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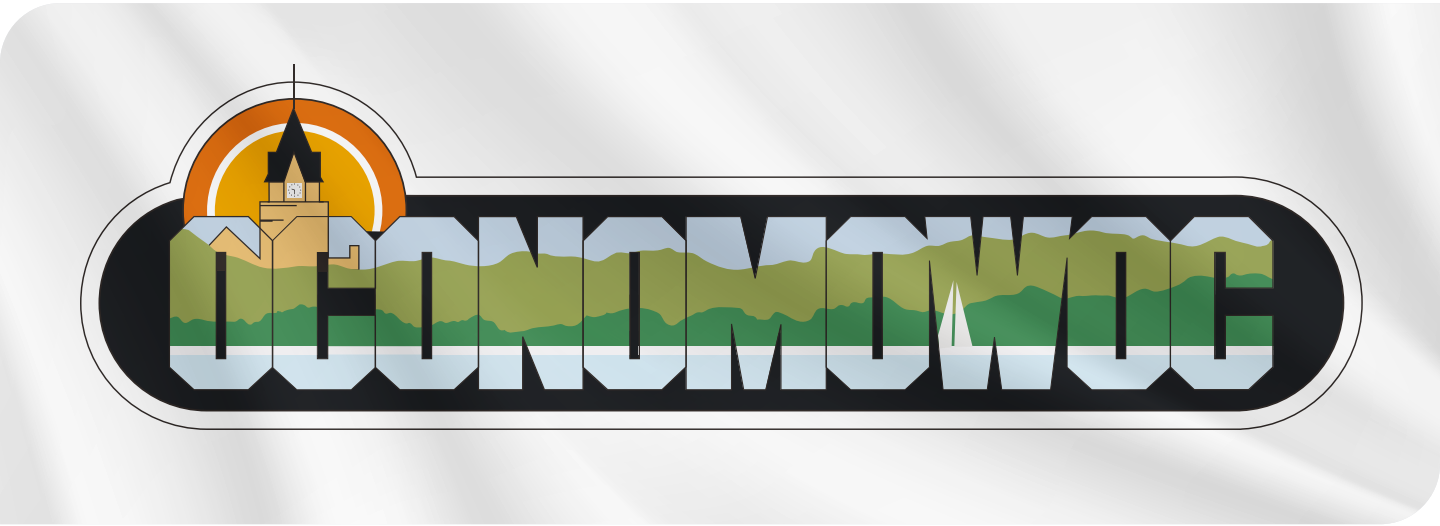
Application note
Oconomowoc & Alyza

Automated phosphorus control at Oconomowoc WWTF drives compliance

Real-time phosphorus monitoring automates dosing and supports future upgrades



Flag of Oconomowoc, Wisconsin, USA

Author
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End user: Oconomowoc WWTF

Xylem's role: YSI Alyza IQ PO4 analyzer deployed for continuous monitoring of orthophosphates

Project results: Five years of reliable phosphorus compliance

Overview

Faced with increasingly stringent phosphorus limits, the Oconomowoc Wastewater Treatment Facility (WWTF) implemented real-time monitoring and automated chemical control to ensure compliance.

The mid-sized utility must maintain a total phosphorus (TP) effluent limit of 0.95 mg/L–and is preparing for even tighter future regulations. Averaging 2.4 MGD, the plant sought a reliable, cost-effective strategy for meeting evolving regulations while minimizing chemical use.

Oconomowoc WWTF is also a founding member of the Oconomowoc Watershed Protection Program (OWPP)–a collaborative initiative that tackles phosphorus reduction at the source through conservation agriculture, stormwater practices, and community partnerships.[1] While the OWPP targets upstream improvements, smart instrumentation at the treatment plant minimizes phosphorus discharge downstream.

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Alyza IQ PO4 analyzer installed at the effluent of Oconomowoc WWTF, providing feedback for automatic ferric dosing control.

Sign recognizing local farmers participating in the Oconomowoc Watershed Protection Program. Photo taken during site visit to Oconomowoc WWTF, 2024.

Challenge: Reducing ferric use with confidence

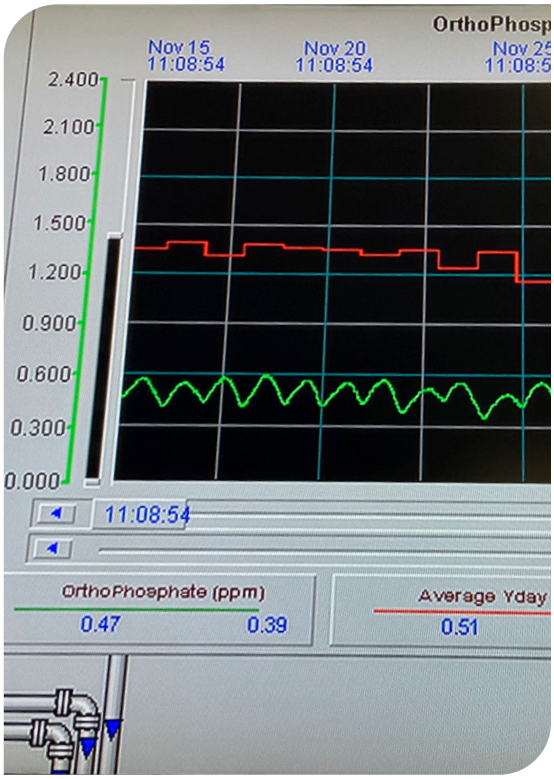
To meet phosphorus limits without overusing ferric chloride, Oconomowoc WWTF implemented online orthophosphate monitoring.

Operations Manager Kevin Freber brought valuable experience from his previous role at Watertown WWTP, where he achieved a **25% reduction in chemical use** with YSI's legacy P700 analyzer.[2] At Oconomowoc, he implemented the upgraded Alyza IQ PO4.

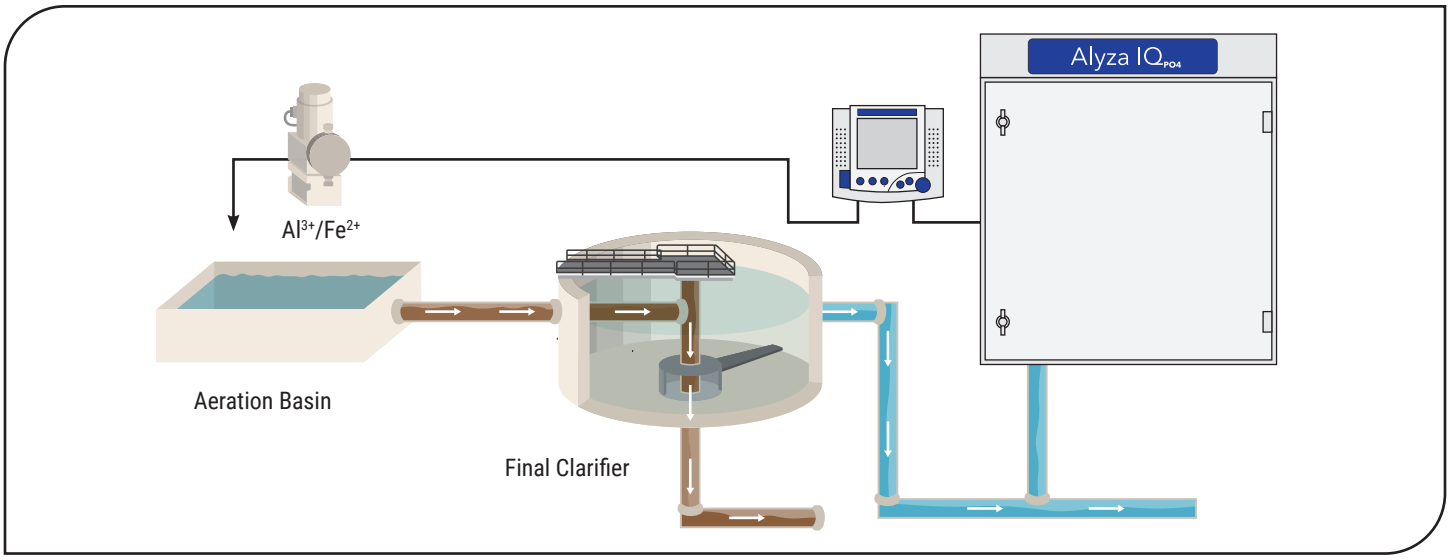
Installed in 2020, the Alyza measures orthophosphate at the plant effluent—about three hours after ferric is dosed. This setup provides a critical feedback point for ensuring compliance with final effluent phosphorus limits. The analyzer delivers high-accuracy, low-level PO_4 measurements for effluent monitoring and control.

The analyzer collects orthophosphate data every 15 minutes and sends the values to SCADA. The plant's control system then adjusts two ferric dosing pumps using a stepwise control strategy that responds dynamically to current PO_4 levels.

The control scheme targets a setpoint of 0.52 mg/L orthophosphate in the effluent. If PO_4 exceeds 1.5 mg/L, pumps ramp up motor speed by 1.5%. Between 1.0-1.5 mg/L, pump speed increases by 1.0%. Below 1.0 mg/L, smaller adjustments of 0.5% or 0.25% fine-tune dosing to prevent overshoot.



SCADA trend showing orthophosphate levels (green) and ferric dosing response (red). The stepwise control logic adjusts dosing as PO_4 levels fluctuate, maintaining residuals within the target range.



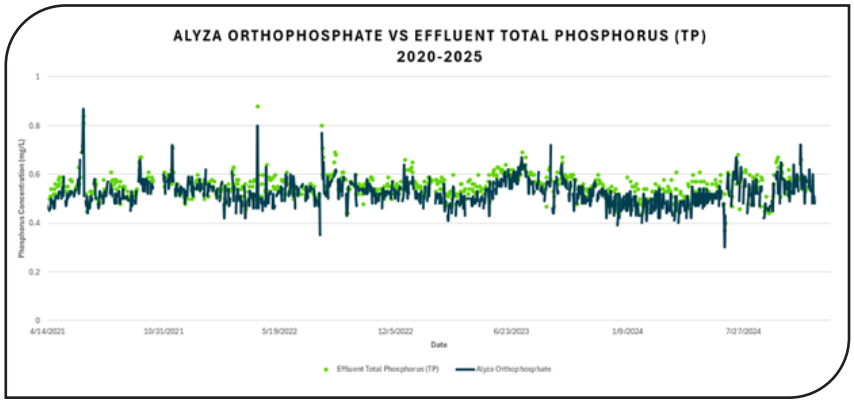
Feedback control diagram showing ferric dosing adjustments based on orthophosphate measurements from the Alyza IQ PO4 analyzer.

Performance: Five years of reliable compliance

Since installing the analyzer, Oconomowoc WWTF has reliably met its phosphorus permit requirements, with only one brief exceedance since 2021. The Alyza has operated reliably for five years with minimal maintenance, eliminating the need for daily manual adjustments based on grab samples.

Lab data from the final effluent closely aligns with the Alyza orthophosphate readings. A regression of Alyza orthophosphate readings against daily effluent TP grab samples from 2020-2024 yielded an R^2 of 0.84, confirming the analyzer's accuracy.

Ferric chloride usage trends closely with both analyzer and lab data, indicating stable performance and low variability. Over time, this has translated into predictable chemical costs and improved operational efficiency.



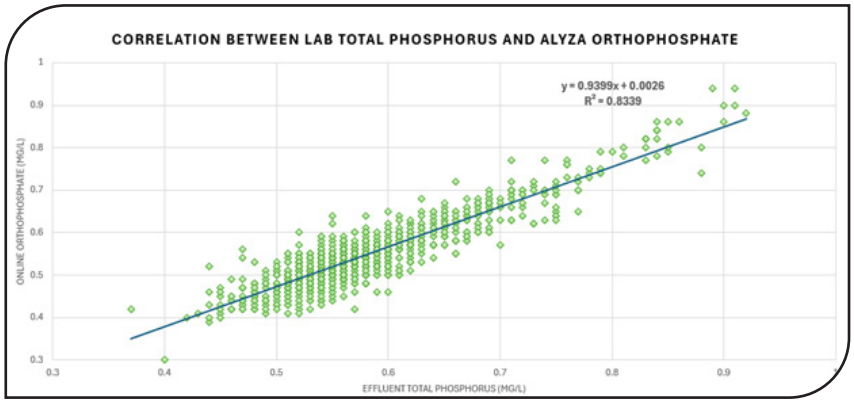
Final effluent total phosphorus concentrations compared to orthophosphate readings from the Alyza IQ PO4, 2020-2024.

Did you know?
Oconomowoc WWTF is a founding member of a regional watershed protection program.

Operations: Maintenance made easy

The Alyza IQ PO4 has proven to be low maintenance at its indoor installation location. Operators clean the sample filter every two weeks, swap reagents biannually, and replace the mixing valve and filter annually. The unit has remained stable and consistent over time, requiring only routine cleanings and reagent swaps.

Installing the unit indoors supports consistent performance by protecting it from environmental variability. Before maintenance, the analyzer should be allowed to reach ambient indoor temperature for stable performance.



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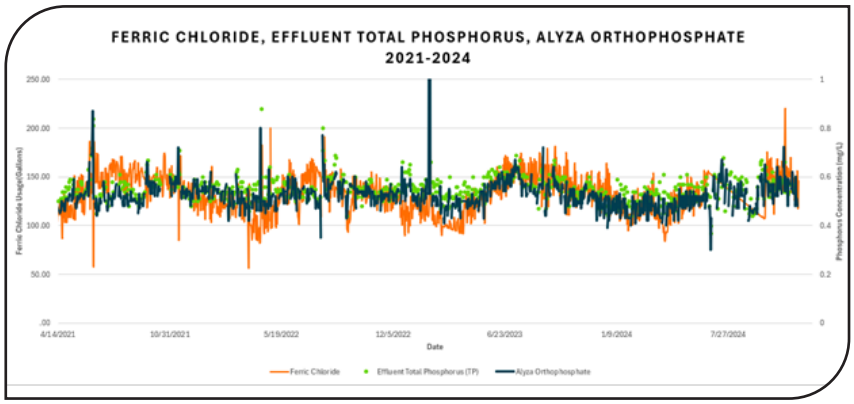

Final effluent total phosphorus concentrations compared to orthophosphate readings from the Alyza IQ PO4, 2020-2024.

Next steps and broader impact

The success at Oconomowoc demonstrates how smart instrumentation can achieve both regulatory compliance and chemical efficiency. By pairing high-accuracy monitoring with automated control, the plant eliminated guesswork from ferric dosing decisions.

More broadly, this initiative reflects Oconomowoc's holistic approach to nutrient management. As a founding OWPP member, the utility supports upstream watershed improvements while optimizing its performance at the plant. Together, these efforts promote long-term regulatory resilience and protect downstream water quality.

The Alyza IQ PO4 provides real-time insight needed for confident, precise operation in an increasingly demanding regulatory landscape. Operations Manager, Kevin Freber's leadership highlights how online monitoring empowers operators to achieve sustainable, measurable results, offering a blueprint for other utilities navigating similar nutrient challenges.

Sources:

1. City of Oconomowoc, Oconomowoc Watershed Protection Program (OWPP). www.oconomowocwatershed.com

2. Kevin Freber, Interview by Adrienne Stenz. Operations Manager, Oconomowoc WWTF. Conducted December 2024.

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