



CUSTOMER CASE STUDY

Improving the sustainability of wastewater renewal with AVEVA™ Advanced Process Control

South Platte Renew - southplatterenewco.gov
Industry - Water

Goals

- Achieve stable, year-round partial nitrification performance in solids contact tanks
- Improve energy efficiency by reducing blower system demands
- Foster enthusiasm among operations staff for long-term use of advanced process control

Challenges

- Address increasingly stringent regulations on nutrient removal
- Maintain ammonia setpoint when diurnal ammonia loading fluctuates over time and requires real-time monitoring and rapid response
- Operate within peak usage limits of local power distribution

AVEVA Solutions

- AVEVA™ Advanced Process Control
- AVEVA™ PI System™

Results

- Improved process stability and ammonia removal within 14 hours of implementation
- Reduced ammonia load variability to under 25% of traditional ABAC-based control
- Increased plant resiliency while reducing energy consumption by 30%
- \$80,000 in saved energy cost per year more than offset expenditures on AVEVA licenses, meaning implementation involved no additional spending by SPR

Wastewater recovery plants know wastewater is a precious resource. By efficiently filtering biological nutrients from the water, they return clean water to the environment. When unknown materials are dumped into the water, a plant's ability to detect and adjust treatment as quickly as possible is essential to optimizing cost, energy usage, and, ultimately, sustainability. When South Platte Renew (SPR), the 3rd-largest water resource recovery facility in Colorado, wanted to improve its resource usage and increase the resilience and sustainability of its operations, it turned to AVEVA to pilot a program with AVEVA Advanced Process Control (APC).

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Anna Schroeder

Engineering Supervisor, South Platte Renew

Seeking a more sustainable system

Sustainability has always been important to SPR, a joint venture of the cities of Littleton and Englewood, which treats the water of a population of 300,000 residents and some industrial facilities. In its facility, SPR uses nitrogen trickling filters and solids content tanks to convert ammonia to nitrate. This solids stream consists of mixing primary and secondary solids for anaerobic digestion, which produces biogas that the facility captures and cleans for resale as renewable natural gas. It also dries the solids in centrifuges and provides them to farms as nitrogen-based fertilizer.

SPR is always looking for new ways to improve sustainability and efficiency. It had heard of advanced process control but viewed the system as still in its early stages. As Anna Schroeder, an Engineering Supervisor at South Platte Renew acknowledges, "We were interested in the technology. It's right in line with our goals in sustainability, innovation, and optimization."

Every day SPR needs to meet stringent regulations in nutrient removal while also staying within its local power utility's distribution limits. SPR is aware that, because flows shift in the plant's solids contact tanks from somewhere between 4 to 25 million gallons over the day, its aeration usage could become inefficient. Prior to AVEVA APC, SPR used dissolved oxygen control (DO), which remains the industry standard, and then an ammonia-based aeration control (ABAC) system, which uses in-line instrumentation – both of which are reactive systems. SPR was interested in the predictive control system, as it promised greater efficiency by responding to shifts up to two hours ahead of time, rather than only reacting to changes in current conditions.

Easy setup and immediate results

To start, SPR partnered with AVEVA and Carollo Engineering to build a desktop simulation based on historical data received from AVEVA PI System. This simulation showed that AVEVA APC had a quicker response time to treatment because of its two-hour anticipatory window than ABAC, which is still a reactive rather than predictive method.

AVEVA APC uses historical data to put knowledge about patterns of air usage and diurnal flows into action, reducing around 25% of the variability of traditional ABAC-based control. The software was also able to enforce high and low DO concentrations, which optimizes the blowers' energy usage. The computer data showed a possible 13-18% reduction in energy usage, promising cost savings through improved operational efficiency.

When SPR implemented AVEVA APC during basin maintenance, it didn't even have to change its basin from its ABAC setup. Rather, it took only a day or two with the SCADA integrator to program the basin and set up the process control. Within the first 14 hours of implementation, AVEVA software was able to maintain and stabilize the ammonia effluent load.

Using historical data, AVEVA APC predicted 140 minutes into the future based on current ammonia levels. It then adjusted airflow according to these predictions. “Comparing the simulated AVEVA APC to the ABAC pilot,” says Schroeder, “showed that there was a quicker response time to treatment due to the fact that AVEVA APC can predict roughly two hours ahead of time.” By accounting for diurnal changes with an ammonia loading setpoint rather than ammonia concentration, AVEVA APC was able to use the same amount of air as ABAC while maintaining the ammonia setpoint for longer. In short, the pilot showed AVEVA APC to be a more efficient system.

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Optimizing operators

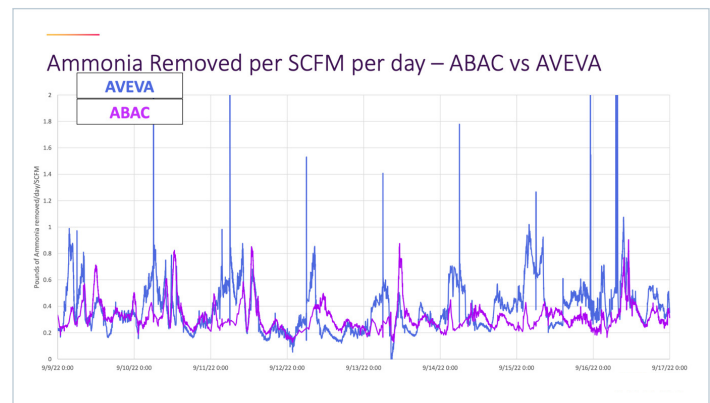
Not only is AVEVA APC more efficient, but its operators find it very intuitive to use. It was very important to SPR that its operators not only felt comfortable but also confident in using the system. Despite initial skepticism, operators are enthusiastic about the pilot’s results. “AVEVA APC was surprisingly easy to operate,” said one operator. “I wasn’t expecting it to perform better than the existing process control.”

A significant benefit of AVEVA APC is that it enables operators to spend their time where it is most needed. Once operators establish the goal ammonia setpoints, AVEVA APC adjusts accordingly.

No longer having to man the process control also means that operators feel better prepared for worst-case scenarios. The operating system is now more resilient to unexpected changes and operators can now more efficiently intervene in water renewal operations when necessary.

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AVEVA APC improved process control and removed ammonia more efficiently from wastewater than SPR’s ABAC model

SPR’s operators support the implementation of AVEVA APC as part of the wastewater recovery plant’s drive toward sustainability. With the support of its operators, South Platte Renew is planning to adjust all their basins to the pilot conditions and AVEVA APC so they can capture the full scale of the estimated 18% energy savings. SPR is also considering using AVEVA APC when it implements a chemical dosing process for phosphorus removal.

Watch the full presentation [here](#).