

Use Case: Wastewater Treatment Optimization

Industrial wastewater systems must ensure that discharged water meets strict environmental standards. However, manual sampling and delayed laboratory testing often cause **overdosing of treatment chemicals**, **energy waste**, and **compliance risks**. The goal is to move from reactive management to **real-time, data-driven wastewater control**.

Solution Overview

The **IO-GATE Edge Device** serves as the central intelligence for continuous monitoring and process optimization. By integrating **ifm sensors** (PM1718, SM4000, AL2205, DP2200, and R1D100), plants can collect and analyze critical parameters like **flow, pH, conductivity, temperature**, and **pressure** directly at the source.

Sensor	Function	Application Area
SM4000	Flow sensor	Monitors wastewater flow through pipes to detect anomalies, blockages, or leaks.
PM1718	Pressure sensor	Ensures stable line pressure in pumps and aeration systems.
AL2205	Signal converter	Connects pH and turbidity probes to IO-GATE via IO-Link or Modbus for accurate chemical control.
DP2200	Differential pressure sensor	Detects filter clogging in membrane or sand filtration stages.
R1D100	Temperature sensor	Monitors process temperature in aeration tanks or biological treatment stages.

Edge Processing and Automation

The **IO-GATE** collects and processes all signals locally. Built-in rule logic enables event-based control, such as:

- “Increase aeration if dissolved oxygen < 4.5 mg/L.”
- “Trigger alarm if pH < 6.5 or > 8.5.”
- “Adjust chemical dosing when conductivity exceeds threshold.”

Data is sent securely to **Cumulocity IoT** or **Azure IoT Hub**, where operators visualize performance trends and compliance data. Even during network downtime, the IO-GATE continues to control and log events autonomously at the edge.

Example – Chemical Dosing Optimization

Previously, chemical dosing in a wastewater treatment plant was performed on a fixed schedule, leading to overuse of coagulants and pH stabilizers. After deploying **IO-GATE** with **AL2205-connected pH sensors**, dosing pumps are now controlled automatically based on real-time pH and conductivity values.

Results after 4 months:

- 20 % reduction in chemical consumption
- 15 % lower sludge generation
- 12 % energy savings through optimized aeration
- ROI achieved in under 9 months

Why IO-GATE Matters

- **Real-time edge analytics:** Enables faster reactions and regulatory compliance.
- **Predictive control:** Prevents overload of filtration and aeration systems.
- **Sustainability:** Reduces chemical waste, sludge, and CO₂ emissions.
- **Data integration:** Links operational metrics to corporate ESG and sustainability dashboards.

- **Scalable design:** Can be expanded to stormwater and process water applications.

Benefit	Impact
Automated chemical control	Reduces chemical waste and dosing errors
Real-time monitoring	Improves process stability and compliance
Predictive maintenance	Prevents system overload and downtime
Data transparency	Supports sustainability reporting and optimization

Conclusion

The combination of **IO-GATE** and **ifm sensors** transforms traditional wastewater plants into intelligent, adaptive systems. This ensures stable operation, lower costs, and environmental compliance — a major step toward **sustainable industrial water management**.