporation and three surrounding communities with a combined population of approximately 225,000. With a design capacity equivalent to a population of approximately 6 million, the facility treats and discharges more than **120 million cubic meters of wastewater each year**.

Primary challenge

Severe biological and mineral fouling in final-effluent monitoring

Solution

YSI IQ SensorNet [VisoTurb](#) and [ViSolid](#) sensors with [UltraClean](#) ultrasonic cleaning technology

Project results

Reduced optical sensor cleaning from daily to every four to six weeks

Because the influent includes both industrial production wastewater and municipal wastewater, its composition is more variable and difficult to treat than municipal wastewater alone. Reliable process instrumentation is therefore essential for maintaining treatment performance and meeting final-effluent requirements.

Monitoring final-effluent quality

The plant continuously monitors turbidity and suspended solids in a final-effluent clearwell located downstream of secondary clarification and mechanical solids removal. The sensors are installed in a clearwell approximately 6 meters, or 19.6 feet, deep.

Continuous measurements help operators assess treatment performance and identify abnormal conditions. An increase in turbidity or suspended solids can provide an early indication of hydraulic overloading, solids carryover, disrupted settling or declining biological process stability.

To support dependable alarms and operating decisions, the facility needed sensors that could maintain reliable measurements between scheduled maintenance visits.

The challenge: Severe optical sensor fouling

The composition of the wastewater promotes rapid biological growth on submerged surfaces. Biofilm accumulated on the optical measurement windows of the plant's turbidity and suspended solids sensors, interfering with the measurements.

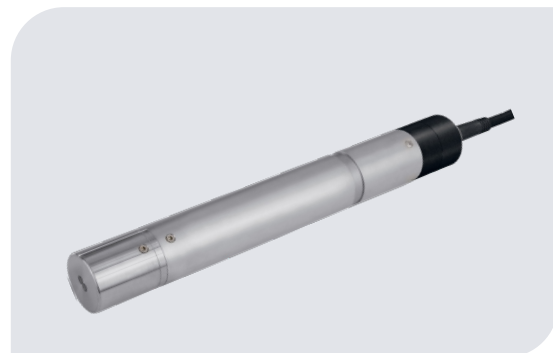
Mineral deposits associated with the wastewater's lime content created an additional layer of buildup. Conventional mechanical wiping systems could not consistently remove these deposits. As fouling increased, measurement reliability declined and operators had to manually clean the sensors almost every day.

The facility needed an alternative cleaning method that could:

- Reduce biological and mineral buildup
- Operate without external moving parts
- Extend the interval between manual cleanings
- Support stable, continuous measurements
- Reduce routine operator maintenance



The VisoTurb uses a nephelometric measurement principle and integrated UltraClean ultrasonic cleaning for continuous turbidity and TSS monitoring.



The reflectance-based ViSolid sensor is designed for continuous TSS measurement in applications ranging from activated sludge to concentrated sludge.



ViSolid and VisoTurb sensors installed in a clearwell to monitor the plant's effluent.

Did you know IQ SensorNet can monitor multiple wastewater parameters on a single network?

This scalable platform connects digital sensors across the treatment process, supporting continuous monitoring of turbidity, TSS, dissolved oxygen, nutrients, sludge level, and more. [Click here to explore IQ SensorNet.](#)

The solution: Integrated ultrasonic cleaning

The facility evaluated two optical sensors connected to the YSI IQ SensorNet process monitoring system:

- **VisoTurb**, a nephelometric sensor for turbidity and total suspended solids measurement
- **ViSolid**, a reflectance-based sensor designed for total suspended solids measurement

Both sensors feature integrated UltraClean ultrasonic cleaning. High-frequency vibrations act directly on the sensors’ optical measurement surfaces, helping reduce the adhesion and accumulation of biofilm and solids without a mechanical wiper or other externally moving cleaning components.

Results: Weeks of reliable operation between cleanings

The integrated ultrasonic cleaning significantly extended the interval between manual cleanings:

- The VisoTurb sensor operated reliably for more than four weeks before manual cleaning was required.
- The ViSolid sensor operated for more than six weeks without additional manual cleaning.
- Sensors with mechanical wiping – or without an active cleaning system – had previously required attention almost every day.

Because the application did not require a DIN/ISO-compliant turbidity measurement, the facility ultimately selected the ViSolid sensor, which provided the greatest resistance to the site’s severe fouling conditions.

The result was less routine maintenance and more dependable continuous data for monitoring final-effluent quality.

UltraClean ultrasonic cleaning extended reliable operation from approximately one day between maintenance activities to more than four weeks for VisoTurb and more than six weeks for ViSolid.

How UltraClean ultrasonic cleaning helps control fouling

UltraClean technology uses high-frequency vibrations to help prevent biological growth and suspended material from adhering to the sensor’s optical surfaces – without the moving parts and maintenance issues associated with mechanical wipers.

Maintenance comparison

Sensor/cleaning approach	~Maintenance interval
Conventional mechanical wiping or no active cleaning	Nearly daily
VisoTurb with UltraClean	More than 4 weeks
Visolid with UltraClean	More than 6 weeks



VisoTurb sensor **with** UltraClean ultrasonic cleaning activated, after a 30-day deployment.



VisoTurb sensor **without** UltraClean ultrasonic cleaning activated, after a 30-day deployment.

Reduced maintenance and more dependable data

Extending the maintenance interval from nearly daily cleaning to four weeks or longer delivered several practical benefits:

- Fewer routine sensor-cleaning visits
- Less operator time spent on preventive maintenance
- Reduced risk of measurement drift caused by fouling
- More reliable continuous data
- Greater confidence in process alarms and operating decisions
- No mechanical wiper blades or other external cleaning parts to replace

The sensors did still require periodic inspection and manual cleaning because of the unusually severe conditions at the facility. However, integrated ultrasonic cleaning substantially reduced the frequency of that work.

Selecting the right measurement for the application

VisoTurb and ViSolid use different optical measurement principles and are designed for different monitoring needs.

VisoTurb is appropriate when the application requires nephelometric turbidity measurement or when operators want the flexibility to measure either turbidity or TSS. ViSolid is designed specifically for TSS measurement and can be well suited to higher-solids and more challenging wastewater applications.

In this application, the facility did not require a standards-based turbidity measurement. Selecting ViSolid allowed the plant to prioritize resistance to extreme fouling and achieve the longest interval between manual cleanings.

This illustrates an important principle for online wastewater monitoring: the best sensor is not determined by the parameter name alone. Operators must also consider the expected concentration range, wastewater matrix, measurement objective, installation location, fouling potential, and applicable regulatory requirements.

Conclusion

Severe biofouling can make continuous optical measurement labor-intensive and unreliable when the sensor and cleaning method are not suited to the wastewater matrix.

At this facility, YSI IQ SensorNet VisoTurb and ViSolid sensors with integrated UltraClean ultrasonic cleaning substantially reduced the accumulation of biological and mineral deposits. The sensors extended reliable operation from approximately one day between maintenance activities to more than four weeks.

The facility ultimately selected ViSolid for continuous suspended solids monitoring because it provided the greatest resistance to the site's severe fouling conditions. The result was less routine maintenance and more dependable continuous data for monitoring final-effluent quality.

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