CASE STUDY

FINAL EFFLUENT MONITORING

In a municipal wastewater treatment plant in Norfolk, England

ABSTRACT

A 3-month trial was conducted at Whitlingham Sewage Treatment Works (STW) in Norfolk to monitor phosphate (PO_4-P) concentrations in final effluent (FE) using SWS's sensor probes. The objective was to assess continuous phosphate levels in real time to support regulatory compliance and optimisation of treatment processes.

BACKROUND

Phosphorus is a leading contributor to freshwater eutrophication. For water utilities, it is a growing environmental challenge. Monitoring phosphate (PO_4-P) in treated effluent is critical to compliance, but remains technically complex, requiring wet chemistry rather than simpler spectral or ion-selective technologies.

Anglian Water's Whitlingham STW, serving 300,000+ people, is a Bio-P removal plant using Enhanced Biological Phosphorus Removal (EBPR), which relies on effective Acetic Acid dosing. Discharge consent is 1 mg/L Total-P, tightening to 0.25 mg/L in AMP8 from April 2025. Whitlingham was selected as a pilot test site to explore if phosphate monitoring can provide insights for improving operational efficiency.

THE CHALLENGE

Phosphate is a critical pollutant to control and one of the hardest to monitor. It requires wet chemistry, making real-time measurement complex, costly, and until now, largely unavailable.

At Whitlingham STW, Anglian Water faced three key challenges:

Tightening Limits: Discharge permits were set to tighten from 1.0 mg/L to 0.25 mg/L under AMP8, demanding more efficient process control.

Data Gaps: Infrequent, delayed lab testing created blind spots, offering no early warning for process issues or compliance risks.

High Chemical Costs: With over £600,000 spent annually on acetic acid dosing, the lack of real-time data made optimisation difficult.

Without continuous monitoring, phosphate posed a regulatory risk, adding operational uncertainty and cost pressure.

THE SOLUTION

SouthWestSensor's DropletSens PO_4 sensor is a compact, real-time phosphate monitoring solution that produces high-frequency, lab-quality data autonomously in the field.

Dissolved ortho-P levels in conjunction with turbidity may be used to estimate Total-P.

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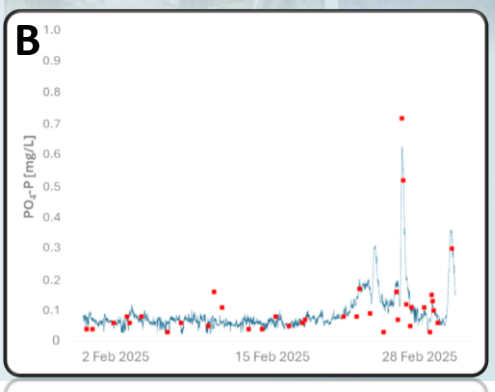
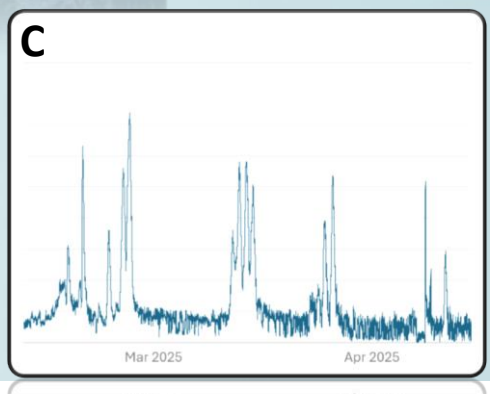
CASE STUDY

- **Location:** Fixed securely in the Final Effluent channel at Whitlingham STW.
- **Power:** Connected to mains electricity.
- **Filtering:** Fitted with a 0.45-micron inlet filter to prevent clogging.
- **Data Handling:** Integrated with a UDLive logger, with seamless cloud data upload.





Sensor installed in FE channel **(A)**

Sensor data tracks PO_4-P **lab data (B)**

3-month sensor data identifying repeated PO_4-P spikes **(C)**

THE RESULTS

Metric	Value
Average PO_4-P Level	~0.1 mg/L
Maximum Observed Spike	0.8 mg/L (within permit limit)
Data Points Logged	>750,000 over 3 months
Lab Cross-Validation	Confirmed high sensor accuracy
Operational Efficiency Insights	3 periods of higher P-levels observed; could benefit from dynamic adjustment of acetic acid dosing
Outcome	Sensor permanently installed

CLIENT TESTIMONIALS:

Alec Kimble, Managing Director, Bi-Zen Ltd: '*SWS's sensor kit proved a key tool for our optimisation work, very easy & quick to install with readily available and continuous lab-quality data. Could lead to direct acetic acid dosing cost savings. Plus the sensors have much wider utility beyond P-optimisation.*'

Shaun Barker, Bioresources Operations Manager, Anglian Water: '*The phosphate sensor is a game changer for us. It gives us constant eyes on critical P-levels versus normally conducted infrequent lab analysis, which is labour intensive and can miss key events; have now already ordered the SWS kit.*'

Wilf Bourgeois, Senior Environmental Process Scientist, Anglian Water: '*Beyond P-monitoring as in Whitlingham, I can see much wider applicability of SWS sensors including the use of portable units to assist commissioning of new P-plants and for N-removal optimisation.*'

Questions? We are here to help.

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Please contact us to discuss details of your application