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ARTICLES

What is Wastewater Odor Control?

At some point, every wastewater treatment plant or water resource recovery facility has been subject to comments, concerns or questions about wastewater odor. Through the process of collecting and treating the wastewater from sewers and collection systems, nuisance odors are emitted and often become a point of concern for treatment or mitigation. Wastewater odor control is the process by which the malodors in sewage are either prevented from being formed in the first place with liquid phase treatment — treatment within the wastewater — or by capturing and/or treating the vapor coming off the treatment process — vapor phase treatment. Odor control solutions range from mechanical systems to chemical additives to naturally occurring oxidants.
https://wwdmag.com/33007964

Four Asset Management Steps for Wastewater Utilities

The most successful wastewater and water providers have been the ones that established effective asset management programs. It only takes a handful of organized steps and thoughtful consideration to lay the foundation for a powerful and asset management plan for wastewater utilities. However, utility asset management can be intimidating, with numerous factors to consider and many pieces of the puzzle to put together. To navigate these complexities, it is essential to keep the big picture in mind and focus on four fundamental pillars.
https://wwdmag.com/33006820

PODCAST

Episode 70: AWWA ACE23 Wrap-up

In this episode of Talking Under Water co-host Bob Crossen is joined by fellow Endeavor Business Media Water Group colleagues Mandy Crispin, WaterWorld editor-in-chief, and Jeremy Wolfe, EBM Water Group editor, to discuss AWWA ACE23 in Toronto, Canada. The June event marked the first time the AWWA annual conference has been located in Canada since 2007. Among the trending topics at the show were workforce issues, drought, water supplies, and smart water technologies, notably artificial intelligence and machine learning. The editors share their experiences at the show and insights from the conversations they had with attendees, leaders and solutions providers. Examples include the positioning of smart water technologies as workforce solutions to bridge the legacy knowledge gap, and conversations about the regulatory environment, including the Lead & Copper Rule, PFAS Maximum Contaminant Levels, Build America Buy America and the recent EPA proposal for Consumer Confidence Reports. Listen to the full episode on the Wastewater Digest website.
https://wwdmag.com/33007065

VIDEOS

Can You Trust Predictive Wastewater Analytics?

Automation and AI, such as ChatGPT, are dominating headlines, but what do these digital advancements mean for wastewater operators? The "smart water" buzzword has consumed the marketing and communications for products in the drinking water space, and it is beginning to penetrate the wastewater market as well. Operators fear computers will mess up their systems or replace them in the workforce, but is that really the case? Jenn Baldwin, digital one water strategic growth lead for Jacobs, shares a vision of the future and how Jacobs addressed operator concerns.
https://wwdmag.com/33006499

Veolia NA Released Free Operator Courses

Workforce is one of the top three stressors among all water and wastewater utilities in the U.S. It all starts with finding qualified candidates, a barrier to entry that holds many back from achieving operator status. To address that, Veolia North America released Veolia Academy, an online self-paced education platform with decades of resources and educational materials for training operators. Karine Rougé, CEO of municipal water for Veolia NA, explains how the resources came to be, why the company made them free and what it means for the future of the industry.
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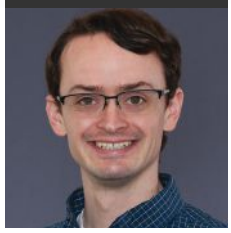
By Bob Crossen



Under the Surface

The drinking water market has been hectic and manic. Regulatory structures are moving and shifting all the time, and large regulatory changes have been proposed. But for the wastewater sector, it has been comparatively quiet and unassuming.

We know regulatory actions and updates are forthcoming — risk assessment of PFAS in biosolids, long-term CSO plans coming to fruition, etc. — but, so far this year, the ship has been steady. Perhaps more interesting to me are the quieter trends and innovations bubbling up.

For one, energy management has always been a central focus for wastewater utilities due to the electrical expenses related to aeration and blowers. In the past month, I've learned about two facilities in particular that are addressing their energy problems head-on.

First is the City of Roseville's Pleasant Grove WWTP, which installed equipment that would create renewable fuel for its solid wastes truck fleet. We will publish a Plant Profile on this facility in the September/October edition of Wastewater Digest as well as a video interview and photo gallery of the plant on our website.

Second is the Delaware County Regional Water Quality Authority, which used artificial intelligence to identify optimizations of its aeration blowers to save the utility considerable costs in operations each month, and they see additional savings with future uses of the technology. A video interview with the utility and the solutions provider can be found at wwdmag.com/videos.

Concerns about energy extend into the topic of sustainability as well. In this issue, the Regional San EchoWater facility is featured in the Plant Profile section on page 38 (along with a video interview and photo gallery on our website). Regional San's focus on Title 22 water is positioning it for its next project, called Harvest Water, which aims to reduce the reliance of agricultural users on ground water sources by instead using recycled water.

There are really fascinating and interesting stories around the country happening in wastewater, and these are just the tip of the iceberg. I'm always open to learning about them, so be sure to drop me a line about your energy and sustainability efforts at my email below.

Bob Crossen | Editoral Director | bcrossen@endeavorb2b.com

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Supreme Court Weakens Clean Water Act Wetlands Protections

The Supreme Court ruled that the Clean Water Act (CWA) can only allow U.S. EPA to regulate discharges into wetlands that are directly connected to, and practically indistinguishable from, protected waters.

In a major ruling, the Supreme Court's decision on Sackett v. EPA cuts the reach of waters of the United States (WOTUS), only allowing the regulation of wetlands that are indistinguishable from a protected body of water. Under this 5-4 decision, other wetlands are no longer protected under the CWA.

The decision has wide-reaching ramifications for federal regulations on water quality management and stormwater management.

The Court decided that WOTUS can cover "only those relatively permanent, standing or continuously flowing bodies of water forming geographical features that are described in ordinary parlance as streams, oceans, rivers, and lakes."

According to the Supreme Court, wetlands can only be considered as part of WOTUS when they have "a continuous surface connection to bodies that are 'waters of the United States' in their own right, so that there is no clear demarcation between 'waters' and wetlands."

This decision impacts EPA's authority as the definition of WOTUS under the CWA decides the reach of the agency's regulations.

Solenis Completes $4.6B Acquisition of Diversey

Solenis, a provider of water treatment solutions, has completed its acquisition of Diversey Holdings Ltd., a provider of cleaning and disinfection solutions, for approximately $4.6 billion. The parties completed the acquisition, which had been announced earlier this year, effective July 5.

With the acquisition, Solenis has grown to an enterprise operating in more than 130 countries with 71 manufacturing facilities and more than 15,000 employees. Headquartered in Wilmington, Delaware, Solenis was acquired by Platinum Equity in 2021. Bain Capital, the majority shareholder of Diversey, will hold a minority stake in Solenis as a result of the transaction.

John Panichella, CEO of Solenis, stated that the addition of the Diversey line of cleaning and hygiene products and technologies helps create cross-selling opportunities that will make Solenis an even more valuable partner for its customers.

Minnesota Estimates PFAS Removal to Cost $21B Over 20 Years

The Minnesota Pollution Control Agency released a report that estimated the removal and destruction of PFAS from certain wastewater streams in the state could cost $14 to $28 billion over 20 years.

The MPCA commissioned the independent study as part of Minnesota's PFAS Blueprint, a comprehensive interagency plan to prevent, manage, and clean up PFAS pollution. The study is the first of its kind and, although specific to Minnesota, the methods developed to estimate costs can be applied anywhere.

The report, titled "Evaluation of Current Alternatives and Estimated Cost Curves for PFAS Removal and Destruction from Municipal Wastewater, Biosolids, Landfill Leachate, and Compost Contact Water," was prepared by Barr Engineering Company and Hazen & Sawyer with funding from the Minnesota Environment and Natural Resources Trust Fund.

The companies found that PFAS removal and destruction from municipal wastewater could cost between $2.7 million and $18 million per pound, depending on facility size. Small wastewater treatment facilities would face per-pound costs more than six times greater than large facilities, due to economies of scale.

New technology that reduces costs to remove and destroy PFAS from wastewater is in development, but the MPCA indicated that, without an alternative source of funding, PFAS removal and destruction from municipal wastewater will be unaffordable for the foreseeable future.

California Commits $291.8M to Harvest Water Project

The California Water Commission is committing $291.8 million in grant funding to support Regional San's project to recycle wastewater for agricultural use and groundwater recharge.

Once operational, Harvest Water will supply billions of gallons of drought-resistant, recycled water per year for agricultural use and groundwater recharge near the Sacramento-San Joaquin Delta. Construction of the infrastructure needed to make Harvest Water a reality is projected to begin in late 2023 and be completed in early 2026.

Initial studies and planning for Harvest Water began a decade ago in conjunction with Regional San's facility upgrade known as the EchoWater Project (see page 38). The EchoWater Facility will produce the high-quality tertiary-treated recycled water needed for Harvest Water.

Ultimately, Harvest Water will deliver this safe and reliable supply of recycled water to facilitate groundwater recovery, boost sustainable agriculture and strengthen local habitats.

The project will also sustain a healthy water supply for more than 5,000 acres of riparian and wetland habitats, supporting a longer migration window for fall-run Chinook salmon through increased streamflow volume in the Cosumnes River. It also will improve regional water quality by reducing the salinity load to Sacramento River and Delta waterways.

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Digital Success for Small Utilities

by Steve Green

A digital roadmap for impactful, cost-saving tools

As with larger wastewater utilities that have likely started adopting smart water management, the thousands of smaller rural and suburban collection systems are contemplating how to make their own digital water journeys to increase resilience and improve operational efficiencies.

A number of challenges face these operators who want to get started with digital. Along with the increasing challenge of training their workforce and attracting talented technicians, the question is: how much and how fast can these digital techniques be adopted successfully, and what is it going to cost?

Add the effects of climate change with more frequent and more intense precipitation events, cyber-attacks and energy resiliency, and the result is a challenging situation for wastewater utility operators and managers. They must do more with less, manage risk by anticipating and addressing future challenges while replacing an aged infrastructure, many times with doubtful or inadequate funding.

The AWWA State of the Water Industry 2022 Executive Summary identified major challenges faced by water utilities. The new digital water industry has introduced a wide variety of sensor, software and hardware tools with the capabilities to help address 15 of the summary's 20 challenges.

Today's digital innovation will be tomorrow's normalcy, but a pivot is required. To make digital water management happen, operators must untangle the complicated array of technologies and find out where to start and what to prioritize, assess both capital and operational costs, and calculate associated savings over the current operation.

Defining Digital Wastewater Transformation

Smaller utilities are looking to digital transformation to improve their operations. So, what is digital transformation? In a nutshell, it is the process of translating data into information for improved decision making. The transformation starts by assessing what systems a utility already employs, the challenges and needs a digital tool is intended to address, and the gap between the current and intended states.

Digital tools to address the gap are then researched and a digital roadmap is defined to close the performance gap and achieve the intended goals by becoming a more digitally

informed utility. Each utility's transformation is unique. That means the answer to the burning questions — how do I start and what is it going to cost — depend on the utility's situation.

Wastewater utilities typically have some form of the following systems in place, in either a digital or analog form:

- System maps or geographic information system (GIS);
- Customer information system (CIS);
- Supervisory, control and data acquisition (SCADA);
- Maintenance or work orders management system, whether basic or computerized (CMMS);
- Laboratory information management system (LIMS);
- Operational optimization tools, such as excel spreadsheets;
- Enterprise asset management system (EAMS);
- Flow metering, infiltration and inflow study and pipeline inspection data; and
- Other instrumentation, sensors, software, or analog operational tools.

The systems listed above commonly do not interact with each other, with data from each system remaining within its own data silo. Data-informed decision-making thus requires significant efforts to access, download, translate and analyze these data into meaningful formats, meaning that a time-constrained manager often makes decisions with an incomplete picture. The new digital utility upgrades these systems to a digital format and then combines information gathered from these various data sources and operational silos into a real-time integrated data model called a digital dashboard.

The data from all systems is gathered into a centralized digital data historian, and the data is translated and curated into meaningful information that operators can use for better-informed decision making. The digital dashboard is then translated into appropriate formats to enable greater mobility for operations teams via access on smartphones, tablets and laptops for technicians on the field, at home or in the office.

Digital Twins & Dashboards

Moving beyond dashboards, digital twins of water systems can be developed to compare scenarios, model changes and conduct training in an offline format that is nearly identical to the physical system. Data science methods such as machine learning can then be applied to the digital twin of a system. These can provide early awareness of risks and offer optimized setpoint recommendations, saving electricity, chemicals and other benefits.

For example, consider a theoretical small community in the western United States, with 7,000 wastewater connections. The utility has begun its digital journey by implementing a GIS system, so that operators know where the pump stations, utility maintenance holes and other system assets are located, along with an inventory of their parameters. It has a separate paper-based work-order system, and local pump station controls are in place with alarm dialers.

The initial goal is to implement a computerized maintenance management system (CMMS) that is integrated with the GIS system so that work orders and asset conditions can be tracked and verified over time to better inform capital investment decisions.

From here, the wastewater utility leader can prioritize a new centralized SCADA system to bring awareness and remote control of critical pump stations into a central headquarters location. In times of crisis, this will increase the resilience of the utility.

From a resources standpoint, this can reduce operator trips to the pump stations to monitor conditions, freeing up the team for other needs and reducing fuel costs and emissions associated with truck rolls. The utility may even choose to take it a step further by implementing a workforce mobility system to provide visibility of the system across mobile devices, modernizing the alarming from the current dial, drive, look and react approach.

The next step for this small town is to deploy real-time sensors in key locations in the collection system to enable conditions-based maintenance. Many wastewater utilities conduct jet-cleaning and root-sawing activities on their gravity interceptors based off of past overflow events, perceptions of importance or risk, and any recent robotic camera inspections that may be available. In most cases, maintenance activities are more frequent than necessary and driven by historical reasoning, such as "that's how we've always done it," or "it overflowed once eight years ago."

Some areas may even get special political attention, for example the sewer lines serving city council members' houses or similar. Readily available and simple to deploy sensor systems can be installed to provide real-time conditions into a centralized location, allowing public works leaders to confidently switch to conditions-based maintenance. In doing so, they can free up their understaffed maintenance teams to address the backlog now captured in the new CMMS system.

The data collected from the pump station SCADA system and the collection system sensors will be catalogued into a digital historian with appropriate tagging to ensure the usefulness of the data as the town continues its digital journey. The town can now use this data to compare or better correlate a hydraulic model of its collection system.

A digital platform solution can be implemented to create a digital twin of the system, allowing offline simulations to train new team members or test bypassing scenarios for planned construction projects. With a digital twin in place, data science methods such as machine learning can be applied to optimize pumping for energy savings, or maximize system attenuation and storage to avoid overflows during precipitation events.

The utility leader for the small town can now shift from historic or reactionary operations to a more confident, scientific approach. The utility can add features and new systems. One such example includes adding sensors to the digital platform when it makes operational sense and as budget allows.

While cost is always a challenge, today's software platforms come in the form of software-as-a-service, where data is stored in the cloud. There are no IT infrastructure costs for servers or other on-premises items, which are now provided in a centralized fashion. Software updates and security upgrades are continuously updated by the provider along with timely, integrated help desk support.

The wastewater community already knows the strengths and weaknesses of its infrastructure. With tools such as real-time conditions sensors, a digital twin and data science tools, priorities can be managed so that maintenance activities are directed and money is spent where it is needed as defined by data, rather than by instinct or uninformed intervals.

Digital Water Roadmap

The first step in a digital journey is the most important. Each utility's case is unique, and the utility manager must first answer the question: What does your unique digital transformation look like? This is where a digital roadmap (see page 13) comes into play.

Step 1 of the digital roadmap sets the stage for steps 2 through 5. As a utility takes these steps, the journey increases in complexity, but it also increases value and return on investment.

The roadmap writing process starts with a thorough site assessment typically led by a consulting owner's engineer. After obtaining system descriptions, understanding existing data sources and determining historic data availability, the engineer then interviews key personnel in operations, engineering, leadership and finance, researches the regulatory context, and performs an on-site visit. All this goes into the existing conditions engineering report.

Engineers then perform a multi-dimension gap analysis — basically what a utility has, what it does not have and what it will take to achieve project and digital goals — and then research technology providers and products with the capabilities to close the identified gaps. A cost-benefit analysis is then completed, leading to an initial draft of the four-step journey to the project goals. Feedback is then incorporated, any further needed scenarios are evaluated and the roadmap is finalized. Depending on the utility size and complexity, the roadmap process can typically be completed within four months.

With a roadmap in place, a utility can analyze its entire operation and know what it will require to implement impactful digital tools. The roadmap is used to make cases for capital investment and obtain the budgets that will provide long-term value. The digital roadmap can be integrated with the traditional wastewater master plan to ensure digital upgrades are done in a logical and value-added manner to complement the physical infrastructure upgrades.

That answers the question about how to get started, but it leaves the second question unanswered: how much it will cost?

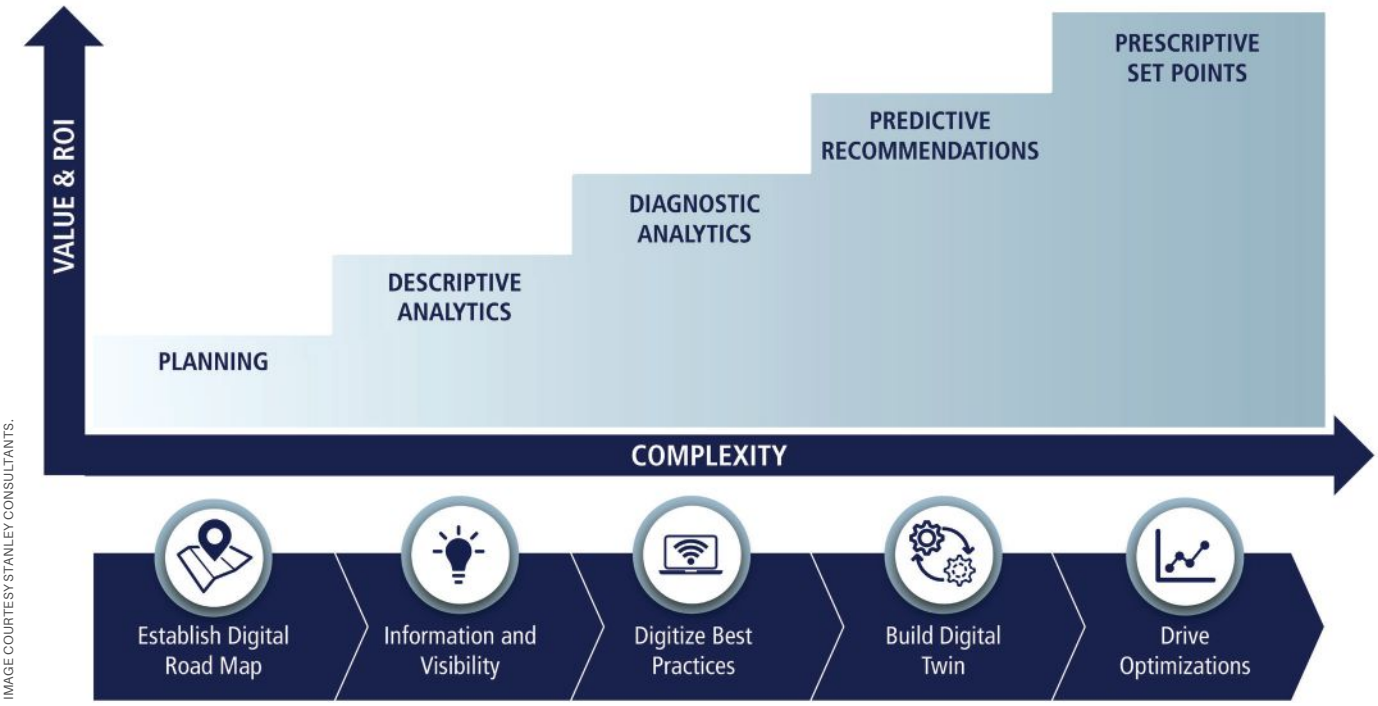

IMAGE COURTESY STANLEY CONSULTANTS.

The answer to that depends on the current state of a utility and where it wants to be with digital systems in the near- and long-term.

The good news is that operators can start their digital journeys with an a la carte approach. There is a wide range of costs depending on the extent and sophistication of the digital systems that are implemented. Owners and staff should remember that the idea around operating with an understanding of facts instead of guesswork pays for itself through more efficient operations and mitigated risks.

A sound digital roadmap will clearly show the costs and benefits of the journey to becoming a digital utility.

Steve Green is the digital water practice leader at Stanley Consultants. Steve has spent his 23-year career in business development and project delivery roles in the water industry, helping water system owners improve their infrastructure via technology adoption and collaborative project delivery. Steve holds a bachelor's degree in bio-resources engineering from Montana State University and an MBA from the University of Washington. He can be contacted via email at greensteve@stanleygroup.com.

ReWa's treatment process allows for cleaning more than 40 million gallons of wastewater per day and to safely introduce clean, re-usable water back into the environment.

IMAGES COURTESY WIN-911

Improving Alarm Notifications

by Cody Bann

Renewable Water Resources upgrades its alarm notification system.

Greenville County, South Carolina, encompasses an area approximately 795 square miles with a population of more than 500,000 people. The water and wastewater infrastructure servicing the county is intricate and robust. It includes more than 350 miles of pipes, connecting the community and providing for future growth and development.

The company managing the county's water and wastewater infrastructure recently upgraded its alarm notification system, improving operations and monitoring.

The Old Alert Process

For almost 100 years, Renewable Water Resources (ReWa) has been responsible for the Greenville County water and wastewater infrastructure. The organization manages eight water resource recovery facilities (WRRF). This oversight includes purifying more than 40 million gallons of water per day from homes, businesses and industries. ReWa also operates 83 pump stations and nine water treatment facilities. Each facility contains a self-sufficient water treatment process with onsite power generation and sometimes thousands of gauges, flow meters and storage tanks depending on the facility size.

Since 2002, ReWa has relied on AVEVA's System Platform supervisory control and data acquisition (SCADA) system, integrated with remote alarm notification software, to monitor and alert the team about any abnormal operating conditions. This involved a complicated process of the SCADA system calling a mobile phone; operators would then stop work, answer the call, input a unique identification number and then enter an acknowledgement.

This process could take up to one minute. While this does not seem very long, it is critical time lost during possible emergencies. Additionally, since these alarm notifications were transmitted via cell phones, if the operator was in a part of the facility without good cellular service, the call might break up and the entire identification input process would have to be repeated.

Upgrading Technology

In 2020, ReWa, the software company, and MR Systems, the systems integrator with whom ReWa partners to implement technology, identified opportunities to improve the WRRF alarming systems by deploying a WIN-911 mobile solution.

Tony Jones, ReWa business analyst, reached out to Edward Noyes, application engineer with MR Systems. Jones worked closely with Noyes, who listened to Jones' concerns and designed a system that met ReWa's security requirements, improved the ease and efficiency with which operators can monitor and take action based on SCADA alarms, and deployed a proactive monitoring system to notify ReWa technology personnel in the event of a system issue.

The remote alarm notification software's mobile app enables efficient plant operations by giving operators the ability to monitor and act on SCADA alarms via mobile devices with redundant voice and text call outs as needed. Additionally, it complements ReWa's mission of supporting wastewater treatment through the use of innovative solutions, promoting operational efficiency and reinforcing the core value of safety and unity.

"While we've only been using the mobile app for six months, the team has quickly adapted to working with the more efficient and robust system," Jones said. "They no

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The notification software's integration with a SCADA system offers ReWa another layer of security.

longer waste time punching in identification codes or depending on intermittent cell service to acknowledge an alarm."

The remote alarm notification software provides the teams with faster response times, which is critical since many alarms involve lost power. In these situations, every minute counts to get an alarm message to the team, which could mean the difference between restarting the generator or experiencing an overflow.

Secure Monitoring

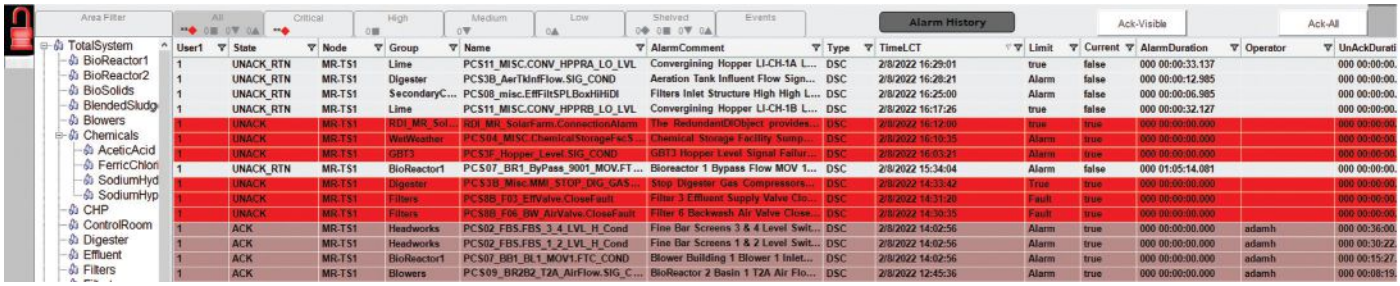
The types of alarms monitored include critical functions — pumps, ultraviolet disinfecting systems, generators and the utility power — that can stop a process and result in a sewer overflow or discharged of untreated water.

To ensure the systems' integrities are not compromised, it is critical to use the most secure architecture possible. To that end, Noyes and the MR Systems team implemented the highest security levels offered in the form of inter-component encryption in conjunction with a custom-built proactive monitoring system. The proactive monitoring system detects if the remote alarm notification software and AVEVA are communicating, and notifies designated personnel of any issues. Additionally, the software's integration with the SCADA system offers ReWa another layer of security.

"WIN-911 gives ReWa the confidence that they can trust the systems," Noyes said.

Making a Difference

This proactive and perpetual monitoring routinely averts problems. However, in the event that any of the equipment is not operating properly, the remote alarm notification software alerts the ReWa team via the mobile app, phone call, email, or text. One such instance occurred when the team



WIN-911, integrated with AVEVA's system platform, monitors ReWa's critical functions that can stop a process and result in a sewer overflow or discharge of untreated water.

received an alarm related to a power outage at one of the WRRFs.

A newly installed generator did not automatically start during a power failure. WIN-911 alerted the technology staff, who then began a dialogue with the operations team via the mobile app's chat feature. Because of this early and real-time intervention, ReWa assessed the problem and determined that the generator was not properly wired, avoiding additional problems that an extended power loss would have caused.

"Prior to this upgrade, ReWa functioned in a reactive mode and waited until the software notified the operations team there was an issue," Jones said. "Now, we have completely changed this mindset and become more efficient. The IT team knows there is a system problem long before the operations team."

The Future

Named a Utility of the Future by the National Association of Clean Water Agencies, ReWa is committed to enhancing the area's quality of life through the quality of its waterways. Using advanced technology like the AVEVA System Platform and the software's mobile app helps the team keep that commitment.

"This is a journey and, as a forward-thinking early adopter, ReWa continues to explore technology like remote alarm notification software that allows us to improve infrastructure and operating efficiencies," Jones said.

Cody P. Bann is director of engineering at Austin, Texas-based WIN-911 and may be reached at cody.bann@win911.com. The company helps deliver critical machine alarms via smartphone or tablet app, voice (VoIP and analog), text, email, and in-plant announcer.

Fix That Summer Funk

by Jeremy Wolfe

Experience the heat of summer without the odor

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Odor control is often a necessary reality for wastewater utilities. Either to abide by local regulations or to maintain good community standing, utilities can find themselves working to mitigate odorous compounds in their collection systems, treatment facilities and solids handling facilities.

There are no federal regulations for odor control at wastewater treatment plants. However, left unhandled, odor can cause significant strain with nearby communities. States and communities have many unique regulations and requirements. Nationwide, though, the approaches to odor control use the same technologies.

Two Odor Control Approaches

To effectively control odors, wastewater utilities should first identify the cause of the nuisance odor and then identify the most effective technology to resolve it.

The most prominent compound responsible for odor is hydrogen sulfide. Other prominent compounds include methanethiol, ammonia, and volatile fatty acids. Many of these compounds are the byproducts of microbial activity, often under anaerobic conditions.

Odor control for wastewater collection and treatment includes two main approaches: vapor-phase technologies and liquid-phase technologies. Vapor-phase technologies control the odorous compounds in gasses and the air, while liquid-phase technologies control the compounds and microbial activity in the wastewater itself.

These two approaches each have their own host of unique solutions, as touched on below.

Vapor-phase Technologies

Vapor-phase technologies draw in and treat air from the sources of odorous compounds. These technologies are directly involved with ventilation to ensure that air is only discharged after treatment, often solubilizing the compounds.

Some prominent vapor-phase technologies to deal with wastewater odor control are as follows:

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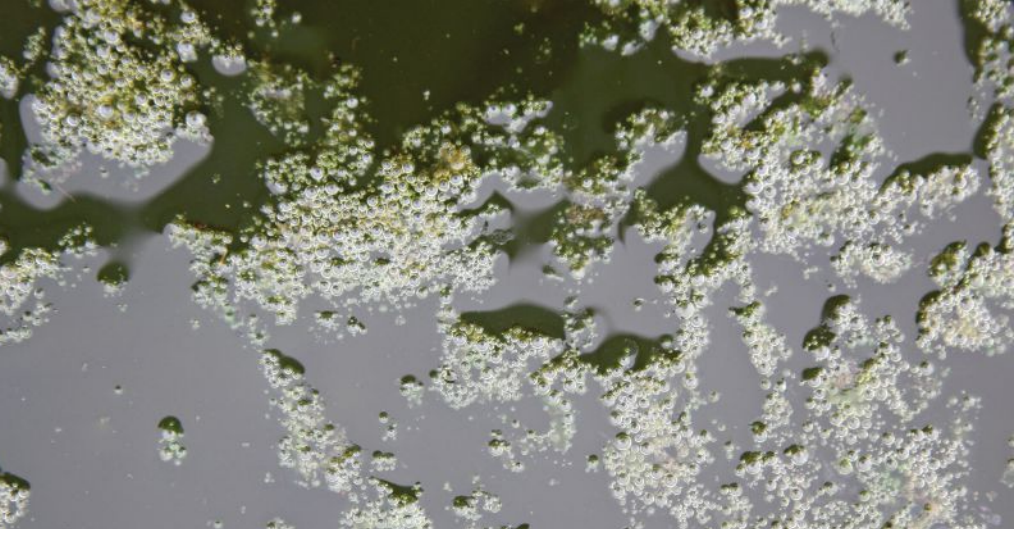

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Wet air scrubbing is a vapor-phase odor control approach where the system adds the targeted compounds to a chemical solution. For example, sodium hydroxide or sodium hypochlorite can be used to solubilize hydrogen sulfide. A single-stage system can use a single solution to solubilize targeted compounds, whereas a multistage scrubber can treat the air through a series of treatments. The approach can treat for most prevalent odorous compounds.

Liquid redox uses an aqueous solution of chelated metal to remove hydrogen sulfide from a gas and convert it into solid, elemental sulfur. Compared to wet air scrubbing, liquid redox processes have higher capital costs but lower operating chemical costs.

Biofiltration uses microbes to solubilize multiple odorous compounds. They are effective at removing sulfur-based compounds, but not as effective at removing nitrogen-based compounds.

Solid scavengers convert sulfur compounds into more stable compounds through reactions that consume the medium itself. They are ideal for treating biogas with low to moderate levels of hydrogen sulfide.

Carbon adsorption systems attract multiple odorous compounds from the air, adhering them to its surface. It can remove hydrogen sulfide and other sulfur-based compounds well, but these systems are less effective at treating nitrogen-based compounds.

Liquid-phase Technologies

Liquid-phase technologies treat the wastewater stream itself to minimize the release of odorous compounds from the stream, often by adding chemicals to the wastewater.

Liquid-phase technologies are more often used in wastewater collection systems, rather than wastewater treatment plants. This treatment prevents hydrogen sulfide from escaping into the air, which also prevents corrosion. A single application point of liquid-phase technology can provide odor control for multiple odor release points, such as utility maintenance holes and re-pump stations.

Some prominent liquid phase technologies are:

Iron salts can oxidize or precipitate dissolved sulfide, turning it into ferrous sulfide

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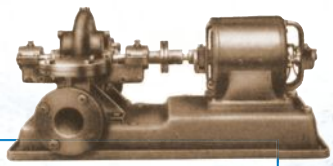

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and ferrous iron. At the treatment plant, aeration can then turn these compounds into sulfate and ferric iron. Iron salt solutions are classified as hazardous compounds and require appropriate handling.

Oxidation for odor control involves a strong chemical oxidizing agent, which chemically reacts with dissolved sulfide to convert it to sulfate or sulfur. The hazardous agent can also treat many other odorous and non-odorous compounds. One of the most commonly used oxidizers is hydrogen peroxide.

Lastly, the application of the chemical compound **anthraquinone** can also interrupt the processes of sulfate-reducing bacteria, controlling the presence of odor-causing sulfide.

Today's Solutions

The market for wastewater odor control provides a number solutions for utilities to choose from, each providing a unique approach to specific odor control technologies. Some of today's odor control solutions providers include:

SciCorp

SciCorp International Corp is a Canadian privately owned environmental technology company. SciCorp produces its own liquid plant based bioaugmentation products. The company has been in operation for 40 years and is currently active in 35 countries. It provides liquid micronutrient solutions to the wastewater treatment industry to eliminate odor at the source by reducing activity of odor producing microbes, while at the same time enhancing the performance and activity of non-odor producing microorganisms. The use of SciCorp's technology also reduces energy consumed and biosolids produced, thereby reducing CO_2 emissions and carbon footprint. SciCorp also claims that its solution improves treatment performance, increases capacity and reduces operating costs of WWTPs without additional capital expenditure.
www.scicorp.net

Kusters Water

Kusters Water, in conjunction with CSO Group Ltd., offers the Terminodour odor control technology. CSO Group has installed this technology at hundreds of plants throughout the world. This system offers a green solution to traditional odor control utilizing low amounts of electricity. The system can oxidize H_2S at 50 ppm in a building and 500 ppm in a covered tank or wet well. It is capable of treating additional odorous compounds including VOC's, organic acids, amines, mercaptans, ammonia and others.
www.kusterswater.com

Vapex Environmental

Vapex's technology utilizes a patented process to treat hydrogen sulfide, mercaptans, amines and other odorous compounds found in municipal wastewater. The process creates hydroxyl radicals, a powerful oxidant, using only water and electricity. No additional chemicals or media are required. Hydroxyl radicals are so reactive that a small system can treat most of the odors gassed from wastewater, allowing the units to have a small footprint. The mist creating the radicals is sprayed into the enclosed space, oxidizing the odors *in-situ* rather than removing the air, leading to a low energy demand. In addition to eliminating odors, the technology also remediates fats, oils and grease (FOG), and kills sulfur reducing bacteria, decreasing the negative impacts of FOG buildup and lowering microbial induced corrosion.
www.vapex.com

Veolia Water Technologies

Veolia's Hydrex Sulfide Elimination System (HSES) is designed to combat hydrogen

sulfide odors and corrosion. This odor control solution eliminates foul odors, reduces corrosion, and enhances overall operational efficiency. The system is available to treat H_2S in solution or vapor phases in wastewater plants, lift stations, or other H_2S generating areas. This two-step process uses environmentally sustainable and biodegradable chemistries to eliminate sulfides.

The first step is a "reduction" step where a reagent is added and removes electrons from the sulfide molecule, converting the sulfide into inert and safe elemental sulfur that cannot reform into sulfide. The second step is a regenerative oxidation process, where the reagent reacts with an oxidant converting it back to its original form, ready to attack and reduce another sulfide molecule. This process continually works to enable the rapid and efficient destruction of sulfide until H_2S levels have been reduced to an acceptable level.

www.watertechnologies.com

Jeremy Wolfe is an Editor for *Wastewater Digest*. Email him at jwolfe@endeavorb2b.com

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The town implemented a small diameter gravity sewer collection system, which delivers wastewater to a centralized treatment facility.

IMAGE COURTESY WOODARD & CURRAN

Establishing Service in a Small Coastal Town

by Julianne Page

Lincolnville implements centralized wastewater collection and treatment.

Situated in Maine's Midcoast region, the Town of Lincolnville is home to approximately 2,250 residents. During the summer months, tourists flock to this region to take in the quaint downtowns and rocky coastline.

Lincolnville Beach offers a reprieve from the rocks with a short sandy strip perfect for sunbathing, swimming or launching a kayak, adjacent to the main thoroughfare. Overlooking Penobscot Bay and the Island of Isleboro, the beach is close to the island ferry service and within walking distance to antique shops, galleries, a local museum and several restaurants.

Like many small communities, most residents and businesses historically relied on privately owned septic systems and overboard discharges for wastewater disposal, and a handful of restaurants discharged their wastewater to a small private treatment facility. These aging and failing systems were leading residents to voice concerns about drinking well water quality, as well as the environmental impact on Lincolnville Beach and Penobscot Bay.

Weekly water testing at Lincolnville Beach, in partnership with the University of Maine Cooperative Extension's Healthy Beaches Program, had documented unsafe levels of *enterococci* bacteria levels during summer months dating back to 2004. With more than 10,000 visitors to the beach each summer and approximately 8,000 vehicles driving through daily, protecting the environment that draws in tourist business and supports an active clam digging industry became a significant issue for the town.

The Lincolnville Sewer District was established to evaluate different wastewater treatment options and funding resources to implement a public wastewater collection system and treatment facility in the beach area.

Creating a Right-Sized Solution

Lincolnville Sewer District officials partnered with Woodard & Curran to conduct an alternatives analysis to determine the most effective, affordable option for the community.

One idea was to tie Lincolnville's wastewater collection system into a neighboring town's treatment system, but constructing more than 5 miles of sewer lines to tie into Camden's system was too costly. However, building a small, localized collection system and package treatment plant balanced affordability and long-term benefits to meet community needs at a manageable investment.

The recommended approach included a small diameter gravity sewer collection system that would deliver wastewater to a centralized treatment facility. The new water reclamation facility (WRF) is located adjacent to the existing privately held treatment system and is able to reuse the existing ocean outfall for discharge of treated effluent.

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IMAGE COURTESY WOODARD & CURRAN

The WRF overlooking the Penobscot Bay includes an anoxic tank (foreground), an aerated reactor (not pictured), a storage tank for treated effluent (mid-photo), and a control building to match the coastal aesthetic.

IMAGE COURTESY WOODARD & CURRAN

The new wastewater collection system and associated WRRF have been online for two years. Approximately half of the anticipated users are now connected to the system, with more connections anticipated.

The existing submersible pump stations were also able to be reused, with minor modifications made to accommodate larger pumps that could handle the additional flows. An energy-efficient, customizable, on-site wastewater treatment solution was selected to provide biological treatment, and ultraviolet irradiation was included for disinfection.

The new WRF was built on a steep slope behind a busy ferry terminal on Route 1, overlooking Penobscot Bay. This challenging, quarter-acre parcel of land was a key factor in choosing the treatment system, which is suitable for small spaces with the capacity to treat the design average day flow of 25,000 gallons per day.

Another key component to the project included provisions for fats, oils, and grease (FOG) trapping and collection mechanisms at source locations. Several commercial connections to the system are seasonal food establishments, which makes it critical to remove as much FOG at the source as possible to reduce wear on the collection system and overall operations costs.

The town was encouraged to collaborate with restaurants to install grease traps/receptors or automatic grease recovery units. The Lincolnville Sewer District also incorporated this provision into its sewer use ordinance.

Funding Critical Infrastructure

While the collection system and associated WRF was critical for protecting the area's environment and water quality, the system has so few users that user fees would not be enough to pay back this significant investment.

Several funding avenues were identified to back this project, including a $1 million grant from the Maine Department of Environmental

Protection; a $1 million grant and $1.6 million loan from the U.S. Department of Agriculture, Rural Development; a $500,000 Community Development Block Grant; and a $250,000 grant from the Northern Border Regional Commission.

A public outreach campaign helped garner the necessary support from area residents and businesses to establish the Lincolnville Sewer District, which used these funds to cover construction and startup costs in lieu of existing ratepayer fees.

The town also implemented incentives to homeowners willing to disconnect their septic tanks and tie into the new sewer system, such as covering the installation cost for 20 grinder pump stations at homes situated at a lower elevation than the new gravity sewer line.

Small & Successful

Woodard & Curran also advised the Lincolnville Sewer District on hiring a contract operator for the new WRF. The contract operator visits the site several times a week to check the system and collect samples that are sent to an independent laboratory for testing.

The new WRF is equipped with a supervisory control and data acquisition (SCADA) system, included in the project design, that connects to a cellular auto-dialer, which notifies the operator in the event any system alarms are enabled.

IMAGE COURTESY WOODARD & CURRAN

A small, localized collection system and package treatment plant met community needs at a manageable investment.

The new wastewater collection system and associated WRF have been online for two years. Effluent produced through the treatment process is consistently testing at a higher quality than required by the facility's discharge permit. Approximately half of the anticipated users are now connected to the system, with more connections anticipated.

With summer businesses open for the season, locals and tourists can visit Lincolnville Beach, eat locally harvested clams, and recreate in the waters of Penobscot Bay knowing the environment is being kept safe and healthy for all to enjoy.

Julianne Page, PE, is a technical manager at Woodard & Curran with more than ten years of experience in municipal wastewater engineering. She has led design and construction administration efforts for a variety of projects throughout the United States including wastewater treatment plants, pump stations and collection systems.

Water/Wastewater Solutions

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www.evoqua.com

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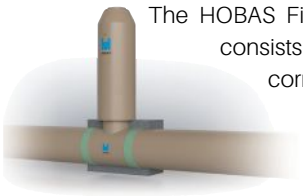

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Thermo Fisher Scientific
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Aqua Metrology Systems
www.aquametrologysystems.com

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Eaton
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Regional San EchoWater

by Bob Crossen

The largest CWSRF project in California completes construction under budget while meeting permitting requirements for ammonia removal.

After one decade and $1.7 billion across more than 20 projects, the EchoWater Resource Recovery Facility project for Regional San is complete, making it the second largest plant of its kind in the U.S.

Regional San spans a 3,200 acre space between Sacramento, California and Elk Grove, California. Of that space, 1,100 acres are process areas with 2,100 acres of buffer land. It treats 135 million gallons per day for a population of 1.6 million people.

Christoph Dobson, Regional San general manager, said the buffer land was purchased years ago with the recognition that the community would expand and eventually encroach on the treatment plant. Keeping that buffer land allows it to ensure noise, odor and dust are not issues for its neighbors.

The decade-long EchoWater project was initiated following communications from the Central Valley Regional Water Quality Control Board in 2010, when it issued new treatment requirements for Regional San's wastewater discharge permit.

"That was the very beginning. We had to start planning, design and construction," Dobson said.

What is EchoWater?

The most critical element of the EchoWater project was ammonia removal. To achieve that, biological nutrient removal (BNR) became the cornerstone for the project's overall goals. The BNR process spans nearly 18 football fields in size on the facility's 3,200 acres.

For Regional San, the performance of the process is proof that it was worth the investment.

"It's extremely effective and a very good process," Dobson said. "We're removing 99%+ of ammonia in wastewater and about 88% of the total nitrogen."

The project did not earn any grants and was funded entirely by ratepayers through the use of a Clean Water State Revolving Fund (CWSRF) loan from the California State Water Resources Control Board in the amount of $1.5 billion. It is the largest listed CWSRF loan on the California Water Boards' website. With the help of that loan and its low interest rate between 1.7 and 1.8%, ratepayers were saved an estimated $500 million in interest payments.

"We were very fortunate we got that," Dobson said, adding the amount was so large that it impacted the SRF program on a broader scale. "We kind of became a little bit of the villain that had tied up the SRF loans, but it was very effective for us."

He said, in the end, the project was able to complete the work without the need for all $1.5 billion in the initial loan. He said EchoWater used approximately $1.4 billion in total.

Plant Description and Flow

Regional San is an advanced tertiary treatment plant, the size of which is only smaller than that of the Blue Plains Advanced WWTP in Washington, D.C. Dobson said Regional San's permitted capacity is 181 million gallons per day (mgd), but during extreme weather events, it handles more than triple that permitted capacity.

"We've been handling flows in excess of 600 million gallons per day during the recent atmospheric river events that we've had here in California over the past winter," Dobson said.

Following the flow of the water into the plant, it is met with bar screens, sediment, and scum and grit removal processes in the primary treatment stage. In the secondary treatment stage, it enters the BNR treatment process, which Dobson said is one of the newer additions to the facility. This stage was vital for meeting the new permit requirements, particularly for ammonia removal.

"Our process at the time was carbonaceous oxidation tanks, and they don't remove ammonia," Dobson said of the change in permitting requirements in 2010, "so the BNR is there to remove ammonia."

After that, the water enters the secondary sedimentation tanks before it moves to tertiary treatment.

"The tertiary process — this is another new process for us — is granular media filtration, so that was a new one that was part of the EchoWater project," Dobson said. "And then of course we have disinfection contact basins and finally we neutralize the chlorine with sodium bisulfite before we discharge to the Sacramento River."

Dobson said there is an 800-foot pipeline diffuser that leads to the discharge point at the bottom of the Sacramento River. As for the solids, Regional San uses anaerobic digestion.

Location: Sacramento County, California
Size: 135 average mgd; 181 peak mgd
Equipment: bar screens, sedimentation tanks, scum removal, grit removal, biological nutrient removal, granular sand media filtration, anaerobic digestion, enhanced disinfection

"From there, the solids head out to our solids storage basins where they further break down over about a five-year period," Dobson said. "And then — we like to call it harvesting — we dredge the solids from the bottom and inject those into the soil and disc that into the soil of our lined, dedicated land disposal units."

Not all solids are disposed in this way, however, as around 25% of those solids are sent to Synagrow, a biosolids recycling facility, with which Regional San has an established public-private partnership. Synagrow then converts those solids into a Class A fertilizer that is used on farms and agricultural operations throughout the region, which aligns with Regional San's value and mission of environmental stewardship.

Water Reuse is the Future

On a similar note of values alignment, Regional San currently has a 2 to 3 mgd Title 22 recycled water facility on its plant site, which is used to water local ballfields and landscaping. Some of that recycled water is even provided to an industrial user for a cooling water application.

While the amount is quite small in the grand scheme of Regional San's efforts, Dobson said the tertiary process that is now in operation treats water to such a degree that it could all fulfill Title 22 requirements as well.

Recycling that water — a project Regional San is calling Harvest Water (see page 8) — is the next evolution for the facility, and it aims to have water flowing by 2025.

"Harvest Water will pump about 50,000 acre feet per year to southern Sacramento County farmers, and they're going to use that water to irrigate their crops," Dobson said. "Right now, they all use groundwater so they're pumping from the ground and, with the drought and everything, that's over-drafting those groundwater basins."

One benefit of this process is "in-lieu groundwater recharge," meaning that reducing groundwater pumping allows for natural recharge of that groundwater. Dobson said that, over the life of the project, the groundwater table is expected to raise by 25 feet. Harvest Water also expects improvements to riparian forest habitats in addition to more sustainable agricultural water use. Half of the $600 million cost is already allotted through grant funding.

Bob Crossen is editorial director for the Endeavor Business Media Water Group and is editor-in-chief of *Wastewater Digest*. Crossen can be reached at bcrossen@endeavorb2b.com.

WATCH THE VIDEO

Watch the interview with Cristoph Dobson on Wastewater Digest at **www.wwdmag.com/33008123**.

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Calendar

September 2023

SEPTEMBER 10-12 – Smart Water Summit, Scottsdale, AZ, *smartwatersummit.com*

SEPTEMBER 25-27 – WaterPro Conference, Aurora, CO, *waterproconference.com*

SEPTEMBER 26-28 – The Utility Expo 2023, Lousville, KY, *theutilityexpo.com*

SEPTEMBER 30-OCTOBER 4 – WEFTEC 2023, Chicago, IL, *weftec.org*

October 2023

OCTOBER 3-5 – AWWA WaterSmart Innovations, Las Vegas, NV, *awwa.org*

OCTOBER 4-7 – AWT Annual Convention and Conference, Grand Rapids, MI, *awt.org*

November 2023

NOVEMBER 5-9 – Water Quality Technology Conference, Dallas, Texas, *awwa.org*

NOVEMBER 14-16 – One Water Summit, Tucson, AZ, *uswateralliance.org*

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