

# Xylem expertise helps South Carolina utility eliminate taste and odor issues in drinking water

Advanced oxidation treatment system and water treatment plant upgrade save money

AOP technology is emerging as a new best practice in water treatment, particularly attractive to utilities experiencing threats to their source water quality due to nuisance algae issues, which create displeasing taste and odor (T&O) compounds. Xylem's deep expertise in water treatment solutions recently helped a beleaguered South Carolina water utility implement a state-of-the-art ozone AOP system to achieve its treatment objectives, within budget and timeline parameters.

## Customer Challenge

The Anderson Regional Joint Water System (ARJWS), a wholesale drinking water provider to 14 water utilities in Upstate South Carolina, was facing a sizable public relations issue due to ongoing T&O issues in its finished potable water.

ARJWS was receiving hundreds of complaints each week of musty-smelling and bad-tasting water after its source water, Lake Hartwell, started experiencing algae issues in 2013. The blue-green algae, or cyanobacteria, produced nontoxic compounds geosmin and 2-Methylisoborneol (MIB), the sources of the dirty tasting water.

ARJWS officials tried a variety of solutions, such as copper- or peroxide-based algaecides for in-lake treatment. Adding powder activated carbon (PAC) and chlorine dioxide in the treatment plant to adsorb and oxidize the objectionable compounds did not deliver the desired results, due to the high concentrations of compounds being generated by the algae. Then Lake Hartwell experienced an even larger bloom in 2014, continuing the troubles for ARJWS.

**"We were impressed with both the Xylem marketing and technical teams. It's one thing to sell a product, but to really understand it and how it works with everything in the facility is another."**

After these methods were unsuccessful, ARJWS directed its engineering consultant Goodwyn, Mills and Cawood (GMC) to explore a treatment system upgrade to eliminate seasonal taste and odor events, remove color associated with naturally occurring iron and manganese, and establish resilience against algae-linked compounds and other contaminants of emerging concern (CECs).



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|------------------------|---|
| <b>END USER:</b>       | Anderson Regional Joint Water System  |
| <b>CLIENT:</b>         | Brasfield & Gorrie  |
| <b>CONSULTANT:</b>     | Goodwyn, Mills and Cawood (GMC)   |
| <b>ORDER DATE:</b>     | Sept. 26, 2016  |
| <b>COMPLETION:</b>     | April 2018  |
| <b>XYLEM SOLUTION:</b> | Xylem provided treatability testing and analysis of different advanced oxidation processes (AOP) to eliminate ongoing taste and odor issues in the finished potable water produced by ARJWS as part of a holistic solution to also encompass environmental threats and future regulatory initiatives. Xylem developed full-scale ozone AOP design submittals and equipment execution. |

The full-scale state-of-the-art system consisted of two Wedeco PDOevo 900 Ozone AOP Systems for the newly constructed treatment facility.

Using the Construction Management at Risk (CMAR) project delivery approach, Xylem collaborated with engineering consultant GMC and contractor Brasfield & Gorrie on successful project execution within the ARJWS budget and timeline.

## Xylem Solution

Through its representative Premier Water, Xylem Inc. teamed up with GMC in 2016 to begin the multiphase process of determining the most viable treatment option in terms of objectives, lifecycle costs and total cost of ownership.

Based on the nature of the contaminants, Xylem designed and executed a treatability study featuring ozone and two other advanced oxidation processes – ozone/hydrogen peroxide, as well as ozone/ UV light. Results of the study indicated ozone alone would be sufficient for most operating conditions and provide the lowest lifecycle cost based on a 20-year evaluation. However, detailed analysis of augmenting ozone with hydrogen peroxide showed that while the lifecycle cost would increase slightly, the ARJWS capital expenditure would be reduced with the use of a smaller ozone contactor basin. Additionally, ozone AOP was determined to be the most viable overall option because it provided operational flexibility and an additional AOP barrier when needed.

Xylem's expertise in water treatment solutions, the diligence of the Xylem Wedeco team, and its ability to meet the aggressive spring 2018 schedule set by ARJWS officials made it an excellent partner for the project. In addition to providing the full-scale system, Xylem also ensured optimization of the overall plant upgrade design concurrently with the equipment manufacturing process.

## The Results

In the first six months of operation, MIB and geosmin concentrations in Lake Hartwell were down significantly from previous years, though still at levels detectable by humans. At the start of the algae bloom season, the ozone AOP system eliminated 99.9 percent of the incoming MIB/geosmin, resulting in non-detect values in the outlet. Color has consistently been clear with the increased removal of iron and manganese.

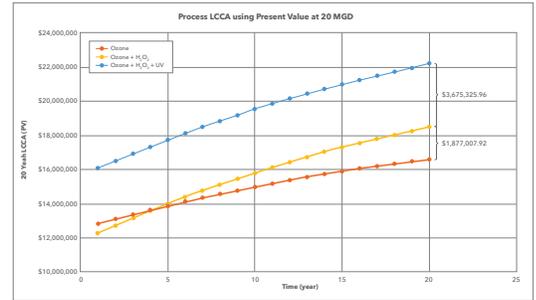
The effectiveness of the preoxidation process is bringing considerable operational efficiencies to the clarification and the Xylem Leopold Filterworx system. Additionally, Trihalomethanes (THME) levels were reduced by more than 50 percent due to the ozone treatment and reduced chlorine use.

Average Total Organic Carbon (TOC) removal rates have increased from 35 to 40 percent to 60 to 65 percent, further reducing organic compounds in the finished water, which also aids in reducing post-treatment Disinfectant Byproduct (DPB) formation.

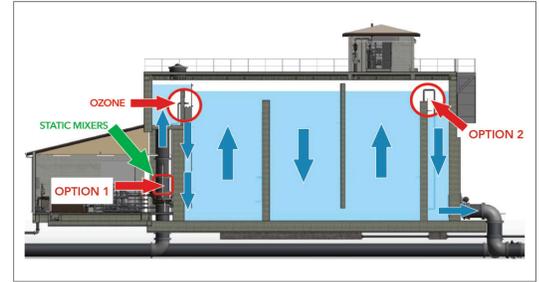
With PAC no longer in use, the plant is saving more than \$500,000 per year in consumables, plus many operating and servicing hours. "We consistently went over our \$125,000 annual solids removal budget for our onsite lagoons when PAC was used, which also diminishing the available capacity in the lagoons; those same funds now enable the plant to remove nearly double the solids annually produced," said Jennifer Barrington, ARJWS System Engineer.

Upfront chlorination to keep the media filter cleaner is no longer required, reducing overall chlorine use by 50 percent. This results in a savings of about \$40,000 to \$50,000 annually and is expected to significantly increase the overall life of the chlorine system.

Since the new treatment plant came online, ARJWS has not received a single complaint from any of its 200,000 customers about the water, according to Scott Willett, ARJWS executive director.



Over a 20-year period, cost estimates for ozone + peroxide were \$11.9 million, with a guaranteed maximum price (GMP) of \$12 million. Final costs for the treatment system were \$11.3 million with \$378,000 for annual operations and maintenance costs.



The system design includes two options for dosing hydrogen peroxide. In option 1, peroxide is fed prior to ozone addition to create hydroxyl radicals in AOP mode. In option 2, peroxide can be used at the end of the contactor to quench any ozone residuals.



The Xylem-designed AOP system consists of two Wedeco PDOevo 900 ozone AOP systems, each producing 1,000 pounds of ozone per day.

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