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Chelsey Little
Plant superintendent/pre-treatment coordinator
Montague, Mass.

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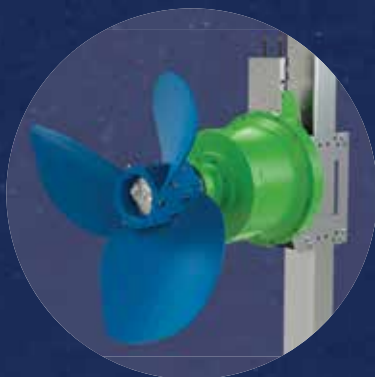
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let's be clear

What's the Point?

IN ENDEAVORS FROM WARFARE TO POKER, FROM CHESS TO FOOTBALL, FROM INVESTING TO WATER TREATMENT, SUCCESS GOES FIRST TO THE OWNER OF A SOUND STRATEGY

By Ted J. Rulseh, Editor



"If you are tired of hammering your head against the wall, if it feels like you never are good enough, or that you're working way too hard, it doesn't mean you're a loser. It means you've got the wrong strategy."
Seth Godin, author and entrepreneur

I learned an early lesson in strategy while playing high school basketball. I was guarding the opposing team's center, who was a couple of inches taller. He kept posting me up and shooting jumpers and half-hooks right over me. Clearly his coach had seen in scouting that I didn't know how to "front" a player (and that my teammates didn't know how to give help). So that's how they attacked us. It was a painful lesson.

* * *

"Strategy without tactics is the slowest route to victory. Tactics without strategy is the noise before defeat."

Sun Tzu, Chinese general

The importance of sound strategy applies in work life as well as in sports. In fact, it applies in just about every endeavor. In a public agency like a drinking water or wastewater utility, it can be difficult to act strategically. Funds are often short, demands are many, emergencies (large and small) are common. It becomes easy to slip into fighting fires or managing by crisis.

* * *

"What's the use of running if you are not on the right road?"

German proverb

But managing by crisis is not the way to run an enterprise. It's not good for your sanity, it's not good for the customers you serve, and it's not good for those customers' pocketbooks. In the end, emergencies always cost more. The way to be cost-effective is to manage and operate strategically.

* * *

"Begin with the end in mind."

Stephen Covey, author and educator

What's the most significant outcome you're looking for? Maybe it's zero permit violations. Maybe it's no sewer overflows or untreated discharges. Or fewer water main breaks. Or lower rates. Whatever your ultimate objective is — your version of the ideal world — that's where to aim your strategy, and your energy.

* * *

"In strategy it is important to see distant things as if they were close and to take a distanced view of close things."

Miyamoto Musashi, Japanese swordsman



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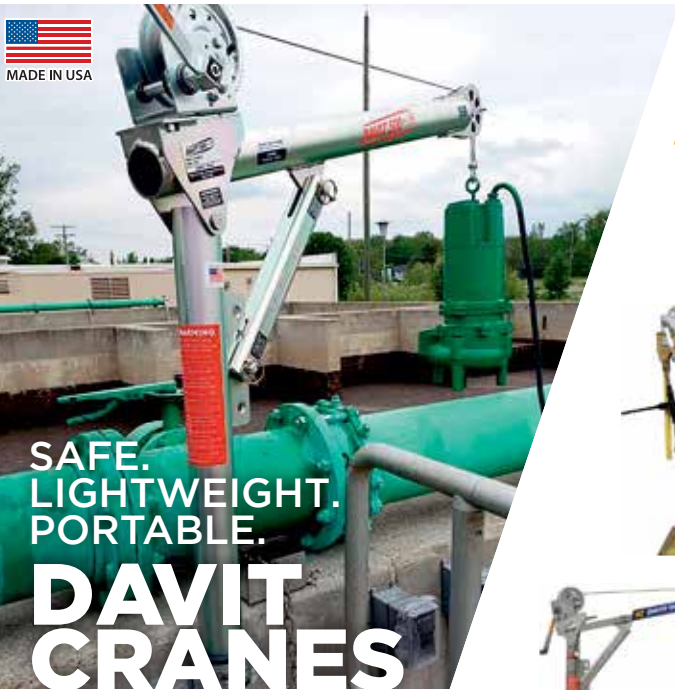
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Once you've chosen your point of focus, don't let anything distract from it. Share your ultimate aims with your team. Enlist them to help develop the strategy that takes you where you need to go. In planning a budget, don't think in terms of X and more than last year. Think in terms of what it takes to reach your goal. With strategy comes passion. The more you believe in your strategy, the better you can convince those around you — including those who hold the purse strings — that you're right.

* * *

"The main thing is to keep the main thing the main thing."

Anonymous

It's hard to stay focused when all manner of day-to-day obstacles arise — turnover on the team, budget directives, neighborhood controversies, petty squabbles between employees, weather events. It can be easy to lose the track, forget the strategy and start fighting fires again.

Don't let it happen. Keep the focus where it belongs. Write the ultimate goal down where you can look at it every day. Post it in common areas around the office or on placards in the trucks, if you can do it in a way that doesn't look corny. (Management by slogan is not a good idea, either.)

At the end of each day, ask: How much progress did we make today? Don't let trifling matters interfere.

* * *

"Things which matter most must never be at the mercy of things which matter least."

John Wolfgang von Goethe, German philosopher

I hope you've enjoyed the insights on strategy from some great minds in various walks of life. Best of luck on the journey. **tpo**

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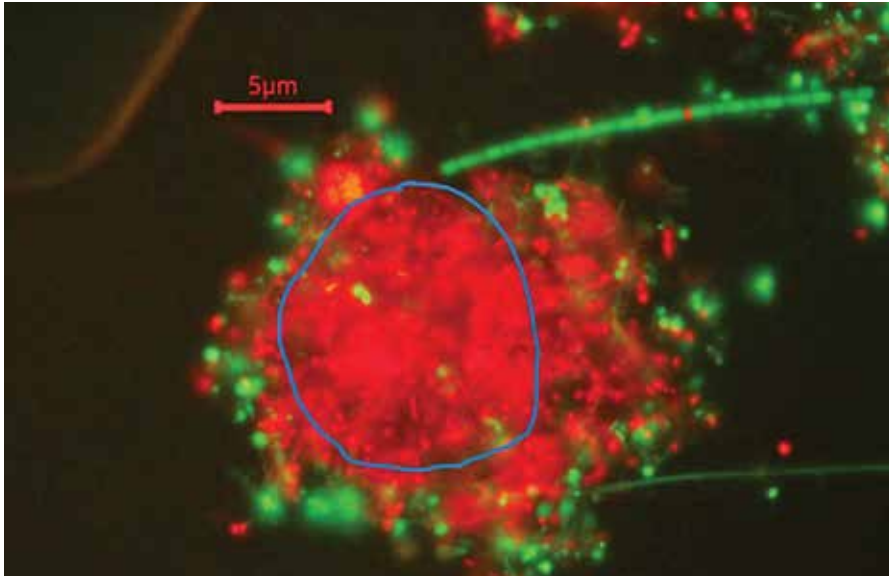
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AIDING FLOCCULATION

The Role of Dead Bacteria

While living bacteria are directly responsible for general treatment, there are several crucial ways in which dead bacteria also aid in flocculation and overall treatment. In this online exclusive article, read about how dead bacteria can act as bridging agents between live bacteria and other suspended particles.

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STOCKHOLM JUNIOR WATER PRIZE

United States' Naomi Park Wins

Naomi Park from the United States has received the prestigious Stockholm Junior Water Prize 2023 for her research on the removal of carbon dioxide and oil products from the ocean. HRH Crown Princess Victoria of Sweden presented the winner with her award during a ceremony at World Water Week in Stockholm.

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OVERHEARD ONLINE

“We know there are still issues with the testing protocols, but we have to start somewhere to find out what is in the wastewater and biosolids.”

Northeast States Publish Results of PFAS Testing in Biosolids and Wastewater

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IN DEFENSE OF WATER

Project Grant Awarded

Marquette University in Wisconsin has received a second two-year, \$3.8 million U.S. Department of Defense grant for an ongoing interdisciplinary program titled “In Defense of Water.” The program develops novel, sustainable technologies to protect human health and the environment, treat sewage, provide clean drinking water, and build a framework for emergency response to water contamination.

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Big Challenge? No Problem.

CHELSEY LITTLE AND HER TEAM ENGINEERED A BIG TURNAROUND FOR A MASSACHUSETTS CLEAN-WATER PLANT FACING A CONSENT ORDER

STORY: **Scottie Dayton** | PHOTOGRAPHY: **Melissa Leete**



Every wastewater professional in western Massachusetts knew the U.S. EPA and state regulators were looking at the Montague Clean Water Facility.

When the plant supervisor position opened up September 2019, no one touched the hot potato except Chelsey Little. “The only way I saw was up, and the challenge was exciting,” says Little. Hired in March 2020, she had only four years of experience.

She walked into a perfect storm. In 2015, and as part of a five-year trial, the 1.83 mgd (design) activated sludge plant was reconfigured to high-rate anaerobic digestion. In 2017, two major paper mills ceased operations.

Without the pulp and paper waste, sludge consistency changed almost overnight to a soupy mix. Over time, TSS short-circuited into the effluent and triggered permit violations. Flying under the radar, a food production facility contributed to TSS and dumped acidic cleaners and lactic acid into the sewers. An aquafarm added more TSS. Process control became erratic and frustrating.

Over the next two years, Little and her multitalented team restored compliance, showered the plant with much-needed love and engaged in community outreach. In 2023, the New England Water Environment Association honored Little, 35, with the William D. Hatfield Award.

BACKGROUND

Little never fit the typical mold. While classmates watched cartoons and read comic books, she watched the Discovery Channel and read *National Geographic*. “I loved biology, but didn’t pursue it until after I married and had two children,” she says.

In 2016, Little earned a bachelor’s degree in biological sciences from Southern Vermont College, graduating

Chelsey Little, plant superintendent and pretreatment coordinator, Montague Clean Water Facility

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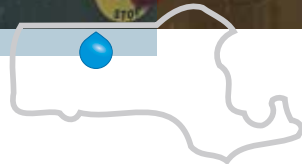
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Little, at the control panel of the volute dewatering press (PWTech [Process Wastewater Technologies]), received a 2023 William D. Hatfield Award.

“I loved biology, but didn’t pursue it until after I married and had two children.”

CHELSEY LITTLE



Chelsey Little, Montague (Massachusetts) Clean Water Facility

POSITION:
Plant superintendent and pretreatment coordinator

EXPERIENCE:
7 years

EDUCATION:
Bachelor’s degree, biological sciences, Southern Vermont College; master’s degree, environmental public health, University of Vermont

CERTIFICATIONS:
Grade 6C (municipal and industrial wastewater)

GOALS:
Change perceptions of clean-water professionals and what they do

summa cum laude. Then came a master’s degree in environmental public health from the University of Vermont while working as the laboratory manager at the Greenfield (Massachusetts) Water Pollution Control Plant.

“My husband, Todd, is a water and wastewater operator and we talk shop,” says Little. “He mentioned that the many small drinking water systems in our area had no nearby state-certified drinking water labs. With our backgrounds, we opened Pioneer Valley Environmental Laboratories in June 2016.”

By April 2018, the highly successful part-time enterprise forced the couple to decide between running it full-time or remaining in their present occupations. They chose the latter for the security it gave their three small children, and because Little realized how much she loved and missed treating wastewater.

After a brief stint as chief operator at the 1 mgd (design) Northfield Water Pollution Control Facility, Little took her current supervisor position.

DREAM TEAM

When Little wasn’t writing effluent and industrial pretreatment reports or high-flow management plans for the regulatory agencies, she was the plant’s self-proclaimed project manager.

“I told my guys what to do and they did it,” she says. “By keeping the work in-house, we saved the town hundreds of thousands of dollars.”

Her team includes Tim Little, foreman, operations manager and brother-in-law; operators Tim Puera, Adam Kleeberg and Samuel Stevens; Noah Diamond, laboratory manager, and Patricia Holloway, administrative assistant. Puera is also a mechanic, Kleeberg a licensed plumber and Stevens a carpenter.

Their most ambitious undertaking was installing the ES-302 two-channel Volute dewatering press (PWTech [Process Wastewater Technologies]). Over two months, they poured the concrete pad and trenched in the drainage. Kleeberg oversaw plumbing the return activated sludge feed and flowmeter, while Stevens supervised running the conduit and pulling the wires.

“Specifications came with the press and PWTech provided a checklist of what to do, and the plant staff put it together,” says Little. “Once complete, a PWTech representative came to inspect and activate the press. It began running in early January 2022.”

Today, the press turns sludge at 1.5% solids into cake at 26% solids for composting. The plant has been compliant since January 2022. Little estimates the in-house installation saved the town more than \$100,000.

With the acquisition of a 21,000-gallon storage tank in February 2023, the facility gained the capacity (50,000 gallons total) to again become the regional biosolids dewatering hub. Until then, surrounding communities

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paid haulers to transport it long distances for dewatering.

“We initially accepted three 9,000-gallon loads per week, but we anticipate handling eight such loads per week,” says Little. To further increase revenue, she ordered a feasibility study based on opening a regional composting facility.

SLEEPING TIGERS

While some operators dread regulators, Little views them as assets. She has worked with Dan Kurpaska, a state Department of Environmental Protection wastewater management regulator, and Jack Melcher, a U.S. EPA enforcement officer, for six years.

“They are a wealth of information and anxious to help solve problems,” says Little. “The key is to keep them apprised of what is happening.”

Cases in point were bulking/settling occurrences at the plant and



The team at the Montague Clean Water Facility includes, from left, Noah Diamond, laboratory manager; Samuel Stevens, wastewater technician; Tim Peura, lead mechanic; Adam Kleeberg, lead operator; Anthony Montivirdi, laborer/operator; Chelsey Little, superintendent; and Patricia Holloway, administrative assistant.



The Montague Clean Water Facility.

fluctuating biology and chemistry with no obvious cause. Little reported the process control situation to Melcher, who uncovered industrial users in significant noncompliance with pretreatment requirements.

Little’s investigation discovered that fermentation at the soy-based food facility produced exopolysaccharides, which caused settling problems at the plant and had to be wasted. “In addition, their wastewater had pH levels of 1 or 2, and 5 is the legal limit,” she says. “Once this and other rogue facilities became compliant, we regained process control.”

Until recently, industrial clients were sampled annually. “Part of our problem was lacking the personnel to run a comprehensive industrial sampling program,” she says. She sought funding, then hired Diamond and tasked him with sampling the companies quarterly.

The case convinced Jay Pimpore, EPA pretreatment coordinator, to invite Chelsey to present “How Pretreatment Changes Impact Process Control” at the New England Regional Pretreatment Coordinators Conference and the

“I thought planting a pollinator garden to attract butterflies and bees would be beautiful and illustrate again that treating wastewater is about the environment.”

CHELSEY LITTLE

New England WEA Spring Conference on Innovation and Resiliency.

Her conclusion advised operators to pay attention to their industrial clients and to unusual process conditions: “Take time to investigate, and above all sample, and sample often.”

PLANT IMPROVEMENTS

The consent orders included upgrades, and the removal of two 1-ton chlorine gas cylinders in the dosing room was first on the list. Plans from an engineering firm split the room into two, each with a 500-gallon liquid sodium hypochlorite tank. *(continued)*



Chelsey Little, shown checking the residual chlorine analyzers (Hydro Instruments), believes strongly in the value of public outreach.



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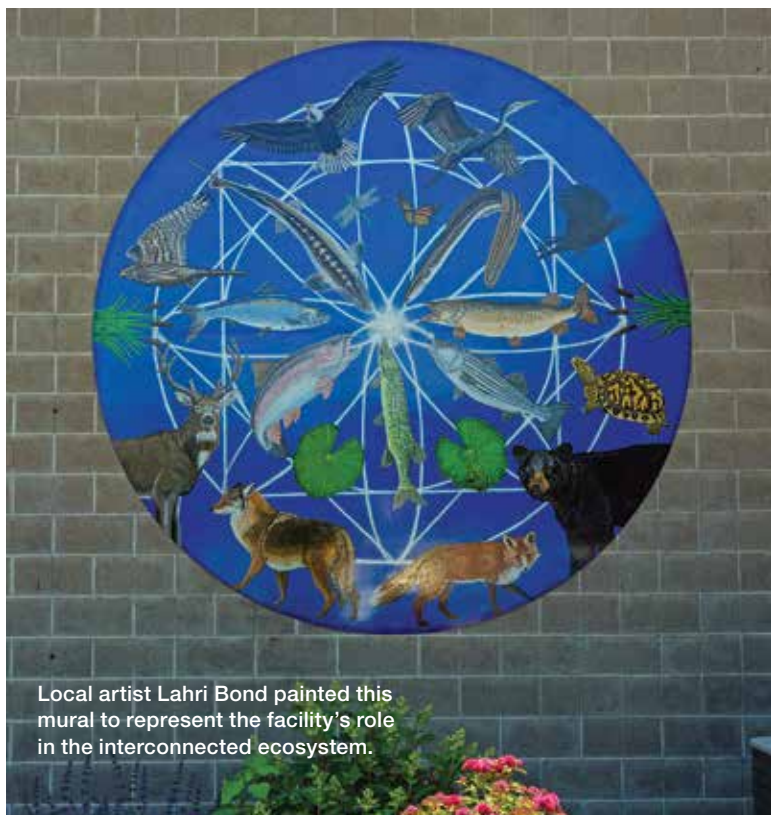


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Local artist Lahri Bond painted this mural to represent the facility's role in the interconnected ecosystem.

Over winter, the team worked after hours for six months to complete the remodel in time for the chlorination season beginning in April. Little estimates that not hiring a contractor saved more than \$200,000.

The plant's multiple sumps required quarterly cleaning by an industrial company. "Service calls cost \$2,000 to \$4,000," says Little. "We wanted to buy a small vacuum tank, but needed a trailer for it."

After some networking, the public works department in a neighboring town offered a decommissioned two-wheel LED display trailer. The team added two front wheels and welded lots of metal to anchor a 450-gallon vacuum tank with a 5.5 hp gasoline engine (Brenner-Fiedler).

Other improvements included updates to the indoor and outdoor lighting, pouring a concrete pad for the solids frac tank ramp at the head of the operations building, and the purchase of a milling machine.

"Ordering parts for the four-channel Fournier rotary press cost \$5,000 per component," says Little. "Now Tim Puera mills them." The press dewateres primary sludge.

While researching environmentally friendly polymers to replace the synthetic product in use, Tim Little found Tidal Clear (Tidal Vision Products), a water-soluble chitosan synthesized from the shells of harvested mud crabs.

"Chitosan is a close derivative of chitin, the second most abundant biopolymer in the world," says Little. "Our initial jar tests showed chitosan compared with the synthetic flocculant in performance and price, but we want to run more trials with the company."

PUBLIC OUTREACH

As Little dealt with the plant's physical needs, she stayed focused on her goal to change the public's perception of it: "I wanted people to know that our role in the community is to protect their health and ecosystems, but we didn't make a good first impression. All drivers saw from the road was the building's ugly gray brick wall."

Working with a committee, Little invited local artists to design a mural highlighting water ecology, the Connecticut River Watershed wildlife, and the interconnected ecosystem.

After reviewing 23 submissions, the committee selected Lahri Bond to paint the mural on a 10-foot-diameter aluminum disk. It was secured to the wall and unveiled during Earth Day in April 2022.

RACING FOR RECOGNITION

Entering the 2022 Montague Soapbox Races was a component of Chelsey Little's outreach program. "The fire department has an entry," she says. "Why shouldn't the wastewater department support this popular community event?"

Her team of operators agreed and spent off hours building the car from scrap metal and parts. Tim Puera oversaw design and assembly, welding two discarded oil tanks together to form the body. Sam Stevens donated an old riding lawn mower's steering mechanism, which Puera installed along with the brakes.

After 45 hours, *Archimedes* rolled off the assembly line. "People may have missed the symbolism behind the name, but they understood the #2 on the sides of the car," says Little.

Racers were divided into kids (age 8 and up), teens, and adults. Last year's races in September at Unity Park in Turners Fall had 20 competitors. The hill at Unity Park drops 60 feet in the first 300 feet with a long left curve at the bottom.

Adult racers have reached 34 mph from a standstill on the 4-foot-high, 12-foot-long starting ramps. Their fastest times on the third-of-a-mile course are less than 30 seconds.

Archimedes, driven by Stevens, age 29, faced 12 other racers and finished fifth in 49.05 seconds. Leslie Jackson, age 77, followed in *Purple* with a time of 49.13 seconds. The winner zoomed across the finish line in 45.52 seconds.

Little and her husband built *Troll Pride* for Lia, their 13-year-old daughter, and learned that doing it right wasn't easy. Their entry provided the day's most spectacular spill when the steering failed.

"She careened to the right on the initial downhill straightaway and crashed into the trees," says Little. Medics attended to Lia's skinned knee and mild concussion. The crowd gave her a standing ovation.

Back at the plant, *Archimedes* hangs in a place of honor, suspended from the rafters in front of a large window at the end of the hallway to the blower room.

The town's \$2,500 investment produced better than expected results. "The mural has become our logo and is highly visible from the road," says Little. "People love it and want us to sell T-shirts with the image on them."

With the mural in place, the team noticed the dead grass and bare ground in front of the building. "I thought planting a pollinator garden to attract butterflies and bees would be beautiful and illustrate again that treating wastewater is about the environment," says Little. Last spring the team planted flowers, trees and bushes irrigated with plant effluent and fertilized with composted biosolids.

Little reports that the facility has remained compliant. She still attends town hall meetings and community events to remind the public that "the treatment plant is at the river and operated by certified professionals." **tpo**

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Bring It On!

A PENNSYLVANIA AUTHORITY ADDS MACHINERY THAT DE-PACKAGES MULTIPLE KINDS OF FOOD WASTE FOR CO-DIGESTION WITH BIOSOLIDS TO BOOST BIOGAS PRODUCTION

By Steve Lund

The Hermitage Municipal Authority started adding food waste to its biosolids in 2014 to produce more methane for its combined heat and power system.

At first the wastewater treatment plant handled only liquid waste from a pair of food producers but over nearly 10 years the menu options increased substantially. Canned soft drinks? Hermitage can handle that. Fruits and vegetables in plastic or cardboard crates? They'll take it. Mayonnaise in plastic jars? Send it over.

The authority found multiple sources of organic material to add to the anaerobic digesters while creating a market for processing food waste in an environmentally responsible way. "We didn't actually have to look for material — it started finding us," says Thomas Darby, manager of the authority and superintendent of the Hermitage (Pennsylvania) Water Pollution Control Department.

THREE DIGESTERS

The Hermitage treatment plant (7.7 mgd design, 3.5 mgd average) has a headworks with fine screening (Jones & Attwood) and three sequencing batch reactors with aerators (Evoqua Water Technologies). The effluent is UV disinfected (Trojan Technologies) and discharged to the Shenango River.

Biosolids go to gravity belt thickeners (Evoqua) and then to feed sequencing tanks for mixing with food waste. From there the mixture goes to a thermophilic digester (140-145 degrees F) for 48 hours, and then to two mesophilic digesters (98 degrees F) for 21 days.

The digesters have cannon mixers (Veolia Water Technologies) that use bubbles of the biogas to constantly mix the contents. The resulting biosolids

“We’ve become a little bit of a recycling center as well as a wastewater operation and a renewable energy facility.”

TOM DARBY

qualify as a Class A product that is trucked to a farm. The biogas is captured in a 100,000-cubic-foot storage ball, scrubbed to remove siloxanes and hydrogen sulfide, and then chilled.

The scrubbed biogas feeds a 600 kW Caterpillar engine-generator and a 375 kW Nissen Energy unit. The two produce nearly all the plant's electric power plus process heat for the treatment plant. "If everything is running and we're at full operation, which means all the processes are working properly and the digesters are all online, we can zero out our electric bill," Darby says.

LIQUIDS FIRST

The first source of food waste was a food distributor that had been land-filling expired milk, cottage cheese and other products in one-gallon plastic



Hermitage Water Pollution Control Plant workers load packaged food into the Scott Equipment Turbo Separator.



The eCrusor (Veolia Water Technologies) de-packages food in plastic jars without shattering the brittle plastic lids.

jugs returned from stores. The wastewater department used a perforator (R.E.M.) that punched holes in the jugs to drain the liquid. That worked fine.

The next source was a maker of ice cream cones that sent truckloads of liquid, pumped directly into the hydrolysis tank used to store food waste before mixing into the digesters. "That's all we thought we would ever do,"

(Continued on page 24)

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(Continued from page 22)

Darby says, “But when I started speaking to Chambers of Commerce and Kiwanis Clubs around Western Pennsylvania and Eastern Ohio, companies approached me and said they had material in packages and boxes. Could we do anything with that?”

His first reaction was that handling such material would be too much trouble, but he kept hearing about companies that needed to dispose of boxed food. Eventually the authority purchased a hammermill called a Turbo Separator (Scott Equipment Company) that could process not only boxed food but canned goods and products in plastic bottles or crates.

“We had all kinds of stuff coming in at that point,” Darby says. “We could just toss it into the Turbo Separator, which did a fantastic job of breaking it down and spitting out the packaging into a roll-off.”

Some packaging still presented problems. Items such as mayonnaise jars have hard lids that are more brittle than the rest of the container. “Those lids began to shatter,” he says. “Small flakes started getting into our process, and we don’t want that in our biosolids.”

That prompted Hermitage to add a third piece of equipment, an eCrusor de-packaging system (Veolia). It uses a pair of augers to squeeze the food out of the packaging and doesn’t shatter the lids. “Today we have all three systems in place,” Darby says. “Depending on the product, we can run any one of them or all three.”

CERTIFICATES OF DESTRUCTION

Hermitage never had to be aggressive marketing its food waste recycling service; food waste brokers contacted the utility about handling various products. One asked if Hermitage could handle 300 tons of ice cream after a sample tested positive for *Listeria*.

“We gave them a price to take it, and we created a certificate of destruction that the FDA then approved,” Darby says. “Now for every load we issue a



Food waste that comes in aluminum cans has two benefits. The organics help boost biogas production and the cans can be baled and sold.

certificate showing that it was destroyed in an environmentally sound process.”

Some of the packaging goes into landfills, but some is recyclable and generates revenue. Aluminum beverage cans are drained in the perforator and packaged into 400- to 500-pound bales that are sold. Wooden pallets are sold to local buyers. Pallets marked with company logos are saved, and the owners pay Hermitage for storing them until they are retrieved.

“We’ve become a little bit of a recycling center as well as a wastewater operation and a renewable energy facility,” Darby says. *(continued)*



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(Continued from page 24)

The authority doesn't handle restaurant or post-consumer waste. "Everything we get is pre-consumer," says Darby. "It has never been on anyone's table. It's all material that has been sitting in a warehouse somewhere too long and it's about to expire, or it already has expired."

"There may be nothing wrong with it whatsoever, but because it has that expiration date on it, they can't sell it. But we can get a benefit out of it, create energy and substantially reduce the impact on landfills."

LESSONS LEARNED

Food waste processing has been beneficial to the authority and the food companies. It helps the authority produce more electricity and generate revenue, while enabling food distributors to handle waste products for a lower cost than landfilling.

“We can get a benefit out of [restaurant or post-consumer waste], create energy and substantially reduce the impact on landfills.”

TOM DARBY

One thing Darby would do differently is to build more redundancy into the system. The hydrolysis tank where the food wastes are stored isn't large enough, and if it is full additional material has to be rejected. He'd also like more biogas storage so the plant would never have to flare — that could happen if one generator is down for maintenance and the storage ball is full.

One unanticipated problem was the acidity of the biosolids in the thermophilic digester. The pH between 4 and 5 is much lower than in the other digesters. As a result, some of the original ductile iron piping corroded and



The Turbo Separator removes food products from the packaging and spits the waste material into a hopper.

had to be replaced with stainless steel. Some pumps also had to be replaced.

"The whole process has been a very interesting learning experience for all of us," Darby says. "At the time we started this, my wastewater plant team members weren't quite sure if my head was screwed on right. But we all adapted and we've found that receiving food waste is a very good revenue stream for our community."

"As an example, we haven't had a sewer rate increase for 10 years. That's because we're getting paid to receive the organics and keep it out of the landfill." tpo

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Stephen Sanders, a director and head water and wastewater trainer at the Environmental Training Center at the State University of New York Morrisville, instructs a class of operators.

A Longer Reach

AS A TRAINER, STEPHEN SANDERS FOUND THE POWER TO CHANGE OPERATORS' LIVES FOR THE BETTER, AND TO HELP RAISE THE STATURE OF WATER AND WASTEWATER PROFESSIONS

STORY: Ted J. Rulseh | PHOTOGRAPHY: Sarah Marcellus

Stephen Sanders started his career as an operator and troubleshooter. He found his true calling when he became a water and wastewater trainer.

Since 2015, Sanders has been the director and head trainer at the Environmental Training Center at State University of New York Morrisville. There he helps students gain the knowledge and skills to perform effectively on the job, while encouraging them to take a broader view of their profession.

"I always encourage my students as they're going through class to become a part of something bigger than their plant," Sanders says. "If all you see every day is just your plant, you might find it difficult to stay in this career.

"There are other things you can get involved in. Maybe that's the AWWA section in your state, or your WEF Member Association, your Rural Water Association — something where you start meeting like-minded people.

You create a network of resources and support that, if you only looked at your plant, you wouldn't tap into."

Sanders certainly practices what he preaches: he's active in his state's AWWA and WEF organizations and represents the operations and training professions as a member of the WEF board of trustees.

DIVERSE EXPERIENCE

Originally from Grand Rapids, Michigan, Sanders moved to New York State at age 19 and spent a few years working in the food service and transportation sectors. In 2001 he started work in the lab at the Watchtower Wastewater Treatment Plant in Patterson, a sophisticated facility with a certified lab and a nutrient removal process.

He soon moved over into operations, learning all aspects of the process. "It was super fascinating," he recalls. "I wanted to know what those lab analyses and numbers meant."



Stephen D, Sanders Environmental Training Center, SUNY Morrisville

POSITION:
Director/head trainer

EXPERIENCE:
**22 years on the water/
wastewater professions**

CERTIFICATIONS:
**New York Level Grade 4A
Wastewater Operator, Grade C
Water Operator**

AFFILIATIONS:
**WEF board of trustees, AWWA,
New York Water Environment
Association**

GOALS:
**Support reciprocity in
certification, help rebrand the
water and wastewater as a
desirable industry in which to
build a career**

After two years he joined the contract operations company then called Severn Trent Environmental Services, eventually becoming a shift supervisor at the treatment plant in Carmel, and consulting on his own for startup and operator training at a plant in Brewster.

Next he did water and wastewater contract operations and maintenance and extensive troubleshooting with a smaller company, Allied Pollution Control.

In 2011, while still at Allied, he began teaching part-time at SUNY Morrisville. He later went to work for the Westchester County Department of Environmental Facilities, ending as supervisor of operations at the county's treatment facility in Yonkers.

In 2015 he took his current position with SUNY Morrisville. He came with experiences at plants of all sizes and with multiple processes:

activated sludge, fixed-film, rotating biological contactors, sequencing batch reactors, membrane bioreactors and others.

"I was curious about all the different processes," Sanders says. "I had the opportunity to run them and troubleshoot them. I tell my classes, 'I've run little package plants the size of this room, and a 100 mgd plant on 20-something acres, and everything in between. This is what I've learned over the years, and I'm giving it back to you.'"

BUSY TRAINING CENTER

New York has strict pre-certification education requirements: "There's over 100 hours of education you have to get before they let you sit for an exam," Sanders observes. That means the Morrisville training center is a busy place, seeing roughly 550 operators per year.

Instead of stretching classes over a full semester with evening sessions, the center compresses them into one- or two-week full-time periods. In that time, students can complete a course, take the final exam and return home with a certificate of completion. Sanders believes that approach results in fewer distractions and better retention of course material. During their training, students take facility tours and do lab work under instructors' supervision.

Sanders handles the load of seven wastewater treatment and four drinking water treatment courses with help from secretary Cory Sawyer Scholefield and part-time instructors Robert Wither, P.E., and J. Michael Coley, P.E., both retired regulators from the New York Department of Environmental Conservation.

As a trainer, Sanders finds he has a greater reach — more opportunity to make a difference — than as an operator. He looks to do more than impart job-related knowledge: "I try to prepare them for careers in water, and I hope I can make their lives better," he says. "That translates to a little more money and a little more ease in their living. I'm also helping the next generation of water stewards, opening their eyes to the different opportunities that are out there."

His students are diverse. Typically, several of the roughly 20 members in each class have two- or four-year college degrees. Many are career changers with no little or no industry education or background. Among the most likely to struggle are those moving into wastewater treatment from unrelated jobs with municipalities. They often have a hard time with the math.

“I always encourage my students as they're going through class to become a part of something bigger than their plant.”

STEPHEN SANDERS



In teaching his classes, Sanders looks to do more than impart job-related knowledge. He wants to prepare them for successful careers and make their lives better.

“I take my time with the math. We put a pot of coffee on, roll up our sleeves, get the white board dirty and do a bunch of math.”

STEPHEN SANDERS

“We’ll get someone who worked in the DPW, and all of a sudden they’re asked to run the wastewater plant,” says Sanders. “They get in the class and it’s ‘Oh, my goodness, I have to learn all this stuff now.’ It’s a little bit unfair to them. I take my time with the math. I slow it down. I stay late a number of days to help people as needed. We put a pot of coffee on, roll up our sleeves, get the white board dirty and do a bunch of math.”

He makes sure not to overlook the soft skills — the people skills it takes to move up in the profession: “We have a supervisory class and a management course. I pay a lot of attention to those courses because if we want to recruit and retain people in water careers, we need good supervision. If people feel they’re being treated unfairly or inappropriately on the job, they’re not going to stick around. We can get people in, but to have them stay, we need to create cultures in which people can thrive.”

ADVANCING THE PROFESSION

Sanders devotes significant time to industry organizations. He serves on the board of the AWWA New York Section and was the first chairman of its Operators Committee. In 2019, as a member of the New York WEA, he started a diversity, equity and inclusion committee.

“We got it going completely from scratch,” he recalls. “We developed it into a very effective committee that has affected a lot of things NYWEA does.



Stephen Sanders does not overlook soft skills like effective supervision and management when teaching his water and wastewater courses.

One of our guiding principles is that everyone should have a sense of belonging. We have to look at ourselves and ask, ‘What are some things that make people feel they don’t belong, and that we need to address?’”

The committee treats diversity broadly — ethnicity and gender but also personal background, professional status and position, and more. Initiatives have included training in unconscious bias, along with raising awareness of inequities in the water industry and starting conversations to search for ways to overcome them. The committee also reviewed awards programs and conference presentations, in part to ensure that operators are fairly represented. Sanders has also served on the WEF DE&I Committee.

As a member of the New York State Operator Certification Governance Council, Sanders works to improve the certification program, and that includes reviewing exams. “Recently we noticed that our pass-fail rate had dropped after the exams were changed,” He recalls. “We found that some of the exam questions were unfair. We reviewed the exams and went to another way of putting them together, where we select questions from a question bank.”

The council also oversees reciprocity on certification with other states, an area Sanders sees as needing serious attention. States differ greatly in the levels of training and education required: “You have a state like New York where we require extensive pre-certification education while other states have none of that.”

Sanders asks rhetorically: Does a state with lesser requirements need to increase them? Do states with stricter requirements like New York, Florida, California or Michigan need to lower standards? As a practical matter, lack of reciprocity among states limits operators Sanders observes.

“Let’s say an operator has to move because of family circumstances, and now they can’t get a job and support their family the way they did in the state they left. It’s a real hardship. We need to keep reciprocity on our radar. I work with one of the strategic committees at WEF, and that’s something we’re definitely going to recommit to.”

A NEED FOR RESPECT

Along with that, Sanders sees a critical need to rebrand the industry. “I poll all my classes. I ask, ‘For how many of you is this your first career?’ Rarely does a hand go up.

(Continued on page 32)



Sanders (left) handles the load of seven wastewater treatment and four drinking water treatment courses with help from secretary Cory Sawyer Scholefield (foreground) and part-time instructors Robert Wither, P.E. (second from left) and J. Michael Coley, P.E., both retired regulators from the New York Department of Environmental Conservation.



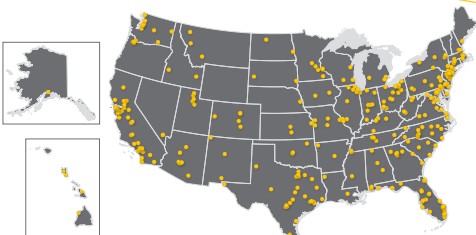
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(Continued from page 30)

“THE UNIVERSITY OF LIFE”

Stephen Sanders used to “duck and weave” when people asked about his educational background: he holds neither an associate nor a four-year degree. “I would try to keep that secret from others,” he recalls. “I’d be sitting at a table at a conference, and I would find a clever way of avoiding the question.”

Now he takes such questions head-on, realizing that his experience — more than 20 years in the water and wastewater industry — confers value: “When I was hired as the head instructor at SUNY Morrisville, they said, ‘No one has the experience that you have.’ That experience is golden. I find myself in situations where I have engineers in my classes. My life experience has been my education, and that’s OK.”

In applying to become a member of the Water Environment Federation board of trustees, Sanders pointed with pride to his background: “I’m built differently. My education is from the University of Life.”

In particular, Sanders wants operators to know that the lack of a degree should not deter them from seeking leadership positions. “You’re at the table doing the same things everyone else is doing, and you’re bringing a perspective that has value,” he says.

“I know there are people like me who are still trying to get over the fact that perhaps they don’t have a college education, and feel they can’t be in leadership positions because of that.

I want to see operators as leaders. We need their perspectives in our industry.

“I want to show people that they can be in leadership positions as operators. They can have a voice. They can be at the table. I want to be forthright about my background, so other people can say, ‘He did it. Why can’t I do it?’”

“Our field is aging out, and we have to come up with some different approaches to make it sustainable.”

STEPHEN SANDERS

When I get around to third, fourth or fifth career, that’s when I see the hands raised. We have to change that. We have to rebrand this field so that people see it as a viable career, right from the start.

“The trades as a whole have taken a hit, but we especially have a problem with regard to operators. How can we recruit people right out of school? How can we get programs going where we visit middle schools, high schools, technical schools and explain these careers to people?”

“I ask my classes how they heard about the career. Often it’s, ‘Well, I knew a guy, who knew a guy, who knew a friend.’ There’s never a school guidance counselor talking about water and wastewater operations or maintenance. Our field is aging out, and we have to come up with some different approaches to make it sustainable.”

In his basic classes, Sanders shows a picture of sewer worker Ed Norton from the 1950s TV show *The Honeymooners*. He asks: “Is Norton a character, or a professional? He’s a character. I need all of you to go out and be professionals because that’s how we’ll attract people to this industry.” **tpo**

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SVI₃₀ comparison of aerobic granular sludge (left) and conventional activated sludge (right)



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Wisdom From Wildlife

AN ANIMATED EGRET, FROG AND DUCK TEACH KIDS ABOUT WASTEWATER TREATMENT IN A CREATIVE VIDEO PRODUCED BY STAFF AT MINNESOTA'S METROPOLITAN COUNCIL

By Sandra Buettner

The Metropolitan Council in Minnesota's Twin Cities region set about to transform a 30-year-old static slideshow into a fun and engaging 10-minute video for school to learn about treating wastewater.

Completed in 2021, the video came in handy, especially when the pandemic hit and kids were learning from home. The utility also took the opportunity to update some of the material from the slideshow.

The video was created internally by Met Council staff members and reviewed by children. Together, they made sure the content included all treatment stages and was easy to understand and entertaining for ages 7-12.

QUIRKY CREATURES

The Met Council's Environmental Services division provides wastewater treatment services to 102 cities and townships and serves about 2.9 million residents with nine treatment plants that process 250 mgd. Three memorable creatures tell the story in the video: Ardea the egret, Anati the duck and Anura the frog.

The names are derived from the Latin taxonomy words for the species and were chosen by the utility's videographer, Carol Critchley. The egret is the primary narrator, walking the duck and the frog through the wastewater treatment process from rainfall to the clean water that goes back to the lakes and rivers.

“We wanted some reassurance that this wasn't just created by adults without testing the reaction from children.”

JEANNE LANDKAMER

for a new slideshow and then animated them for the video. The teachers said the egret, frog and duck really grabbed the students' attention and held their interest.”

There was more to do to create the video from the slideshow. A staff writer, videographer and graphic designer went to work to make the final piece come alive.

TESTING THE WATERS

After consulting with council staff on the accuracy of the wastewater treatment process as displayed in the video, Landkammer, Critchley, and utility graphic designer Linda Jones tested it with eight children of staff members.



The animated tour of the water cycle and the wastewater treatment process features three characters: Ardea (the heron), Anati (the duck) and Anura (the frog).



The clothespins on the “noses” of the frog and duck show that the first stages of wastewater treatment — including the removal of objects in the wastewater that must be screened out and landfilled — come with some rather unpleasant odors.



Biological wastewater treatment relies on microorganisms. In the video, bacteria being looked at through a microscope by the animals look back and provide some humorous commentary.

“We wanted some reassurance that this wasn't just created by adults without testing the reaction from children,” Landkammer says. The results were successful. The kids found it educational and entertaining.

For 20-plus years, the utility has taken part in an autumn water festival for children. It was virtual during the COVID pandemic but returned in person in 2022. Met Council staff created a game for the festival with eight stations tied into the video so the children could act out what they saw and learned.

(Continued on page 38)

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(Continued from page 36)

The children ran from station to station adding props they were given: poop emoji, soap, toilet paper, dirt, a plastic toy and a bucket of water. They added the props to each station as the simulated treatment process progressed. It was a relay; students were divided into teams and enjoyed the physical activity and putting into practice what they saw in the video.

What's Your Story?

TPO welcomes news about your public education and community outreach efforts for future articles in the Hearts and Minds column. Send ideas to: editor@tpo mag.com or call 877-953-3301

MAKING AN IMPRESSION

The video is featured on the council's website and is promoted on social media, in newsletters and on YouTube. As of early 2023 it had received 17,500 views and more than 116,000 impressions since its launch two years previously.

The video is reaching other countries too, including Canada, China, India and Australia. Because of the video, the kids' page on the utility's website went from 45 views in a six-week period to 313.

The video also has other uses. During the pandemic, in-person plant tours were not available, so the teachers used the video instead. The council created a teacher's guide with learning objectives and classroom activities to go with the video.

"One of our plant operators' young daughters was asking him what he did all day when she was in school, and he was struggling to describe his work so she could understand," says Landkamer. "When he searched and found the video from our website he was delighted that he could sit and watch it with his daughter and show her what he did."

The video can be found on the Metro Council's website homepage through this link:

<https://metro council.org/wastewater-water/services/wastewater-treatment/wastewater-treatment-for-kids.aspx> tpo

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CHRISTINE FOWLER BEGAN HER WATER CAREER WITH NO RELATED EXPERIENCE. SHE HAS ADVANCED WITH CONFIDENCE, CURIOSITY AND A BELIEF IN CONSTANT LEARNING.

STORY: **Suzan Chin-Taylor and Stormy Shafer**

PHOTOGRAPHY: **Matt Odom**

Christine “Cricket” Fowler is a perfect example of a trend in the water treatment field: women discovering room for professional training, growth and advancement.

Last year Fowler was recognized as Top Water Treatment Operator in District 5 by the Georgia Association of Water Professionals. She’s part of a team of similarly recognized operators at the Macon Water Authority’s Frank C. Amerson, Jr. Water Treatment Facility, a four-time winner of GAWP’s the Best-Operated Water Plant in Georgia award.

How did Fowler, who knew almost nothing about water treatment, rise to Class 2 Water Treatment Operator certification, with special interest in desalination and new technologies to produce quality drinking water? She worked for it.

DRAWN TO WATER

Fowler’s work life started in the military U.S. Army at Fort Benning, Georgia. Then she joined the CSX Railroad in Hamlet, North Carolina, and was cross-trained in many crafts, along the way gaining various certifications. She later moved to Georgia to be closer to family, started a course in occupational safety and health management at Georgia Tech, and became certified at Georgia Military College to operate forklifts.

Looking for her next job, she applied at Loram Maintenance of Way, which services railroad bed infrastructure; Contour Airlines, which had opened direct service from Macon to Washington, D.C.; and the Macon Water Authority, which was looking for new water treatment operators.

Looking for her next job, she applied at Loram Maintenance of Way, which services railroad bed infrastructure; Contour Airlines, which had opened direct service from Macon to Washington, D.C.; and the Macon Water Authority, which was looking for new water treatment operators.

“I kept calling back enough that they finally gave me a shot. If I could get into the interview, I knew I could sell myself.”

CHRISTINE FOWLER

She wasn’t sure why, but the MWA position intrigued her. “Something told me I needed to take this job, and I kept calling them,” she recalls. “I had no water treatment experience.” What she did have was “a lot of industrial experience and a lot of fortitude. I have gumption, and I always want to learn. I kept calling back enough that they finally gave me a shot. If I could get into the interview, I knew I could sell myself.” *(continued)*



Christine “Cricket” Fowler,
Macon (Georgia) Water Authority



POSITION:
Class 2 water treatment operator and water laboratory analyst

DUTIES:
Manage treatment plant, distribution and collection, lab testing

CERTIFICATIONS:
Class 2 water treatment and laboratory analyst licenses

EDUCATION:
Associate degree, physical science, Carl Albert College; multiple military and other certifications

GOALS:
Advocate water management as a career path; educate and mentor the next generation

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Christine Fowler, Class 2 operator
and water laboratory analyst,
Macon Water Authority

“ I know how to acquire useful
knowledge. I’m taking it in
and not taking it for granted.”

CHRISTINE FOWLER

Offered the job, she jumped into her trainee position. After her probationary period, she immediately began studying for her Class 3 operator certification. Moving quickly through up to Class 2, she also received her lab analyst license, which came about in an unusual way.

Her supervisor accidentally signed her up for the wrong exam, but she took it anyway, since she had paid for it and couldn’t get her money refunded. She passed, and the effort wasn’t wasted:

“It’s been very helpful because it gives you a lot of cornerstone information. It helped me become a better operator, and it also helps people around me.”

COMING INTO HER OWN

Fowler’s first on-the-job trainer was Ronald Eugene Evans, water plant operator. “An old hand with wastewater treatment first, he was very, very good,” she recalls. “Very thorough, strict and commandeering.”

Another colleague who helped bring her up to speed was operator Brian McDade. He deconstructed complex concepts in a way that reached her: “I’m not as good in math as I am in physics. If you break it down for me so I can understand the cogs and wheels and what’s affecting what, it simplifies it for me and makes the math easier.”

She feels blessed to have had such patient, thorough mentors during her training and appreciates their hands-on approach. “Those two truly know the plant. They understand it with their eyes closed. You can call them on the phone and get a consultation. That’s better than any assistant manager who doesn’t know what’s going on day to day, because they’re in the office.”

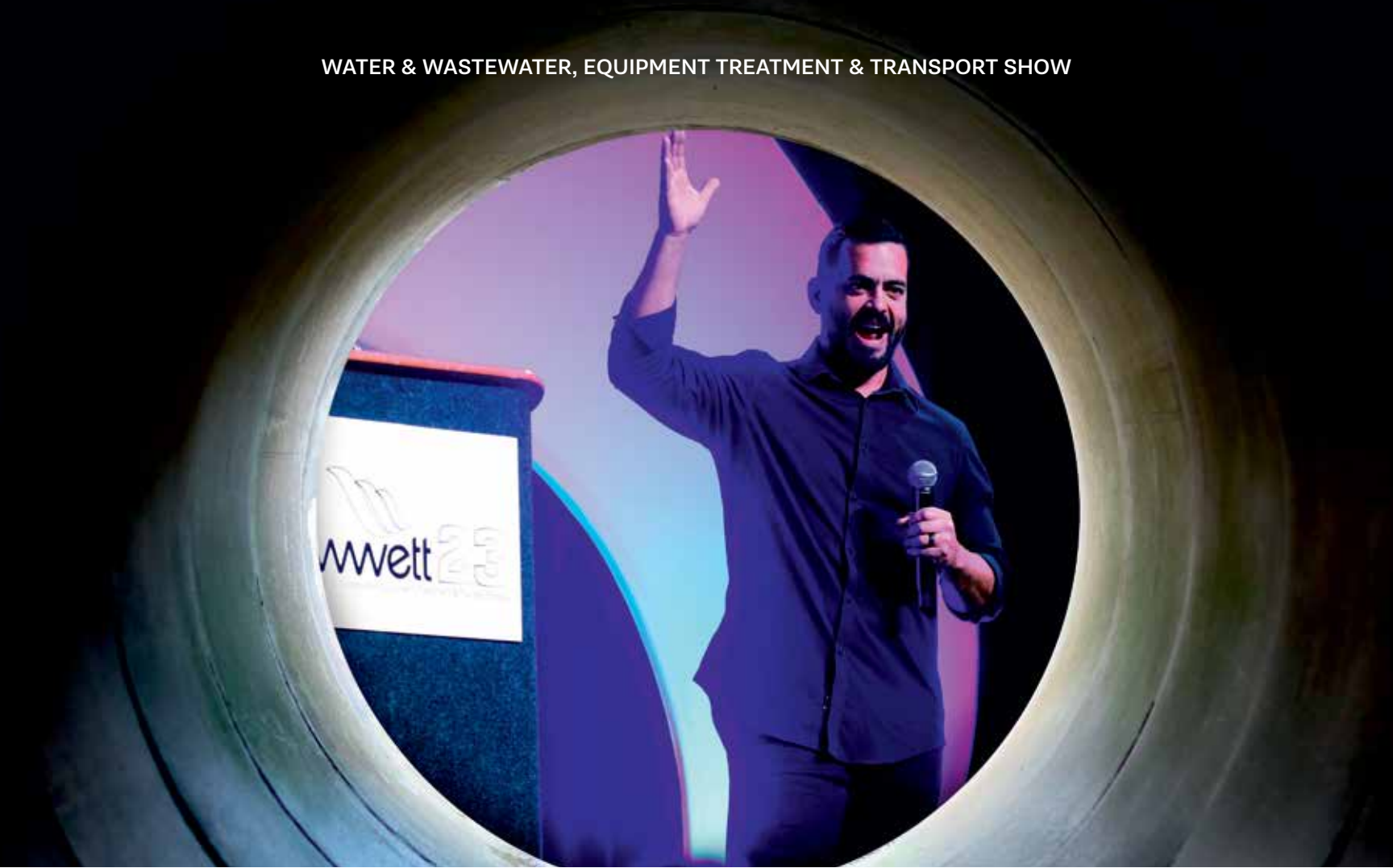
Now Fowler is helping mentor a new crew that recently came on board, to fill out a 10-person facility staff. They include operators Ronald Eugene Evans, Dale Morehead, Brian McDade, Jeffrey Pehlke, Ronald Braswell, Dale Dutcher, Ronald Bales, David Keene and Jonathan McNatt (also a water lab analyst).

CLOSE COLLABORATION

On a 3,125-acre property, that staff runs the Amerson plant to draw water from the 581-acre, 5.8 billion-gallon Javors Lucas Lake. Production capacity is 76 mgd, permitted for 60 mgd, and expandable to 90 mgd for the future.

Macon Water’s storage system includes four clear wells totaling 20 million gallons, plus 10 elevated and 10 ground storage tanks holding a total of 19.9 million gallons. Finished water is distributed through 1,409 miles of water main and nine pumping stations, providing nearly 26 mgd on average to about 55,000 customers.

(continued)



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The team at the Macon Water Authority includes, from left, Sylvia McCrary, lab analyst II; Chuck Mixon, assistant plant manager; and Christine Fowler.



Fowler checks the source water using an Orion Star A211 pH meter and Cimarec digital stirrer from Thermo Fisher Scientific.

Fowler's duties consist of working with her team to test samples in the lab, perform equipment inspections, monitor lift stations and operate the treatment process, storage and distribution. They also monitor customer telephone inquiries, outage reports and service requests. Some arrive via email through the contact form on the authority's website, but emergencies arrive by phone.

Based on the nature of those calls, Fowler may have to contact the on-call personnel to address trouble spots for service. A SCADA system helps the team monitor and control operations and address issues promptly.

For customer requests for emergency service, operators consult the plant's computer-based Cayenta Customer Information System, which ties into the authority's Cityworks enterprise management software.

Lab work is a regular part of operators' duties: "We go into the lab every hour, on the hour, pull samples from each point in our process and run up to 15 separate tests. Also, we test for aluminum, manganese, fluoride, iron, hardness and alkalinity. And if you're the first person of the day, you've got all that, plus the jar test."

Lastly, there are maintenance and repair issues: "We do constant facility inspections. As operators, we are relied on to observe issues throughout our plant that need addressing."

MAKING WATER

The Amerson plant uses conventional treatment with coagulation, flocculation, sedimentation and filtration. Raw water from the Javors Lucas Lake goes through rough screening and then to pretreatment with chlorine



Christine Fowler was named Top Water Treatment Operator for 2022 by the Georgia Association of Water Professionals.

GONE FISHING

In an effort to connect with its community, the Macon Water Authority hosts a number of annual events, one of which is the Kids Fishing Derby, a favorite of Christine Fowler, water treatment operator and water lab analyst.

The event is organized by the authority's Outdoor Recreation Committee and its nonprofit Macon Water Alliance, established to provide environmental education for residents of Middle Georgia.

"We stock the lake with fish that include bass, rainbow trout and catfish, and the kids really love it," says Fowler. "There are various age groups for the competition. We award some really nice prizes

and provide food and drinks for the families. It's a very special day for the community."

The 2023 event had a record turnout with 467 registered contestants. The winner was a 14-year-old who landed a 3.2-pound bass. The participants were drawn in from Macon-Bibb and 15 other counties.

Says Fowler, "This family event gives some great outdoor recreation to kids and families and shows how important it is that we all take part in protecting natural resources like our beautiful Javors Lucas Lake. It's a special time that we look forward to each year."

dioxide to oxidize iron and manganese. Aluminum sulfate is added as a coagulant before flocculation. The water travels the length of the basins while settling occurs.

Sludge from the bottoms of the sedimentation basins is pumped to the authority's wastewater treatment plants. The water is then filtered with granular activated carbon in 10 filter beds. Fowler credits this media for the authority's winning the Best Tasting Water in the United States in 2009, and the Best Tasting Water in Georgia award in 2023.

After the water has filtered, it is treated with phosphate and lime for pH and corrosion control, fluoridated, and disinfected with chlorine to ensure a proper residual. The finished water is stored in clear wells totaling 20 million gallons before distribution.

HOW IT HAPPENS

Essentially, Fowler functions as a pair of eyes, ears and hands, playing director to a stage filled with up to 15 other workers, most of whom are not on site. They're assigned to other parts of the treatment or distribution system and are called out when she needs them. She's generally one of two operators on site, one inside and one outside, working in six-month rotating shifts.

She sees her biggest success as learning from co-workers and being adaptable: "I know how to acquire usable knowledge. I'm taking it in and not taking it for granted. I'll change something I'm doing in a skinny minute if I find an easier, more efficient way, just as long as it's safe and gets a good quality result."

She's committed to enlarging and refining her computer skills and to continuing her formal education. "I would like to get a bachelor's in applied science," Fowler says. "I have a lot of college credits, but I need some more specific science courses. And I would like to learn more about desalination, because I think that's an option in the future for dwindling water resources."

“If we can't do it on your own, our job is to know who can best help get it done safely and efficiently.”

CHRISTINE FOWLER

She's open to new ideas and developing technologies: "What if there is a better and more efficient way to complete the process? What if it's cleaner and easier on the environment? It's just better all the way around to work smarter, not harder."

RECIPE FOR SUCCESS

Fowler isn't sure why she won her Top Water Treatment Operator award, but she knows why she's successful in her everyday duties. "You have to accept the entire team, not just your local plant," she says. "Every part of your organization is your team, from distribution to drinking water treatment, to wastewater treatment.

"Everyone needs the power to make professional decisions on the fly, and you have to call the team. If we can't do it on our own, our job is to know who can best help get it done safely and efficiently."

She is bullish on the future of the industry and enthusiastic about endorsing it as a career: "There are so many options for somebody with this type of training. You could go to work in a private industry, you could work for airlines, you could work for a municipal treatment plant."

She believes people who are energetic have a bright future replacing those retiring from the industry. The key, she says, is to pay attention, notice things, and remember not to go it alone: "It's all about the team. It takes a village."

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The Bigger Water Picture

TRAVIS LOOP BUILT A 15-YEAR CAREER FOCUSED ON SPECIFIC WATER ISSUES AND SECTORS. HIS CURRENT VENTURE, WATERLOOP, LOOKS AT WATER AND ITS CHALLENGES FROM A BROADER PERSPECTIVE.

By Ted J. Rulseh

For six years ending last December Travis Loop directed communications for the Water Environment Federation.

Since then he has devoted full time to waterloop, his three-year-old nonprofit media outlet focused on exploring solutions for water sustainability and equity. It takes a broad view of the water issues and challenges facing the United States.

Through podcasts, videos and social media messages, waterloop spotlights the people and projects responsible for advancements and successes in the water sphere. Taken together, the material helps readers, listeners and viewers become more knowledgeable leaders and creators of positive change.

The coverage of water extends far beyond the utility sphere. Drinking water and wastewater operators who access waterloop can learn about water issues in all their diversity and complexity, and see how their roles fit in with larger initiatives to ensure reliable and safe water supplies and healthy water environments.

Beyond featuring water sector leaders and experts, waterloop provides a platform for emerging leaders, and for diverse voices that historically have been under-represented. Loop talked about his venture in an interview with *Treatment Plant Operator*.

tpo: What is the origin of your attraction to and interest in water?

Loop: I grew up as a competitive swimmer. I got into surfing and paddling. Just being around the water has always been my thing. I had a background as a journalist before I did water communications. I feel grateful that my professional and personal interests are so aligned.

tpo: What kinds of positions did you hold before devoting all your energy to waterloop?

Loop: I was a newspaper guy from 2000 until 2008, when I became public affairs director for U.S. EPA's Chesapeake Bay Program. After that I was director of communications for the EPA Office of Water in Washington, D.C. for six years. Then I moved over to WEF as their communications director for almost six years.

tpo: What inspired you to create waterloop?

Loop: I got frustrated with so much coverage of water being negative, being about the latest crisis, the latest problem, doom and gloom. It's important to be educated about all that, but I knew solutions were out there. Positive things are happening and progress is being made. I want to explore that side of things and share the developments, the ways we can tackle the challenges. I've always wanted to have my own channel or platform. I'd been thinking about it for a long time. I reserved the waterloop Twitter (now known as X) handle back in 2013.

tpo: How do you envision waterloop having an impact on the water sector?

Loop: It's focused on solutions, spotlighting the people and projects

that are making a positive difference. It's helping to share those stories so others can learn from and copy them. There's no need to reinvent the wheel in terms of, for example, how to clean up a lake or deploy a new technology. Let's learn from people who have done it successfully, and let's emulate them. I hope the content on waterloop gives people encouragement and helps them share successes and solutions.



Travis Loop

tpo: How broadly are you covering the world of water?

Loop: The coverage has turned out to be quite diverse. It branches out far beyond the utility space. The topics include environmental cleanups, the health of our waterways, environmental justice, drinking water quality, climate adaptation, infrastructure and technology. I've been doing some traveling around the country, seeing things firsthand. I've produced stories about issues around the Great Lakes, the Mississippi River, the Colorado River basin, the Gulf of Mexico, and the Central Valley of California.

tpo: What does your audience look like? Who is making use of your material?

Loop: It's a broad cross section that includes people who work at utilities, at all levels of government, in engineering firms and technology companies, in industry associations and environmental groups. It also reaches people who are just generally involved with and interested in water.

tpo: How do you get the word out so that people are aware of waterloop?

Loop: Social media is the big vehicle. I'm on all the major platforms, including the new one called Threads. It's about being active and engaged on social media and sharing the content there. People who want the full podcast episode or video can dive in from there.

tpo: How would you describe the size of your audience so far?

Loop: I'm getting about 50,000 views per month on my videos, and I have about 40,000 followers across my social media accounts. Overall impressions on social media each month are about 100,000. There are listeners in all 50 states, and the audience is about 20% international. A lot of people are paying attention to what's going on with water here in the U.S.

tpo: Where does financial support for your venture come from?

Loop: I'm grateful to have supporters that include foundations and private companies interested in seeing water topics and water solutions gain more visibility. I did a series on PFAS in North Carolina's Cape Fear River and another on lead water service line replacement, and in both cases companies were interested in being part of that content. As I cover certain issues and feature specific parts of the country, there are organizations that see opportunities to gain visibility by being sponsors.





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tpo: What can professionals such as managers and operators of water and wastewater treatment plants gain from following waterloop?

Loop: I know they have a lot of great content sources available to them, including your magazine. But in looking through the podcast episodes they'll see that there's a bit of something for everyone. I know that operators are water people at heart. Surely they can find something that connects with them, that gives them a different angle on their work than they might get from other channels. They are a part of a much larger system: the greater water cycle, the water sustainability picture. It can be informative and motivational to learn about things that are happening in other parts of the water world. Different perspectives are good things to tune into.

tpo: How do you evaluate whether and how much waterloop is making a difference?

Loop: There are a few ways, and they are mostly anecdotal. As I go to meetings and conferences and travel, I have people tell me, 'Yes, I follow the waterloop and I see your material.' People telling me that in person means a lot. And then I hear more from people who are learning things from the episodes, and tell me that or tell others. They may get something from an episode and use it in their work. Or they reach out to me and say, 'Hey I want to talk to that guest you had on. Can you put me in touch?'"

tpo: Where do you see waterloop going in the next several years?

Loop: Being in a startup mode, I'm just hoping to continue making a living at this and expanding the content I provide, not from behind a computer but by being next to water people and water projects. I want to expand the real-world coverage of solutions. There are a lot of channels and a lot of content out there. I don't feel competitive — I feel collaborative. There is so much happening with water, so many people to talk to, and so many success stories, that there's enough to go around for us all. I'm just excited to be part of the water media ecosystem. **tpo**

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2



Getting the Water Out

AN INNOVATIVE CONDITIONING PROCESS FOR WASTEWATER SOLIDS CAN HELP IMPROVE DIGESTER OPERATIONS AND REDUCE COSTS FOR BIOSOLIDS TRANSPORT.

By Ted J. Rulseh

Solids management can rank among a clean-water plant's biggest expenses. In particular, the hauling of liquid biosolids for land application or other purposes can entail substantial and continuing costs.

Orege, a French company with operations in the United States, England and Italy, offers technologies that enhance the thickening of sludges and the dewatering of biosolids. Its SLG process is designed to optimize solids conditioning by modifying the material's physio-chemical and rheological (deformation and flow) properties. The aim is to improve clean-water plants' overall performance, reduce solids volumes, and lower operating costs.

Material conditioned in an SLG unit is more easily dewatered on a belt or screw press; the SLG process achieves an increase of 1.5 to 3 percentage points in dewatered cake solids. This helps reduce hauling costs and can make operation of a downstream dryer more economical.

Taking the process farther, the SLG-F process combines SLG conditioning with the company's Flosep thickener, designed for quick solid/liquid separation in a reduced footprint. It is installed upstream of digesters to improve their performance or after digestion to reduce the volume of biosolids transported. Eddie Johnson, CEO of Orege North America, talked about the technologies in an interview with *Treatment Plant Operator*.

tpo: What is the basic history of development of these technologies?

Johnson: The SLG is the cornerstone of Orege's technology to improve thickening, dewatering and anaerobic digestion processes. We knew it could enable increased solids concentration when deployed ahead of a dewatering system by way of the rheology changes to the material. As we looked at the market, we decided to offer our own thickening technology and so we developed the SLG-F.

tpo: Where was the SLG-F first deployed?

Johnson: We first brought them to market in the United Kingdom,

“We typically achieve a 1.5 to 3 percentage point increase in cake dryness. However, we focus more on annual savings than a specific number for cake dryness improvement.”

EDDIE JOHNSON

where there are small wastewater treatment plants all over the country that do tremendous amount of liquid biosolids hauling. We provided a mobile thickening unit that enables those facilities to reduce the number of tankers they put on the road.

tpo: What is the impact of SLG and SLG-F on creating a good-quality product for beneficial use?

Johnson: The SLG improves cake dryness that a dewatering press produces, and so reduces the cost of hauling the material. It also generally reduces polymer consumption. Another benefit is the aesthetic and handling quality of the cake is much better. It's more porous, it's more friable, and it has more soil-like characteristics. Through conditioning with the SLG, customers get a cake that is more consistent, stacks better, and overall is easier to handle.

tpo: Can these technologies be used ahead of a biosolids dryer?

Johnson: Definitely. Biosolids have to be dewatered to a certain level to make a dryer a good economic investment. The higher the solids before the dryer, the less water the dryer has to remove. If we can increase cake dryness by two percentage points, such as from 16% to 18% solids, the volume of water the dryer has to remove is substantially decreased, and that improves dryer economics and operational conditions. *(Continued on page 50)*

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(Continued from page 48)

tpo: How much more moisture can you typically remove with a belt press or screw press after conditioning in the SLG?

Johnson: We typically achieve a 1.5 to 3 percentage point increase in cake dryness. However, we focus more on annual savings than a specific number for cake dryness improvement. The annual operations savings are driven by higher cake dryness and polymer reduction.

tpo: In basic terms, how does the SLG process operate to improve dewatering?

Johnson: We place the SLG between the sludge feed pump and the dewatering equipment. We first reduce the pipe diameter and measure the flow and pressure in the pipe. Next, we increase the velocity of the material and inject compressed air using an air-to-sludge ratio between 1 and 10. At

this stage the naturally occurring flocs bound together with EPS (extra polymeric substance) are broken down, reducing the particle size. Then the air entrained liquid sludge enters the reactor and after the reactor there is a valve that maintains the entire system under back pressure. Polymer is injected after the SLG and the flocculated sludge is then dewatered.

tpo: What happens after the air injection stage?

Johnson: The material exits the injector and enters the reactor, which is a larger vessel where the velocity slows down, allowing the air to expand. There's no heat or power in this step; it's just a vessel.

tpo: What happens to this material before it is fed to the dewatering device?

Johnson: Between the SLG and the dewatering step we add polymer, and the material goes through a deaerator. The air coming out of the deaerator can be piped directly into the facility's odor-control system so that odor-causing gases are not expelled into the building.

tpo: What are characteristics of the product coming out of the SLG?

Johnson: The solids content coming out is the same as the solids content going in. There's no mass change. There is no heat or chemical treatment in the SLG. After flocculation the material will exhibit a rapid solid/liquid separation and floats.

tpo: How does the process work in the SLG-F configuration?

Johnson: The SLG process works exactly the same, but instead of being connected to a dewatering device, the material leaving the deaerator goes into the feed tank for the FloSep thickener and almost immediately floats up in that tank. We've had people call the SLG-F a mini-DAF or a rapid DAF. The floated material gets picked up by a rotating wire screen drum.

tpo: What solids content can the SLG-F achieve?

Johnson: Waste activated sludge 6%, primary/waste activated blends greater than 6%, primary only greater than 7%. We also can add pressure to the drum to achieve higher solids while maintaining excellent capture rates.

tpo: Can you cite examples of facilities that are using your SLG-F technology?

Johnson: One plant in South Carolina has an aerobic digester and traditionally has two to six biosolids haul events per year. They use the SLG-F to thicken the material before haul events. It cuts the amount of liquid they haul off in half. It provides a two-year payback. Another client in Arizona has the same basic application.

A client in Wisconsin is thickening ahead of anaerobic digestion. In the U.K., customers have installed the SLG-F before anaerobic digestion and have reported an increase in their biogas production of 30% and greater. The technology consistently produces thickened material at 6% solids or greater. The units have replaced gravity belt thickeners and rotary drums.

tpo: What is the advantage of thickening upstream of digesters?

Johnson: The benefits are reduction of the hydraulic load on the digesters and increased solids retention time, along with improved pumping of thicker solids. The SLG-F also improves methane gas production for anaerobic digesters.

tpo: What other benefits does your technology provide?

Johnson: The footprint of our system is smaller than for traditional thickeners. Our complete SLG-F thickening skid can be set down in an existing plant in an 8-by-20-foot area. The skid includes feed pumps, SLG conditioning, polymer preparation, FloSep thickening and thickened solids pumping. It's also a very simple and low-maintenance system. There are very few moving parts. It's a hands-off, fully automated process. **tpo**

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A New Twist on Chemical Grouting

TWO LIFT STATION REPAIRS IN FLORIDA DEMONSTRATE THE ADVANTAGES OF THE NEW AND INNOVATIVE DEEP HORIZONS INJECTION GROUTING TECHNOLOGY

By Suzan Chin-Taylor

A major lift station was under construction to replace an older station in the wastewater collection system in Sarasota, Florida.

The new station would eventually carry about a third of the total flow to the city's wastewater treatment plant. During testing of a 36-inch influent line that crosses Hudson Bayou, city crews discovered significant groundwater intrusion through several holes, breaks and joint failures. This infiltration would overload and stress the treatment system, wasting capacity and shortening the life of plant equipment over time.

The first effort to repair the line was a trenchless epoxy-impregnated liner. While this largely nondisruptive repair has worked in similar conditions, in this case it failed to stop the water intrusion. A second effort involved injection of a two-component, fast-reacting chemical grout to seal the pipe from the exterior. This also failed.

After considering traditional dig-and-replace repair as the third option, the DHIG, or deep horizons general grouting, chemical injection process was chosen. The method was successful on the Sarasota project and was also employed effectively on another project in nearby Hillsborough County.

A NEW APPROACH

Injecting chemicals to stabilize, lift, seal or compact weak soils and rocks is not new. Polyurethane grout has been used for that purpose since the 1960s. However, the process has limitations for asset owners as well as installers.

Historically, grout injection has been limited to depths of 20 feet or less, and the pipe in question lies deeper. As the material is injected, it begins to cure inside the injection tube. While the cure rate can be accelerated or slowed down by regulating the chemical temperature, that control is short-lived.

The deeper or longer the injection tube, the longer time the chemical has to cure before exiting the tube. In the meantime, the diameter of the injection tube effectively shrinks as cured material bonds to the tube wall. Furthermore, the deeper the injection, the more the chemical can lose effectiveness as it cools upon leaving the tube.

DHIG, developed by Polymer Technologies Worldwide, is a method of chemical grouting that enables injection at depths far exceeding previous limits. In Sarasota, the company successfully injected its product to seal a leaking effluent line with an invert depth of about 35 feet and an injection depth of 45 feet.

City officials in Sarasota rejected dig-and-replace as a third repair option for the extensive disruptions and inconvenience it would cause, to avoid an additional \$9 million to \$12 million in additional costs, and to avoid extending completion time by another year for work already late and over budget.

The DHIG method sealed the pipe leaks while enhancing and helping stabilize the foundation of the lift station structure. Furthermore, trenchless process required a small footprint, did not disrupt the surrounding area, and was completed while lift station construction continued.

PROOF POSITIVE

Another lift station project, at Symmes Road in Hillsborough County, further demonstrated the value of the DHIG method. Cracks in well inlet



Deep horizons general grouting is a method of chemical grouting that enables injection at depths far exceeding previous limits.



A special DHIG rig is used in part to advance the injection casing to the desired depth.



Grouting material can be injected from a lateral point and so prevent interference with nearby project activity, saving time and cost and limiting environmental impact.

pipes in the station and some other damage was caused by about four inches of settling of the cover slab.

Standard testing found that soils near the station, 18.5 to 28.5 feet below the surface, were very loose. The station wet well measures 8 feet in diameter and 30 feet deep. To excavate and repair the station would have meant a large area of disturbance, possibly affecting a residential community, underground utilities and possibly Symmes Road itself.

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After injection using DHIG, standard ground borings showed that the injected material did not expand beyond the lift station property. Injecting with 2,623 gallons of polymer through four injection points at depths from one to 45 feet below grade yielded these results:

- Soils around the wet well were significantly strengthened.
- Soils outside the lift station footprint showed insignificant change in soil stiffness, indicating no adverse effects to surrounding properties or structures.
- The grout filled voids, stopping leaks from eroding the area around the system, and stopping water intrusion that had also caused erosion.

A post-injection analysis and report from Integrity Drilling & Geophysical Services showed good control of the material in that none of it encroached on neighboring properties. In addition, soil adjacent to the grout was compacted and stabilized.

RIG OPERATION

The DHIG rig is used in part to advance the injection casing to the desired depth. The 3-inch-diameter steel casing, threaded on each end, is advanced as new sections are threaded on as needed. It takes increasing power to turn the casing as it advances; the strength and adhesive properties of the material being advanced through the casing also affect turning power.

Upon reaching the desired injection depth, the rig withdraws the casing as the polymer is injected. Care is taken to advance at an appropriate rate that avoids fouling of the casing with the polymer, although not so fast that the polymer is under-injected.

To inject the polymer, a special nozzle is advanced through the casing and attached to the drilling head at the casing tip. The casing head and attached chemical feed lines are lowered carefully, using a lowering/turning bar, to avoid fouling the lines or damaging the injection nozzle. That bar is then rotated to lock the equipment to the head. As the casing is withdrawn, the lowering bar is removed in sections, just as the casing is removed.



DHIG technology proved beneficial on projects in Sarasota and Hillsborough County in Florida.

HOW IT WORKS

The significant advantage of DHIG is that there is no theoretical limit to the depth at which the material can be successfully injected. That is because the material is combined at the tip of the casing, enabling full material strength to be achieved where it's needed rather than inside the feed line.

Another benefit is that the material can be injected from a lateral point to avoid interfering with nearby project activity. This limits time, cost and impacts to the public and the environment. For example:

- A leaking cross drain can be sealed without closing down a busy highway or interstate system.
- A lift station can remain in operation while a leaking influent line is sealed.
- Retaining walls can be sealed at depth without excavation or injection from the face, which can further weaken the wall.
- Abandoned wells can be sealed so that the well can be put back into service if need be. **tpo**

Municipality updates clarifier system

Problem

A wastewater treatment plant in Albuquerque, New Mexico faced significant clogging in 12 clarifiers with narrow uptake pipes. The site needed to improve the flow to meet hydraulic requirements and reduce maintenance.

Solution

Envirodyne Systems designed the upgrade to convert the outdated equipment to **21st Century Spiral Blade Clarifier** mechanisms. The collection systems fit the existing footprints and allow for minimal maintenance while enabling the clarifiers to maintain optimal capacity.



RESULT:

The clarifiers provide a higher solids concentration, resulting in lower dewatering costs and maximum performance. 717-763-0500; www.envirodynesystems.com

Downtime avoided for biogas engine with self-resetting explosion relief valve

Problem

An Eastern U.S. wastewater treatment plant using biogas to fuel engines had frequent backfires and explosions in the exhaust duct system. Backfires occur when mapping air/fuel settings to achieve the optimum performance, since biogas has variable quality and a lower methane content. Explosion vent panels were installed on the exhaust ductwork to mitigate the effects of explosions. The frequency of backfires and the requirement to shut down the engine and replace the vents after each explosion led to extended downtime.

Solution

IEP Technologies supplied **EVM Explosion Relief Valves**. The company worked with plant maintenance personnel to calculate the size and quantity of explosion-relief valves needed to replace the vent panels. The self-resetting, closeable, spring-loaded relief valve has an integral flame arrester. It can be used indoors or outdoors and can be activated multiple times without plant downtime or maintenance. The valves are certified by ATEX and IACS. Each unit is tested for function, opening pressure and leak-tightness before shipment.



RESULT:

The installation allowed plant personnel to optimize engine mapping settings and avoid downtime. Backfires and explosions in the exhaust duct were relieved without requiring immediate shutdown of the engine. 413-896-1485; www.ieptechnologies.com

Rotary press resolves challenges for city

Problem

The City of Becker, Minnesota, needed to upgrade its dewatering equipment to increase treatment capacity. A limited budget prevented building expansion or conveyor replacements. High humidity in the dewatering building was exerting pressure on the electrical equipment.

Solution

The city chose the **Fournier Rotary Press**, known for its small footprint and flexible output configurations. The presses were pre-assembled and skid-mounted at the factory, enabling installation without rebuilding the existing concrete floor. New conveyors that receive cake from the presses seamlessly integrated with the existing conveyor system.



RESULT:

“Our staff has been extremely pleased with the high quality of the biosolids, the ease of operation, and the quietness of the equipment,” says Dave Pesola, water and wastewater department supervisor. “The significant reduction in water usage has been an added benefit. We have decreased moisture levels in the press room that had contributed to issues with the electrical and HVAC equipment.” 418-423-4241; www.fournierdewatering.com

Cake storage bin bridges the gap at water reclamation facility

Problem

The Waupun, Wisconsin, Wastewater Treatment Plant could not meet new phosphorus permit limits. The city hired a consulting engineer to evaluate options to bring the plant into compliance.

Solution

An advanced biological nutrient recovery process was constructed to remove nutrients through algae growth. The harvested algae are further processed by a dryer to produce granulate for beneficial reuse. Central to the process is a sliding frame **storage system** supplied by **Schwing Bioset** to bridge the process gap between algae and dryer operations. The custom-designed bin for storing dewatered algae includes vertical sidewalls to avoid bridging of sticky materials while maximizing storage volume. The sliding frame sends residual algae to a pump that feeds the dryer.



RESULT:

With the intermediate storage system, the plant can operate its algae process continuously and operate the dryer on a schedule that supports the rate of algae production. The low-maintenance sliding frame provides the buffering storage needed in a compact process that is fully integrated into the plant SCADA system and doesn't require additional operators or maintenance staff. 715-247-3433; www.schwingbioset.com tpo

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Glass-body sensors a strong fit for treatment applications

By Craig Mandli

Choosing a sensor that is well-suited for your application can improve measurement accuracy and extend sensor lifetime. That's what makes glass body sensors such a strong fit for water and wastewater treatment applications. They are designed to perform well in those unpredictable chemical environments due to the naturally inert properties of glass.

Sensorex's GT-Series Glass-body PTFE-Junction pH Electrodes offer that sought-after reliable performance in unpredictable chemical environments. The inert properties of the glass bodies and PTFE junctions resist clogging and coating for stable readings and minimal cleaning in most applications. According to Dominic O'Donnell, marketing director for Sensorex, models are available with DIN or VarioPin connectors.

"The GT-Series will work well in drinking water or wastewater applications, but also can be utilized in applications such as hydroponics, or industrial water treatment," he says. "Sensorex has over 50 years of experience in the design and manufacture of pH electrodes, so you know you are getting time-tested quality."

The basic GT100 models feature 120 mm insertion length and are available in single- or double-junction reference. They are designed for use at temperatures from 23 to 212 degrees F. They are designed to be easy to use, and perform reliably in applications such as hydroponics, gardening and education.



GT-Series Glass-body PTFE- Junction pH Electrodes from Sensorex

The advanced GT200 (120 mm insertion length) and GT300 (225 mm insertion length) feature a double-junction, salt ring reference for enhanced stability over time. They can be supplied with built-in temperature elements, and are designed for use at temperatures from 23 to 266 degrees F and pressures from 0 to 6 bar. They are ideal for testing samples with high temperatures such as those found in industrial wastewater. A double salt ring reference design ensures constant reference concentration for increased stability over time.

"Having models available with built in temperature sensors ensures the temperature compensation required for accurate measurements in changing conditions," O'Donnell says. "In addition, having detachable cables with either S8 or VarioPin connectors ensures broad compatibility with existing installations."

All models offer accurate and reliable measurements across the full pH scale (0-14). They serve as an instantly ready, drop-in replacement for common 12 mm installations.

714-895-4344; www.sensorex.com

affect the accuracy of readings or the dependability of an instrument. Lovibond obsesses about turbidity measurement, so you don't have to. Lovibond's team of globally recognized turbidity experts work to anticipate and solve operators' struggles with turbidity measurement.

941-756-6410; www.lovibond.com



Patterson portable davit cranes for mobile lifting

Patterson davit cranes allow for servicing multiple locations with a single piece of equipment, minimiz-

ing upfront investment. The low maintenance, easy-to-assemble crane can be used at the plant or on a truck for lifting pumps and other equipment in and out of pits and man-holes. The cranes are now available with an optional magnet attachment that is perfect for lifting road eyes and other metal pieces weighing up to 2,000 pounds. Built with Patterson's hallmark safety and durability, the crane and magnet attachment were developed with the highest quality materials. The crane features a brake that keeps loads in position without creeping and comes standard with a hot-dipped galvanized finish, steel sheaves and stainless steel hardware to prevent rust and corrosion. Available in 1/2- and 1-ton capacities, the cranes are built for

safety, minimal maintenance and extended life, reducing cost and increased efficiency. Learn more and watch the assembly video online.

800-322-2018;

www.pattersonmfg.com/crane-details



KROHNE ALTOSONIC V12 ultrasonic gas flowmeter

KROHNE's ALTOSONIC V12 ultrasonic gas flowmeter offers high accuracy, making it ideal for custody transfer applications. It has 12 measuring chords, two of which are solely

dedicated to diagnostic functions. Once commissioned, it continuously checks the operating status. The positioning of the chords in five horizontal parallel planes compensates for swirl and thus, provides reliable measurements, even with highly distorted flow profiles. The diagnostics in the ALTOSONIC V12 can reliably assess deposits, contamination or changes in wall roughness, so that maintenance can be scheduled according to actual needs.

800-356-9464;

www.us.krohne.com



Flomatic Valves Model 92 swing check valve

Flomatic Corp.'s new Model 92 3-inch AWWA C508 swing check valve is designed to meet the requirements of AWWA Standard C508 and complies with American Iron & Steel provisions. The Model 92 features a clear waterway design, offering unobstructed flow for efficient water movement. It is constructed using ductile iron for the body, cover, and internals, ensuring durability and longevity. The valve also incorporates a replaceable stainless steel seat ring and fasteners as standard components. To ensure secure sealing and prevent leakage, the valve is equipped with a standard resilient seat seal. This design flexes upon contact, providing effective wiping action to clean the seat surface and establish a bubble-tight seal. The valve's O-ring design cover seal reinforces its leak-free performance.

800-833-2040; www.flomatic.com



Blue-White CO₂ feed system

Blue-White's new CO₂ feed system is a safe and effective way to adjust pH and minimize risk associated with dangerous mineral acids. The 0 to 100% scaled flowmeter has an integral adjustment needle valve for increased accuracy. Additional

benefits of the CO₂ feed system include NEMA 4X enclosure, illuminated on/off switch, a flow set-point indicator, stainless steel solenoid valve and simple push-tight tubing connectors. The feeder is an affordable and reliable system that is simple to use and adjust.

714-893-8529;

www.blue-white.com



Endress+Hauser FieldGate SWG50 gateway

Endress+Hauser's FieldGate SWG50 is a new WirelessHART gateway primed for secure communication from field devices. It is compact and ready for Netilion integration while providing an easy-to-use solution for multiple standard monitoring applications across various industries. Netilion is a cloud-based IIoT ecosystem designed for industrial processes, connecting the physical and digital worlds to send information from the field straight to a phone, tablet or another device. The FieldGate SWG50 enables users to monitor measurements and health statuses using WirelessHART connectivity — an economical alternative to complex and costly cable installations. As a gateway ready for digitalization, the integration of FieldGate SWG50 into Netilion is simple and transparent using EdgeDevice SGC500, which is only available for purchase by Netilion users and for those with WirelessHART networks.

888-363-7377;

www.us.endress.com



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medium pressures in a small compact package. The TORNADO T1 Generation F pump can handle a wide range of viscosities, solids, temperature, abrasion, and corrosive/acidic process fluids and environments. Its robust design offers longevity, operational flexibility and dry-run capabilities, allowing it to operate and handle many upset process conditions without causing harm to the pump. The pumps are available up to over 4,000 gpm and up to 130 psi. The front pullout design allows for easy access for maintenance and inspection. Additionally, there is no need to access the timing gears or bearing as they are protected with the NETZSCH Gearbox Security System.

610-363-8010;

www.pumps-systems.netzsch.com



Xylem Cordonel ultrasonic water meter

The Cordonel is an ultrasonic commercial and industrial water meter from Sensus, a Xylem brand, that measures low-to-high-volume flow with proven accuracy. The unique flow tube has three measurement channels to capture every drop and seamlessly integrates with the FlexNet communication network to provide accurate readings in real time. Cordonel is also a sensor that enables the digitalization of water distribution systems by incorporating temperature and pressure data that helps utilities meet customer

expectations. Transferred securely, this actionable information helps utilities maintain water quality, balance pressure levels and gain visibility into its operations.

800-638-3748; www.sensus.com

Aqua Metrology Systems SafeGuard treatment solution

SafeGuard H2O is an advanced intelligent treatment solution that drives down the lifetime costs of ownership and GHG emissions of water treatment. This NSF-approved technology features automatic dosing and incorporates proprietary continuous, real-time monitoring of contaminant levels at the influent and effluent to ensure optimal treatment and compliance with regulatory and operational targets 24/7/365.

The SafeGuard H2O in-situ generation reagent technology displaces traditional treatment technologies such as ion exchange and reverse osmosis, and replaces bulk chemicals including ferric chloride, ferric sulfate, orthophosphates, organo-sulfides, ozone, alum and more.

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product spotlight water

Dedicated coupling designed for easier installs

By Craig Mandli

The use of dedicated or flexible couplings enables a contractor to join same-size plain end pipes without the need for welding and/or special pipe fittings. However, they can sometimes be cumbersome to install, as not only must they be disassembled prior to installation and then reassembled during installation, they require tightening anywhere from six to 24 bolts. Those issues are eliminated with the **HYMAX Pro Dedicated Size Coupling** from **Mueller**.

Applicable to the water and wastewater, irrigation, and industrial markets, HYMAX Pro dedicated size couplings are available from sizes from 4 to 24 inches. The smaller 4- to 10-inch sizes feature an industry-first, two-bolt, stab-fit construction, while the larger sizes feature a four-bolt pattern. All couplings from the HYMAX Pro line conform to the AWWA C219, NSF 61, and NSF 372 standards for drinking water system components. The couplings are designed to connect multiple pipe materials, including fiberglass, PVC, ductile and steel.

“Having only two or four bolts to tighten as compared to the competition, which has six to 24 bolts, makes the HYMAX Pro much faster and easier to install,” says Ken Alessi, HYMAX strategic product manager for Mueller. “It is an excellent product for use on wastewater force mains, as the standard epoxy coating and stainless hardware provides excellent protection against sewer gasses and other atmospheric conditions associated with sewer applications.”

The 304SS stainless-steel fusion-bonded epoxy coated hardware and EPDM gasket are built into the standard product specifications of this



HYMAX Pro
Dedicated Size
Coupling from
Mueller

line without additional cost. This provides corrosion resistance, superior quality and affordability, for all water utilities. In addition, every HYMAX Pro is labeled with an asset registry QR Code so that the products, size, time of installation, location, and other pertinent information can be easily recorded. Installation also does not require any special tools.

“The HYMAX Pro hardware tightens from the bolt head, allowing the installer to use standard end wrenches or shallow socket wrenches,” Alessi says. “Many other dedicated couplings tighten from the nut, which requires more expensive deep-well, or sometimes special-order sockets.”

According to Alessi, the HYMAX Pro represents the first significant improvement for pipe couplings in decades. “Most comparable products are utilizing basic designs that date back over half a century,” he says. “The HYMAX Pro is lighter weight, it has an integrated handle that makes installations much easier, and is designed to install much faster.”

800-423-1323; www.hymaxusa.com



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Clarifiers, Digesters, Water Towers, Structures and Components

By Craig Mandli

Clarifiers

LAKESIDE SPIRAFLO

The Spiraflo clarifier from Lakeside is a peripheral feed clarifier designed for the removal of suspended solids in a primary, secondary or tertiary clarification system. Wastewater enters the outer perimeter of the clarifier



Spiraflo clarifier from Lakeside

and is directed along the narrow raceway formed by the skirt and the outer wall. This flow pattern dissipates the wastewater's hydraulic energy as it flows around the raceway, eventually spiraling down underneath the skirt and into the main settling area. The flow travels inward from the skirt toward the center of the tank, coinciding with the direction of the sludge, and the clarified water rises into the centrally located effluent weir trough. The combination of the spiraling flow pattern and the skirt eliminates all possibility of short-circuiting and provides better utilization of the total tank volume for more effective settling. **630-837-5640; www.lakeside-equipment.com**



Model R OXIGEST treatment system from Smith & Loveless

SMITH & LOVELESS MODEL R OXIGEST

The Model R OXIGEST treatment system from Smith & Loveless provides stable operation and flexible process options for high-strength wastewater or larger flows up to 5 mgd. The field-erected design encompasses complete aeration, clarification and advanced

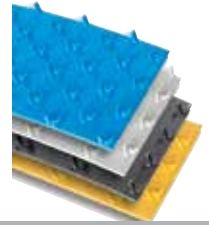
treatment processes while allowing these units to be individually separated and controlled. The system achieves advanced nutrient removal and produces pristine effluent quality suitable for water reuse and direct or indirect discharge. Its concentric tankage maximizes space efficiency in its footprint, thereby preserving facility land for other key plant operations. Multiple aeration zones can be employed to provide specific activated sludge processes for desired treatment levels, including multistage aeration, complete mixed, plug-flow and nitrification/denitrification. Integral treatment process steps can include grit removal, flow equalization, reaeration, tertiary filtration, chlorination, dechlorination and sludge storage. **800-898-9122; www.smithandloveless.com**

Coatings and Linings

AGRU AMERICA SURE-GRIP

Sure-Grip liners from AGRU America are made of HDPE, HDPE-el, PP, PVDF or ECTFE, and serve as a long-term alternative to spray-applied concrete protection products. The liners prevent concrete corrosion and degradation, can substantially extend the lifetime of a structure,

and by preventing exfiltration and infiltration, provide direct protection for the environment. The liners have anchoring systems that enable construction in areas of significant backpressure. Unlike spray-applied liners, which have to be reapplied regularly due to cracking or delamination, these liners are long-lasting, and are designed to avoid the residuals cost often associated with concrete spray-on liners, which require tank emptying and cleaning every few years for reapplication. **843-546-0600; www.agruamerica.com**



Sure-Grip liners from AGRU America

PPG PROTECTIVE & MARINE COATINGS RAVEN 405

The RAVEN 405 wastewater treatment coating system from PPG Protective & Marine Coatings has high physical strength and broad chemical resistance to stand up to severe, caustic environments. This ultra-high-build epoxy lining system has Severe Wastewater Analysis Testing certification and passed the Pickle Jar Test, as its thick film can withstand high hydrogen sulfide gasses and other caustics, chemicals and acids found in a wastewater facility. Applications include concrete wastewater lining, clarifiers and digesters, tunnels and pipelines, tanks, secondary containment and man-holes. Benefits include corrosion



RAVEN 405 wastewater treatment coating system from PPG Protective & Marine Coatings

resistance, 100% solids, ultra-low VOC (0.52 g/L), adhesive strength and quick return-to-service. It can protect new concrete or help rehabilitate an existing structure. **888-977-4762; www.ppgpmc.com**

Digesters/Components

ANAERGIA OMNIVORE

The Omnivore is Anaergia's high solids approach to anaerobic digestion. It incorporates advanced mixing and robust thickening systems to convert low-solids digesters into high-solids digesters (5 to 8%). It adapts to take on increased sludge loading without requiring new construction and supercharges biogas and energy projects by enabling co-digestion of high-strength waste. The system consists of a screw thickener combined



Omnivore anaerobic digester from Anaergia

with the OmniMix, a high-performance submersible mixer that delivers 30,000 gpm of flow, with a connected load of only 12.5 kW and an average power draw of 6kW and can mix solids up to 12%. It features a gearless direct drive motor and a dynamic mixer that allows operators to adjust the mixer position to break up floating layers and resuspend grit. The service box lets operators

access the mixer without taking the digesters out of service, streamlining O&M. **866-978-9785; www.anaergia.com**

HYDRO-THERMAL NON-OBSTRUCTING HEATER

Hydro-Thermal's Non-Obstructing Heater is suitable for heating and maintaining the digester's precise temperature (+/- 1 degree F) for improving methane production and sludge stabilization. It also eliminates hot or cold spots in the digester, even during the winter months. It utilizes a small footprint, with direct instal-



Non-Obstructing Heater from Hydro-Thermal

lation into the existing piping. It is produced using wear and corrosion-resistant metallurgies to withstand grit and highly abrasive materials. Its straight-through design can ensure that rags or wipes do not get caught and plug the heater. With its unrestricted flow there are minimal pressure drops, allowing for a wide range of heating capacity. The heaters have no hot surfaces where burn-on can begin to occur. **800-952-0121; www.hydro-thermal.com**

Mixers

IXOM WATERCARE GRIDBEE AND SOLARBEE FLOATING WASTEWATER MIXERS

GridBee and SolarBee Floating Wastewater Mixers from Ixom Watercare are designed to solve a variety of municipal and industrial wastewater quality problems including high energy costs, EPA discharge permit violations and odor control. Not only can these powerful mixers operate 24/7 to improve overall treatment, they can also supply most of the mixing energy required in any treatment pond, which in turn can reduce the operational hours of the existing aeration/mixing system. Available power options include fully grid, fully solar and combined grid-solar. Applications include wastewater ponds, activated sludge, water reuse/effluent storage ponds, and anaerobic ponds. **866-437-8076; www.ixom.com**



GridBee and SolarBee mixers from Ixom Watercare



Nozzle Mix System from JDV Equipment

JDV EQUIPMENT NOZZLE MIX SYSTEM

The Nozzle Mix System from JDV Equipment is a dual-zone mixing technology that provides uniform mixing patterns that produce even distribution and a stable environment. It can help optimize solids suspension and contact to promote efficiency in a wide range of applications. The system is designed with pumps installed outside the tanks to facilitate ease of maintenance. The pumps are typically chopper pumps or pumps incorporating in-line grinders that prevent fibrous materials from accumulating and causing plugging problems. The

application dictates which type(s) of the many varied pump options can be used. The high-velocity nozzles are mounted inside the tank and are oriented to discharge in a flow pattern that completely mixes the tank contents. **973-366-6556; www.jdvequipment.com**

VAUGHAN TURBO-S MIXER

The Turbo-S Mixer from the Vaughan is a small, powerful propeller mixer that is mounted vertically inside an 18-inch elbow and is capable of mixing a pit with just 2 feet of liquid above the floor. It incorporates an upper cutter above the propeller to stop wrapping and fibrous material binding to protect the mechanical seal. It can be used in dairy manure mixing and in municipal treatment plant anoxic zone mixing and oxidation ditches. It can be quickly imple-



Turbo-S Mixer from Vaughan

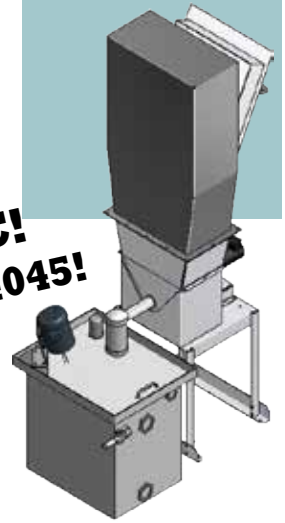
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product focus (continued)

mented in primary influent channels, Bardenpho basin mixing, scum blanket mixing and primary sludge storage mixing. Additionally an optional turntable can allow it to be easily re-aimed in the pit. **888-249-2467; www.chopperpumps.com**

Skimmer

PARK PROCESS SKIMPRO

The SkimPro floating skimmer from Park Process is designed for use in backwash receiving tanks to skim clear water and recycle it back to the clean-water flow. The unit is constructed of 316 stainless steel with a skimmer head that is designed to handle whatever flow is required for the particular application. **855-511-7275; www.parkprocess.com**



SkimPro floating skimmer from Park Process

Tanks

HOUSTON POLYTANK RECTANGULAR PLASTIC TANKS



Plastic Tanks from Houston PolyTank

Houston PolyTank develops and manufactures industrial-strength plastic tanks and pipe using an extrusion wound process for indoor or outdoor use. The tanks can handle a comprehensive range of water, wastewater, and chemical storage (pH levels of 0-14) at temperatures up to 180 degrees F. Rectangular polypropylene tanks are available up to 40 feet long and 18,000 gallons in capacity. Top or side manways and fittings can be placed per customer's request. The tanks are self-supported and can be inserted into standard shipping containers and/or trailer frames such as applications for flow batteries. When inserting the rectangular tank into a standard shipping container, the tank utilizes 90% of the total volume of the container. The tanks are structurally sound and require little maintenance. Rectangular tanks offer ease of handling, installation (requires no concrete pad) and lower transportation cost. **660-778-3393; www.houstonpolytank.com**

temperatures up to 180 degrees F. Rectangular polypropylene tanks are available up to 40 feet long and 18,000 gallons in capacity. Top or side manways and fittings can be placed per customer's request. The tanks are self-supported and can be inserted into standard shipping containers and/or trailer frames such as applications for flow batteries. When inserting the rectangular tank into a standard shipping container, the tank utilizes 90% of the total volume of the container. The tanks are structurally sound and require little maintenance. Rectangular tanks offer ease of handling, installation (requires no concrete pad) and lower transportation cost. **660-778-3393; www.houstonpolytank.com**

IMPERIAL INDUSTRIES 12,500-GALLON STORAGE TANK

The 12,500-gallon storage tank unit from Imperial Industries includes a 6-inch dump, 4-inch intake, heavy-duty pull skid attachment and level indicator. Available options include custom tow, hitch and axle packages, and intake agitation. It is designed for various applications, including field edge load and unloads, shop or yard storage, and grease separation. **800-558-2945; www.imperialind.com tpo**



Storage tank unit from Imperial Industries



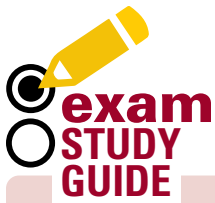
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WASTEWATER

By Rick Lallish

Conditions recognized as major operating problems causing poor performance or failure of wastewater collections systems are known as what?

- A. Industrial discharges
- B. Peripheral lateral discharges
- C. Inflow and Infiltration
- D. Fouled lift stations

ANSWER: C. Inflow and infiltration problems have been overlooked for decades. Many municipalities have adopted the out-of-sight, out-of-mind approach. This has caused many to scramble to find funds to correct for years of neglect. Inflow and infiltration problems are the leading cause of excessive hydraulic overloads, private-home sewage backups, and premature failure of the collection system. More information may be found in the OWP, CSU-Sacramento textbook: *Operation and Maintenance of Wastewater Collection Systems* (Eighth Edition), Chapter 4.

DRINKING WATER

By Drew Hoelscher

What does the CT value represent in water treatment?

- A. How smooth the inner wall is on a piece of pipe
- B. A measure on how effective a disinfectant is in pathogenic inactivation
- C. The size of particle passing through a particle counter
- D. The electrical charge of a coagulant

ANSWER: B. The effectiveness of oxidants varies when treating water for pathogenic organisms. Most water treatment manuals list chlorine, chloramines, ozone and chlorine dioxide as the most commonly used options. Knowing each oxidant will perform differently, an operator can rely on the calculated CT value to ensure the appropriate log removal/inactivation of pathogens is obtained.

ABOUT THE AUTHORS

Rick Lallish is water pollution control program director and Drew Hoelscher is program director of drinking water operations at the Environmental Resources Training Center of Southern Illinois University Edwardsville. **tpo**

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Anaergia appoints Andrew Spence as CFO

Anaergia has appointed Andrew Spence as chief financial officer. Spence has extensive experience as a CFO in the renewable energy sector, having served in this capacity at both Aria Energy, now part of BP, and at Ameresco. He holds a Master of Business Administration and Bachelor of Accounting Science degrees from the University of Puget Sound, and a bachelor's degree in finance from Washington State University. Hani Kaissi, who is currently serving as acting CFO, will continue in his role as chief development officer of the company.



Andrew Spence

Asahi/America welcomes Edwina Merin Johns and Brian Zagrodny

Asahi/America announced two new team members. Edwina Merin Johns was named valve and actuation product manager to its technical service team. She will be responsible for maintaining all product documentation and technical sales tools for the company's portfolio of valve and actuation products. Secondly, Brian Zagrodny joined its outside sales team as national sales manager for fabricated products. His new role will be instrumental in helping the company's sales efforts for the growing thermoplastic pipe, fittings and valve pre-fabrication industry.



Edwina Merin Johns



Brian Zagrodny

Centrisys/CNP secures contract to upgrade Ohio plant

Centrisys/CNP has been awarded the contract to upgrade the Salem, Ohio – Columbiana County Wastewater Treatment Plant. The upgrade will include a Centrisys/CNP CS18-4 skid-mounted centrifuge system and PONDUS sludge hydrolysis process designed to improve digestion capacity and reduce disposal costs. The City of Salem's Wastewater Treatment Plant serves 12,000 residents, with a design capacity of 4 million gpd. The planned upgrade will help modernize the aged infrastructure and improve compliance with the plant's NPDES permit, ensuring reliable wastewater treatment services for the Salem area residents.

Blackline Safety expands manufacturing capacity

Blackline Safety Corp. has expanded its manufacturing capacity at its Calgary, Alberta headquarters. The expansion, which is poised to increase Blackline's production capacity by 30 to 50%, was achieved by repurposing the company's existing space. The announcement comes on the heels of a milestone year which saw the company's global customer base climb to 1,800, across North America, Europe, Middle East, Australia and New Zealand.

Curtis Burks joins HF scientific as operations leader/plant manager

HF scientific, a Watts brand, has hired Curtis Burks as operations leader/plant manager at the company's Fort Myers, Florida headquarters. In his position, Burks is responsible for planning, direction and controlling operational activities, including safe production and shipment of precision instruments and related chemistries at HF scientific. His role is critical to improving and promoting the continuous improvement of culture, safety, quality, cost control and customer service at the Fort Myers facility.



Curtis Burks

AqueoUS Vets acquires Dixie Tank

AqueoUS Vets has acquired Dixie Tank Co., a manufacturer of carbon and stainless steel tanks, pressure vessels, water heaters, filters and custom fabrications for the water, water treatment, hot water, and industrial markets. The acquisition gives AqueoUS Vets an East Coast base of operations

to serve a wider variety of customers across the U.S. Financial terms of the private transaction were not disclosed. Founded in 1943 and headquartered in Jacksonville, Florida, Dixie Tank's facility covers six acres, with approximately 78,000 square feet of manufacturing area.

Michael Nicholson joins Eco remedy

Michael Nicholson, a 33-year veteran of the water and wastewater industry specializing in biosolids and organic residuals management, has joined the leadership team at Eco remedy as vice president of sales and business development. Previously the director of The Denali Technology Group at Denali Water Solutions, Nicholson will be responsible for all activities related to sales and development of Eco remedy's renewable energy gasification technology. He is a member of the Water Environment Federation and U.S. Composting Council as well as multiple regional associations in wastewater, biosolids and recycling.



Michael Nicholson

Val-Matic welcomes Sandra Diaz as director of planning and forecasting

Val-Matic welcomed Sandra Diaz to its team as the director of planning and forecasting. She will provide leadership to improve supply chain and planning processes, expanding on the strengths of current co-workers in both areas. Diaz began her career on the customer service side and eventually crossed into inventory and supply chain management. Over the years, she has held positions such as director of purchasing and director of manufacturing in the PPE manufacturing industry. She entered the supply chain side 12 years ago and has grown her skill set in that area, gaining responsibility in each role.



Sandra Diaz

infinitii ai announces five-year contract in Canada

infinitii ai, a developer in AI-driven predictive analytics software for Smart City water and Smart Industry infrastructure applications, announced a sales contract with a large Canadian municipality. The new five-year \$1.472 million contract with an existing customer adds infinitii auto i&i, infinitii auto qa/qc and infinitii face pro machine learning products to a previous license for infinitii flowworks data monitoring software. The company's customers include the Smart Cities and municipalities of Toronto, Seattle, Miami-Dade County, Boston, Dallas, Region of Peel, Vancouver and Los Angeles County, among others.

Franklin Electric names Greg Levine VP and president, global water

Franklin Electric announced that Donald Kenney, vice president and president, global water, will be retiring after nearly 32 years with the company. Kenney was a driving force behind Franklin Electric's Global Water growth and strategy over the last decade. Greg Levine joined Franklin Electric in July from Nidec Corp., where he served as president of the motion control and drives business for the past six years. Before working at Nidec, Levine held senior engineering roles at Emerson for 15 years. In his new role, Levine will be responsible for Franklin Electric's global water systems business.



Greg Levine



Donald Kenney

Mazzei Injector and Heyward team up

Mazzei Injector Co. has chosen Heyward Inc. as its manufacturer's representative for the municipal water and wastewater markets in the Carolinas. Heyward has been serving those markets since 1908.



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Stantec selected by SFPUC to design new facility

Stantec was selected by the San Francisco Public Utilities Commission to lead design for a new water resource recovery facility on San Francisco's Treasure Island. The island has undergone decades of geotechnical improvements to make it habitable for businesses and residents. The constructed island was first developed for the World's Fair in 1939 and later became a U.S. naval station. It currently has a small wastewater treatment facility to serve a population of nearly 2,500 people. With projections for future development and growth to about 20,000 residents by 2032, SFPUC wants to expand capacity with the new facility.

CWA receives investment from Ohio

The Cleveland Water Alliance received a \$4 million investment from the state of Ohio to build out the next phase of its test beds and further develop its water economy workforce. With this funding, CWA has secured over \$10 million from state, local and federal partners to generate innovative answers to global freshwater issues and accelerate the Great Lakes region's water economy. Over the last two years, funding from the state of Ohio, the U.S. Department of Commerce and Cuyahoga (Ohio) County supported the building of the physical infrastructure of CWA's telecommunications network. **tpo**



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people/awards

The **Fairfield-Suisun Sewer District** received a 2022 Plant of the Year award from the California Water Environment Association and 2022 Platinum Peak Performance Award from the National Association of Clean Water Agencies.

Emily Corwin, senior engineer for the Fairfield-Suisun Sewer District, was recognized as a Hidden Hero of the Greenbelt by the Greenbelt Alliance, a California nonprofit dedicated to educating, advocating and collaborating to ensure that Bay Area communities are resilient to climate change.

Tina Myers, supervisor for the New Holland Wastewater Department, received a William D. Hatfield Award from the Pennsylvania Water Environment Association.

Plant City earned a Public Education Award at the Florida Water Resources Conference.

The **City of Hastings, Nebraska**, received the U.S. EPA George F. Ames Award for Performance and Innovation for its aquifer storage and restoration project.

The **Orange (North Carolina) Water and Sewer Authority** received three 2022 awards from the Partnership for Safe Water: 10-Year Excellence in Water Treatment, and the five-year and 10-year Awards for Distribution System Operations.

Maine Water Company named **Joseph Dignam** chief operator for the Saco River Drinking Water Resources Center.

The **Thomasville Water Treatment Plant** received a Platinum Award from the Georgia Association of Water Professionals for meeting or exceeding all Safe Drinking Water Act requirements.

DC Water named **Jeffrey F. Thompson** chief operating officer and executive vice president.

Water from the **Dempsey E. Benton Water Treatment Plant** in Raleigh,

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TPO welcomes news about your municipal wastewater operation for future articles:

Hearts and Minds: Your public education and community outreach efforts.	Greening the Plant: Improvements at your facility that help the environment.
PlantScapes: Interesting features of your facility's grounds, signage or buildings.	How We Do It: Interesting uses of equipment or technology.

Send your ideas to editor@tpomag.com

North Carolina, received third place in the Best of the Best Water Taste Test at ACE23.

TPO welcomes your contributions to Worth Noting. To recognize members of your team, please send notices of new hires, promotions, certifications, service milestones or achievements as well as event notices to editor@tpomag.com. **tpo**

events

Sept. 30-Oct. 4

WEFTEC 2023, McCormick Place, Chicago. Visit www.weftec.org.

Oct. 3-5

AWWA WaterSmart Innovations, South Point Hotel Casino & Spa, Las Vegas. Visit www.awwa.org.

Oct. 4-6

Southeast Stormwater Association Regional Stormwater Conference, Marriott Hilton Head Resort, South Carolina. Visit www.seswa.org.

Oct. 6

Delaware Rural Water Association Water & Wastewater Operators Expo, Greenwood Volunteer Fire Company. Visit www.drwa.org.

Oct. 12-13

2023 Annual Southeast Alaska Water/Wastewater Operator Training Conference, Baranof Hotel, Juneau. Visit www.awwma.org.

Oct. 15-17

Atlantic Canada AWWA Section Annual Conference, Prince Edward Island Convention Centre, Charlottetown. Visit www.acwwa.ca.

Oct. 15-17

Southwest AWWA Section Annual Conference, Doubletree by Hilton, Lafayette, Louisiana. Visit www.swawwa.org.

Oct. 16-Nov. 17

AWWA Water Treatment Operator Level 3 course, online. Visit www.awwa.org.

Oct. 17-19

North Dakota AWWA Section Annual Conference, Grand Forks. Visit www.awwand.org.

Oct. 18-19

New Jersey Water Association 2023 Management & Technical Conference, The Golden Nugget, Atlantic City. Visit www.njwater.org.

Oct. 18-20

Iowa AWWA Section Annual Conference, Des Moines. Visit www.awwa-ia.org.

Oct. 19

New Hampshire Drinking Water Expo & Trade Show, Courtyard by Marriott, Grappone Conference Center, Concord. Visit www.nhwwa.org.

Oct. 23-25

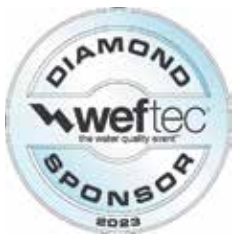
Georgia Rural Water Association Fall Conference, Unicoi State Park & Lodge, Helen. Visit www.grwa.org.

Oct. 23-26

California-Nevada AWWA Section Annual Conference, The Rio, Las Vegas. Visit www.ca-nv-awwa.org.

Oct. 29-Nov. 1

North Carolina AWWA Section Annual Conference, Raleigh Convention Center. Visit www.nconewater.org.



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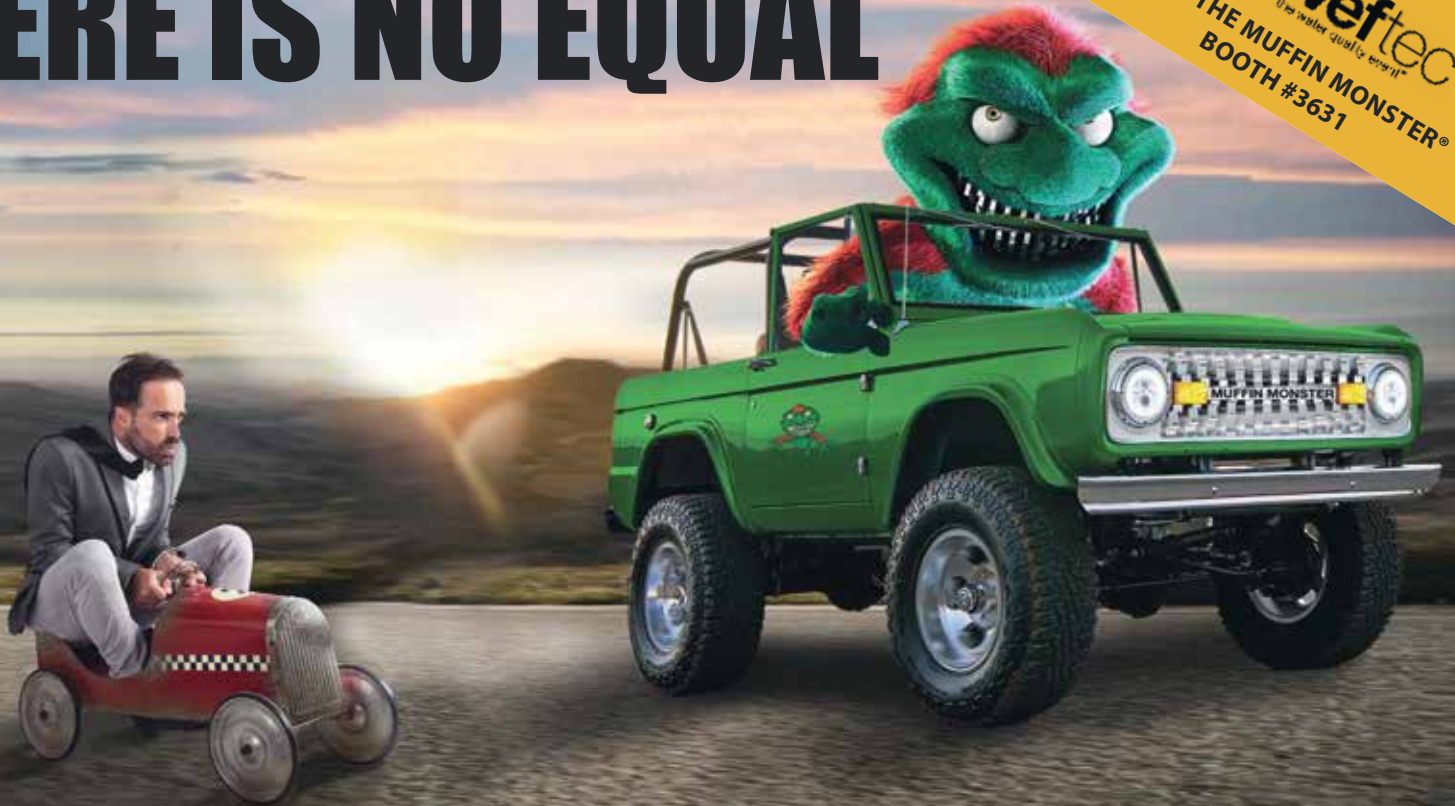
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