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JANUARY 2018

Mark Bowman
Plant Manager
Ironwood, Mich.

The *Right Recipe*

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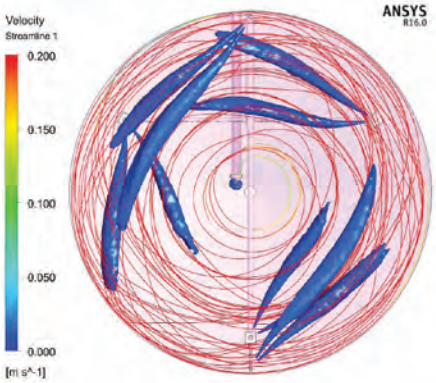

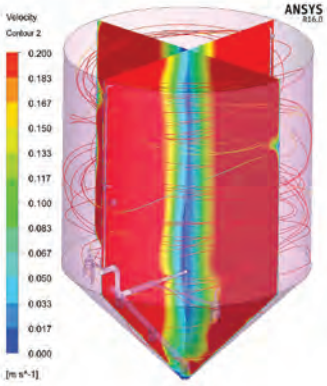

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on the cover

There are various ways to produce Class A biosolids. Mark Bowman, plant manager at the Gogebic-Iron (Michigan) Wastewater Treatment Facility, wants to prove to the U.S. EPA that his preferred method is both cost-effective and scientifically reliable by working with university scientists to document its effectiveness. (Photography by Cory Dellenbach)

top performers:

coming next month: February 2018

FOCUS: Biosolids Management and Headworks

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- Top Performers:
  - Wastewater Plant: Palm Coast (Florida) Wastewater Treatment Plant
  - Top Performer – Water Plant: Superstition Area Water Treatment Plant, Apache Junction, Arizona
  - Top Performer – Wastewater Operator: Suzanne Potts, King County, Washington
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- Sustainable Operations: Sustainability initiatives in Bayfield, Wisconsin
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let's be clear

Not Business As Usual

THE NEW YEAR PROVIDES A PLATFORM TO CONTEMPLATE THE SHAPE OF THE WATER RESOURCES UTILITY OF THE FUTURE. SIGNS INDICATE THAT FUTURE IS DIGITAL.

By Ted J. Rulseh, Editor

Innovation drives forward steadily in the water and wastewater sectors. Now and then, it's worth stopping to take a high-level view and ask: What is the actual shape of things to come?

The National Association of Clean Water Agencies has done that in a July 2017 paper, *Envisioning the Digital Utility of the Future*. The key word there is "digital." NACWA envisions the embrace of digital technology, in many forms, as essential to progress toward goals like improving environmental performance while cutting costs and boosting revenue.

The NACWA paper posits data-driven decision-making, powered by digital technology, as critical to moving beyond mere Clean Water Act compliance and beyond business as usual. "The latest technology — miniature sensors, handheld devices, cloud storage, software programs — gives organizations the ability to gather and see, in the blink of an eye, information integrated from all points across the utility enterprise," the paper states. "Extraordinary insights are delivered that can inform effective, cost-saving decision-making in real time."

What does this mean in practical terms? NACWA spells out how digital technology can help operators and managers transform their utilities in eight essential areas. Here is a quick look:

Reduce operational costs. Digital technology helps track, compile, and analyze data in real time on energy use, chemical consumption, pump efficiency and more. By spotting and analyzing trends, operators can fine-tune key equipment, like aeration blowers, to make sure they perform as cost-effectively as possible.

Manage and mitigate risks. Digital asset management systems using a variety of sensors on equipment can help operators spot problems before unplanned failures occur, costing big money and disrupting processes.

Enhance the customer experience. As water gets scarcer and more expensive, customers want better control of their usage. Digital technology can help water utilities convey metering data to customers in real time and notify them of leaks. NACWA believes this and other forms of customer engagement "will soon become the norm."

Improve financial execution. Digital technology can help utilities move beyond management using cumbersome spreadsheets. By collecting and analyzing financial data down to the level of individual customers, utilities are in a better position to understand their financial commitments, make long-range plans, and make accurate rate projections.

Optimize asset performance, and uncover hidden value. Water infrastructure is aging, and replacing it is expensive. Predictive data analytics using digital tools can help utilities get the most from the assets they have and determine when equipment has become so inefficient as to justify replacement. Technology can also help assess whether it is economical to recover minerals, nutrients and energy from wastewater.

Leverage existing communication and computing platforms. Technology can help utilities cut through the clutter of data from multiple systems and pieces of equipment — in effect turning raw numbers into actionable information. With mobile devices, cloud computing, sensors, and analytics, they can monitor complex and ever-changing processes and make quick and correct decisions based on data, not on "gut feel" or instinct.

Maximize the engagement and efficiency of employees. In the final analysis, utilities' success depends on people empowered to perform at their best. Digital technologies can help make team members more effective at work, completing tasks faster, interacting more easily with co-workers, and saving needless steps and vehicle travel. When properly trained and educated, employees become the foundation for the digital utility.

> "The latest technology ... gives organizations the ability to gather and see, in the blink of an eye, information integrated from all points across the utility enterprise. Extraordinary insights are delivered that can inform effective, cost-saving decision-making in real time."
> **NACWA PAPER**

Integrate water quality, policy and performance. Water utilities face ever stricter and more complex regulations while also under pressure to keep up their infrastructure and hold costs down. "Continuing advances in the collection, management, and analysis of data provide new tools to realize these sometimes competing objectives," the paper states. "Regulatory agencies have recognized that the evolution in the water industry's data capabilities will likely support a more modern, and integrated approach to compliance. The U.S. Environmental Protection Agency (EPA) has in fact established an entire Next Generation Compliance program to embrace the new tools for collecting and reporting environmental data."

Of course, digital technology will not be fully deployed in the new year ahead, but there's no time like the fresh start of a year to begin thinking about the future. The NACWA paper is available at www.nacwa.org. **tpo**

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WARTIME WATER

Overseas Operator

In this in-depth online article by professional speaker, AWWA author and consultant Melanie Goetz, a former regulator and water operator named Seth Garrison details his experiences providing clean water in war-torn Afghanistan. In the line of duty, an anti-tank landmine detonated underneath one of his crew's vehicles, killing four of his coworkers.

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WINNING PROJECT

Enhancing Infrastructure

Sherwin-Williams recently presented its 2017 Impact Awards for outstanding water and wastewater projects at WEFTEC. The winning project, completed by Carolina Management Team, rehabilitated a chlorine contact chamber at the St. Pauls (North Carolina) Wastewater Treatment Plant. The awards honor professionals committed to enhancing infrastructure to improve public health and safety.

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MINI WWTPS

Alleviating Sewer Stress

Rapid, unplanned urbanization is becoming a serious threat across the world, as it puts major stress on critical infrastructure like water and sewer lines. Building on his team's success in India, an associate professor at the University of South Florida College of Engineering is installing miniature wastewater treatment plants in Durban, South Africa, to help combat the issue.

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SERVICE FIRST

RICK LALLISH TRAINS ILLINOIS OPERATORS WITH A LITTLE BIT OF MISCHIEF AND A GREAT DEAL OF DEDICATION TO SEEING HIS STUDENTS ACHIEVE THEIR CAREER GOALS

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Bradley Leeb**

NOT EVERY CLEAN-WATER PLANT OPERATOR CAN GET PAID FOR purposely upsetting the process or causing an equipment malfunction.

Rick Lallish can — and often does. It's part of his method as the Water Quality Control Operations program director at the Southern Illinois University Edwardsville Environmental Resources Training Center (ERTC). There, aspiring operators learn the trade on a 30,000 gpd activated sludge plant and a moving-bed bioreactor inside the center.

"I have a bad habit of causing problems in the plant," says Lallish, winner of the 2017 Kenneth Meredith Award from the Illinois Water Environment Association for promoting operator professionalism. "I might turn the aerators off for a day. I might create a power outage. On the SCADA system, I can change the screen readings so they don't reflect what's going on in the plant. I might open a valve and let the plant drain or turn off the sludge wasting capabilities.

"Basically, I upset the plant. It forces the students to be proactive and look for problems. At the beginning of the semester, they're messed up; they're running around in circles. By the end of the semester, I see them taking action. In doing their plant walk-throughs, they notice when there's a problem, then get together and solve it. My theory is that it's easy to run a plant that's working well. These folks learn to operate a plant when it's not running well. They learn how to fix problems and get the plant to run right."

Rick Lallish combines classroom instruction with a heavy dose of hands-on practice at the Environmental Resources Training Center at Southern Illinois University Edwardsville.

Such mischief aside, Lallish takes pride in giving sound one-year training programs to people looking to enter the profession. He and colleagues also present short schools for experienced operators looking to acquire more advanced licenses and take special two-day workshops to sites around Illinois. "My goal is to help all the operators in the state achieve their goals," he says. "I do what I can to make sure the training they receive is fulfilling and effective."

A KNACK FOR SOLUTIONS

Operations and instruction comprise a second career for Lallish. In 1983 after graduating from high school in Greenville, he joined the U.S. Navy and served 10 years, mostly as a cryptologist. During Operation Desert Storm in Kuwait and Iraq, he served on the aircraft carrier USS Forrestal, running the machines that encrypted and sent highly classified information.

The logic and problem-solving skills he learned in the Navy served him well when he entered the clean-water profession in 1994 in Greenville. He took night classes at the ERTC to earn his Class 1 Wastewater Operation and Collection System Operator certifications. During 14 years at Greenville, he worked up to lead operator, in charge of a 1.5 mgd oxidation ditch plant and a 25-mile collections system with seven lift stations.

Besides the variety inherent in the job, Lallish enjoyed troubleshooting. "I was able to put my Navy training to use," he says. "My basic mindset was, OK, here's the problem. How do we tackle it? Is it mechanical? Is it software?

Rick Lallish, Southern Illinois University Edwardsville

POSITION: Director, Water Quality Control Operations Program, Environmental Resources Training Center

EXPERIENCE: 23 years in the industry

RESPONSIBILITIES: Instruct wastewater operators at all levels

CERTIFICATION: Class 1 Wastewater Operator, Collection Systems Operator

RECENT AWARDS: 2017 Kenneth Meredith Award, Illinois Water Environment Assoc.

GOAL: Deliver high-quality training to operators across Illinois

GPS COORDINATES: Latitude: 38°47′35.56″N; Longitude: 89°59′52.96″W

Lallish (center) prepares students like James Rainey (left) and John Greathouse for their careers by letting them operate a small-scale wastewater treatment facility.

> "My theory is that it's easy to run a plant that's working well. These folks learn to operate a plant when it's not running well. They learn how to fix problems and get the plant to run right."
> **RICK LALLISH**

In the second semester of training, Lallish likes to deliberately upset the plant so that students like James Rainey (right) can test their troubleshooting skills.

Is it operations?" Once he and his team fixed an outbreak of filamentous bacteria (Nocardia) by adding low doses of chlorine to the return activated sludge.

When an industrial discharge caused a spike in effluent nitrogen, Lallish traced the problem to the business responsible. It was related to the chemical content of product: "Whenever they cleaned out a vat, it basically acted like a time bomb in terms of the ammonia nitrogen in the plant. I learned how to do a TKN test using the distillation method. I was able to collect some numbers and had an outside lab verify my findings." Seeing the data, the company installed pretreatment.

ON TO INSTRUCTION

Lallish also enjoyed the people side of the profession — working with Greenville residents, making sewer service calls, and dealing with the City Council. That came in handy when he joined the ERTC in 2008. He's indebted to his Greenville boss and mentor, the late James "Jim" Maurer. "When I left, he gave me one piece of advice: 'Whatever you do, don't forget the operators. Those are the people you work for.' I do my job with that in mind every day."

The ERTC's basic program consists of two semesters of water and wastewater operations training, followed by a 10-week internship at a water or wastewater treatment plant. Graduates are eligible to take Illinois and Missouri certification exams.

On arriving, Lallish discovered how much he had to learn to transition from operator to teacher: "I didn't realize when I started how much there was to this job and how much responsibility came with it. I thought I knew my business, but I had to relearn everything. I had to learn every process, not just activated sludge. I had to understand lagoons, how fixed film works, and why disinfection does what it does. I had to broaden myself quickly to become confident enough that if somebody asked me a question, I could give a sound answer."

He did that by "hitting the books" — studying Water Environment Federation manuals, reading textbooks, reviewing previous instructors' PowerPoint presentations and creating his own. "By writing my own presentations and setting up lesson plans, I forced myself to learn the subjects I would be teaching."

BEYOND INSTRUCTION

Rick Lallish wears multiple hats at Southern Illinois University Edwardsville. Besides directing the Water Quality Control Operations program at the Environmental Resources Training Center, he's the operator in charge of the university's 0.6 mgd activated sludge plant and works with operators John Harper and Mike Taylor. The pilot plant in the ERTC receives its raw wastewater from that facility; effluent from the ERTC plant goes back to the main plant for final treatment.

Lallish also chairs the Illinois EPA Certification Committee, which meets once a year to review the database of questions used to create the state certification exams. He is first vice president of the Illinois Association of Water Pollution Control Operators, serves as an officer for the Mississippi-Kaskaskia Valley Water Pollution Control Operators, and a member of the Illinois Water Environment Association Operations Committee.

In his spare time, Lallish is an avid St. Louis Cardinals fan and a bowler with a 190-plus average. He's also newly married to Niki.

His ERTC colleagues are Kim Bateman, operations director; Drew Hoelscher and assistant Kurt Neuhaus in the water program; David Wesselman, laboratory; Jim Winslade and Marty Reynolds, adjunct instructors; and Marci Webb, office manager.

HEALTHY MIX

The one-year classes for new operators typically include 25 to 30 students, usually a good mix of ages, including about one-third 24 years and younger. That creates a positive dynamic in which the older students share their work ethic and the younger ones help others with math and technology. Students break into groups and alternate weeks in the facility's water plant, wastewater plant, lab, and maintenance area.

The team at the SIUE Environmental Resource Training Center includes Lallish (front left) and staff members from top left, clockwise, Kurt Neuhaus, assistant coordinator, water quality control; Drew Hoelscher, program director, water supply operations; David Wesselman, laboratory manager; Kim Bateman, interim director; and Marci Webb, office manager.

During the first semester on the wastewater side, Lallish runs the plant and has the students help. "I show them hands-on: Here's how you do this, this is what you look for," he says. "They go away for Christmas break, and when they come back for the second semester, we switch roles. I become the regulatory authority and let them run the plant.

"I have them check the equipment, do the startup, cultivate the activated sludge, check the bugs under the microscope ... the whole works. I have them report to me as the Illinois EPA. If something's wrong, they have to call me. I let them make mistakes. I let them do what they can to get that plant up and running and maintain it."

That's also the time when Lallish pulls his pranks. While that causes the students some consternation, it teaches them to be observant. "When they come in the morning, the first thing they need to do is a walk-through," Lallish says. "Does it smell funny? Does it look funny? Is everything flowing that's supposed to be flowing? What do the numbers look like on the SCADA? They have to gather readings every morning."

In the classroom phases of training, Lallish strives to keep the subjects interesting and ease fears of challenging areas. While a colleague teaches the wastewater math class itself, math enters into other sessions, and Lallish tries to make it as simple as possible. "I give them a lot of practice equations. I teach them how to read the formulas and how to put the formulas together. I teach them how to do it on paper because when they're taking the test, there's no computer.

WELL EQUIPPED

The Environmental Resources Training Center constantly looks to upgrade equipment to give students access to the most current technologies. One recent addition is a SCADA system that controls the pumps, valves and other systems at the wastewater treatment plant used in training.

The next project is to build a wastewater collections system and a drinking-water distribution system, both above ground so that students can easily observe their functions. "The collections system is scheduled to have four manholes — one of those being a lift station," says Rick Lallish, director of the Water Quality Control Operations program. "We'll be able to have simulated blockages and other simulated problems. We'll be able to teach operators how to test for slope and velocity. If funds are available, we're looking at a push camera students can use for inspections."

Speaking of which, each year Key Equipment, an Envirosight distributor serving Greater St. Louis, brings in an inspection truck with a tractor camera for a day and lets the students operate it. "We actually open a manhole outside the school and lower the camera in there," Lallish says. "The students actually perform a visual inspection. They love it."

"I show them what the exam questions will look like and give them methods for solving the different kinds of problems. Some older students haven't done math in 20 or 30 years. It's difficult for them, and I understand that. I try to bring it down to their level and make it so they don't have to fear it."

LASTING CONNECTIONS

Lallish estimates that he has personally trained at least 270 new operators, 400 more in short schools, and that many more in workshops. The ERTC as a whole, from June 2016 through May 2017, trained nearly 800 students and awarded more than 58,000 continuing education and classroom clock hours.

Graduates mostly find jobs in Illinois and Missouri, many with the Metropolitan St. Louis Sewer District. "We get a lot of feedback from plant managers saying, 'We want your folks — we don't have to train them. They know what they're doing when they get here.' They've done the work. They've got their hands dirty. They can hit the ground running. Utilities like that."

Lallish's connections with his students don't end when they leave school. He makes it clear that they're welcome to call him with questions. He returns their calls quickly. If they ask a question he can't answer, he taps his broad network of operators.

His rewards come when his students succeed. "For my new operators, it's when they call me after they get their first job in a wastewater plant and tell me it's the first time they felt as if they had a career and something to look forward to. One student a few years back had a pretty rough time growing up and not a whole lot of prospects for a decent life. He took a leap of faith and came to the one-year program. He graduated, got his certification, and got a job at a large treatment plant. Now, he has bought a new home and a car. He has a retirement plan and medical benefits for himself and his family. He called one day and said we changed his life.

"For experienced operators, I get a lot of satisfaction when one of them calls after a class and says, 'I passed my license exam, and I couldn't have done it without you guys.' There is no better feeling than just being told thank you." tpo

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Operator John Hanlon and other Hall Street Wastewater Treatment Facility team members help with presentations as part of Concord's award-winning plant tour program.

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Open Invitation

NEW HAMPSHIRE REGULATORS RECOGNIZE CONCORD FOR PLANT TOURS AND OTHER OUTREACH AIMED AT WINNING PUBLIC SUPPORT FOR UPGRADES AND DAY-TO-DAY OPERATIONS

By Craig Mandli

The Concord (New Hampshire) General Services Wastewater Treatment Division has kissed the low profile goodbye.

Leaders decided that residents needed to understand the division's Class A biosolids program and how the two treatment plants produce clean, clear water — so that they would support investments in plant facilities.

That's why the plants are regularly on display: The division regularly opens them up to tour groups that get the full overview of the processes, according to Dan Driscoll, plant superintendent. Tours host groups from school children to adult service groups and senior citizens. Each tour is geared to the age level.

The Hall Street Wastewater Treatment Facility, built in 1979, treats an average of 4 mgd, including 5 million gallons per year of landfill leachate and 2 million gallons of septage. The plant generates 7,500 tons of Class A biosolids per year, which is used as fertilizer or as a component of manufactured topsoil.

The Penacook Wastewater Treatment Plant, built in 1973 to treat discharge from a tannery, was later converted from conventional activated sludge to a sequencing batch reactor with a 1.2 mgd capacity.

Patricia Myers, laboratory technician, was part of the plant tour program until her recent retirement after 28 years maintaining lab equipment and completing tests, analyses and reports.

UPTICK IN OUTREACH

While the division has always offered tours, only two to three per year were given until three years ago, when an engineering study concluded that a digester would be the preferred alternative for future biosolids handling.

"For a long time, I guess you could say we would sit back and try to stay out of the way," Driscoll says. "If it was quiet, it meant we were doing a good job. But with that big project in the works, we knew we'd need community buy-in. The people needed to know how it would benefit them."

> "For a long time, I guess you could say we would sit back and try to stay out of the way. ... But with that big project in the works, we knew we'd need community buy-in."
> **DAN DRISCOLL**

Tour groups are queried to find out what part of the treatment process they'd like focus on. For student groups, the staff tries to choose a theme that fits the class curriculum. "It can be anything from learning about the trickling filter process and taking samples, which would fit into a biology class, to learning about the equations we use to figure flow rates, which is often some higher level math," Driscoll says.

In addition to giving plant tours, Concord General Services Wastewater Treatment Division employees take part in outreach at many community events.

"A lot of our adult tour groups like to learn more about our Class A biosolids production. Many people in the community don't realize what level we go to for making sure our biosolids are safe for the environment."

BECOMING CLEAR

While the increased outreach has cost, mainly in overtime for the staff to plan and lead tours, the payoff made it an easy decision. "People know we're here, and they know what we do now," Driscoll says.

The efforts have earned noticed at the state level. Last April, the New Hampshire Department of Environmental Services presented the division with its 2017 Outstanding Public Outreach Award. It recognized the tours as well as brochures, website updates, social media, news releases and participation at community events.

Driscoll calls the award a credit to his staff: "It's great to be recognized because it lets us know we're going down the right path. The award was a bit of a surprise, but it's a testament to the job our staff does."

Other communities have taken notice, too. Last year, the plant hosted a group of concerned residents from nearby Belmont. At issue was the safety in spreading Class A biosolids on farm fields. The presentation was made several weeks before a community-wide vote to ban the spreading of biosolids.

"We talked about what we did with biosolids in Concord and met with many people who were either leery or totally against the idea," Driscoll says. "Many of them didn't know the safety precautions involved in producing a Class A product. Once they learned more, we saw some stances softened. The resolution ended up failing, and biosolids continue to be safely applied to farm fields throughout the community."

CONTINUING TO BUILD

The division hopes to extend its outreach by increasing its presence in classrooms, especially in middle and high schools. Department staff is also planning on planting a demonstration nursery in front of the plant that will utilize biosolids to grow trees for city landscape projects. Staff members throughout the Concord General Services divisions also recently took part in a recruitment video urging people apply for job opportunities in the department.

"It's important to help break down that perception of the utility worker leaning on his shovel and not getting anything done," Driscoll says. "When people know what we do, they are more apt to support future initiatives. The people who pay our salaries deserve to know where their dollars are going." tpo

The Right Recipe

A PLANT TEAM IN MICHIGAN'S UPPER PENINSULA LOOKS TO WIN CLASS A BIOSOLIDS DESIGNATION BY VALIDATING A PRODUCTION PROCESS WITH SCIENTIFIC PROOF

STORY: **Ted J. Rulseh**
PHOTOGRAPHY: **Cory Dellenbach**

THERE ARE VARIOUS WAYS TO PRODUCE CLASS A biosolids. Mark Bowman wants to prove to the Environmental Protection Agency that his preferred method is both cost-effective and scientifically reliable.

Bowman, plant manager at the Gogebic-Iron Wastewater Treatment Facility in Ironwood, Michigan, faces challenges with the Class B cake his team now applies to cropland. One is dealing with regulations that require application at agronomic rates. Another is the climate — long winters and a short growing season mean a small window for distribution

There's also a shortage of farms in the area, many with soils already high in phosphorus where biosolids can't be added. And then, some farmers who could use the material would rather not take it. Bowman reasons that creating a value-added Class A product desired by residents would remove administrative and financial burdens and help set his district up for a brighter future.

The method he has in mind is used at the Metropolitan Water Reclamation District of Greater Chicago. The problem: The Gogebic-Iron Wastewater Authority can't afford the extensive and costly pathogen testing Chicago performs as part of the method to win site-specific Class A approval from the EPA.

The solution: Work with university scientists to document that the process recipe, if followed, will reliably achieve the pathogen kill and vector attraction reduction that the EPA requires for Class A material. "We're working through a grant to prove scientifically that if we follow these steps, we will produce Class A material — so we don't have to test it as long as we follow the protocol," says Bowman, who has been with the district since 1988.

PRESSURE ON RATES

The Gogebic-Iron Wastewater Authority was founded in the early 1980s to serve the city and township of Ironwood and the city of Hurley, just across the border in Wisconsin. The treatment plant was completed in 1986 at a

Mark Bowman, plant manager at the Gogebic-Iron Wastewater Treatment Facility, visits the outfall on the Montreal River.

> "We're working through a grant to prove scientifically that if we follow these steps, we will produce Class A material — so we don't have to test it as long as we follow the protocol."
>
> **MARK BOWMAN**

cost of $21 million and with a design flow of 3.4 mgd to accommodate projected population growth.

Instead, the population declined with the closing of a nearby copper mine where many area residents worked. As a result, the authority serves a large, low-density area with few industries, and it must charge relatively high rates to an older population, many with low, fixed incomes. Meanwhile, regulations and reporting requirements are growing and becoming more complex.

This makes it essential for the treatment plant to operate efficiently and drive out costs where possible. Energy-saving initiatives have helped, and so have member communities' efforts to reduce inflow & infiltration from sewer systems built in the 1920s and 1930s. The biosolids initiative is another step toward lowering costs: It would eliminate the expense of land-applying Class B cake without requiring a large capital investment in a dryer, pelletizer or other technology.

OLD BUT EFFECTIVE

The Gogebic-Iron Wastewater Authority treatment plant runs mostly with original equipment, handling average flows of 1.5 to 2.0 mgd and discharging to the Montreal River, a trout stream. High wet-weather flows, which can reach 20 mgd, are handled with help from a 500,000-gallon flow equalization basin that provides primary treatment, followed by chlorine disinfection before discharge to the river.

Mark Bowman and his team struggle to control costs at a treatment plant in a community with a shrinking population and many low-income residents.

Gogebic-Ironwood Wastewater Treatment Facility PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
BOD	92 mg/L	2 mg/L	10 mg/L June-Sept. 25 mg/L Oct.-May
TSS	94 mg/L	3 mg/L	30 mg/L
Ammonia	5.1 mg/L	0.04 mg/L	4.5 mg/L June 2.3 mg/L July-Sept. 11 mg/L Oct.-May
Phosphorus	2 mg/L	0.8 mg/L	1.0 mg/L

PURSUING INNOVATION

After 30 years of operations, Mark Bowman says the Gogebic-Iron Wastewater Facility will need more than a face-lift. He's looking to innovation to help enhance the plant's performance and reduce costs for ratepayers.

Already, aeration for the oxidation ditch has been optimized by sending the output of an Evita dissolved oxygen probe (Danfoss) to the SCADA system, where setpoints control the speed of the mechanical aerators. The system was designed, programmed and installed by Jeff Wasley, chief operator. Another energy-saving project is control of the influent screw pumps so that they work on an off/cycle. In addition, variable-frequency drives have been installed on the aerators and on other equipment where it made sense.

Still, more needs to be done. The Gogebic-Iron Wastewater Authority has received a $235,600 Michigan Stormwater, Asset Management and Wastewater grant to develop a comprehensive asset management plan with Superior Engineering. An inventory and condition assessment of equipment and structures is underway and will become the basis for developing user rates, a replacement fund, and a capital improvement program.

In 2010, the authority commissioned Donohue & Associates to complete a master plan, which confirmed that the treatment plant is using just 25 to 30 percent of its capacity. This means it could easily handle significant growth at minimal cost, enabling rate reductions. Meanwhile, Bowman uses his membership in the Water Environment & Reuse Foundation and its Leaders Innovation Forum for Technology initiative to explore new possibilities.

LIFT is a multipronged initiative to help bring new water technology from the laboratory to the field quickly and efficiently. It includes technology evaluations with treatment facility-based demonstrations; training, education and outreach; benchmarking of utilities' research and development programs; and an informal research and development forum.

"LIFT is a great organization," Bowman says, "It keeps me informed on where the industry is going. I find it very invigorating to follow that and be a member. Right now, we're looking at redoing our clarifier drives. One of our biggest energy costs is electricity to power the aerators in the oxidation ditch. LIFT exposed me to advanced primary clarification. The idea is that you can take a normal clarifier that might be 30 to 40 percent efficient and boost that to more than 70 percent, or even as much as 80 percent efficiency.

"That does two things. It reduces the load on your secondary treatment and it increases the loads to the anaerobic digester so you can produce more gas, generate more heat and electricity, and produce more value-added biosolids. There are a variety of advanced primary clarification technologies, some leading-edge and some more conventional.

"As we move forward with our asset management plan, it may cost the same to do something different, such as an advanced primary clarifier. Engineers should know about these things rather than just staying with the tried and true. LIFT is looking to reduce the risk and accelerate the incorporation of new technologies so we can put them into the mainstream."

Influent is delivered by three screw lift pumps (Lakeside Equipment) to a fine screen (Huber Technology) and then a PISTA Grit system (Smith & Loveless). After two primary clarifiers where ferric chloride is added for phosphorus removal, the water enters an Orbal oxidation ditch (Evoqua Water Technologies) with mechanical disc aerators.

From the oxidation ditch, the flow passes to a pair of final clarifiers, then to disinfection with chlorine, dechlorination with sulfur dioxide, and cascade aeration before discharge. A SCADA system, built by chief operator Jeff Wasley around Proficy software (GE), lets the staff monitor and control all plant functions.

SCADA data and lab test information entered by operator and lab technician Raymond Brunell are fed to a Hach Water Information Management Solution, from which Bowman can easily produce multiple reports including monthly compliance reports to the state Department of Environmental Quality.

Operators also use a JOB Cal computerized maintenance management system (Hach).

Besides Wasley and Brunell, the Gogebic-Iron Wastewater Authority plant team includes operators Ezechiel "Ezy" Lagalo, Stacy Ludtke, Jon Wilson, and administrative assistant Jean Basom.

MANAGING SOLIDS

On the solids side, waste activated sludge, or WAS, is conveyed to the primary clarifiers; the primary sludge and WAS mixture is delivered to an anaerobic digester for a 40-day detention time. The resulting biogas provides digester heating. Digested material is sent to a storage tank equipped with a 50 hp chopper/mixer pump (Vaughan) and then dosed with polymer and dewatered on a belt filter press (Alfa Laval).

"Because we have primary clarifiers, we produce less WAS, and that is a benefit," Bowman says. "The higher the primary-to-WAS ratio, the better the dewatering and the cheaper it is to run the press. We get cake at 20 to 24 percent solids." The cake is held in a storage building with capacity for up to two years' production and is land-applied in spring and fall. Total biosolids production is about 200 dry tons per year.

By the end of 2018, Bowman hopes to be turning that material into a Class A product suitable for public distribution. Already, the plant team has produced batches that Bowman believes would qualify as Class A, given that multiple tests have detected no pathogens. The project is funded by a $635,000 Michigan Stormwater, Asset Management and Wastewater grant for innovative technology. The Combined Long-Term Storage/Air Drying process (also called the Two Summers method) avoids the large capital, energy and maintenance expenses of other Class A methods like composting, heat drying and pasteurization.

(continued)

Gogebic-Iron Wastewater Treatment Facility, Ironwood, Michigan

COMMISSIONED:	**1986 (upgraded 2014)**
EMPLOYEES:	**7**
FLOWS:	**3.4 mgd design, 1.5-2.0 mgd average**
AREA SERVED:	**City and township of Ironwood, Michigan; city of Hurley, Wisconsin**
POPULATION SERVED:	**9,200**
TREATMENT LEVEL:	**Advanced secondary**
TREATMENT PROCESS:	**Oxidation ditch**
BIOSOLIDS:	**Class B, land-applied**
RECEIVING STREAM:	**Montreal River**
ANNUAL BUDGET:	**$930,000 (operations and maintenance)**
GPS COORDINATES:	**Latitude: 46°27′55.00″N; longitude: 90°11′21.42″W**

The team at the Gogebic-Iron Wastewater Treatment Facility includes, from left, Jon Wilson, operator; Jean Basom, administrative assistant; Ezy Lagalo and Stacy Ludtke, operators; Mark Bowman, plant manager; and Jeff Wasley, chief operator. Not shown: Raymond Brunell, laboratory technician.

RIGHT: Students from Michigan Tech begin the tests on biosolids as part of the plant team's effort to validate a Class A production method. LOWER RIGHT: Stacy Ludtke adds polymer to material feeding the belt filter press (Alfa Laval).

PHOTO COURTESY OF MARK BOWMAN

"We're going to use a method that the Chicago district and a number of other agencies have been using for many years," Bowman says. "You take digested sludge and store it for 1 1/2 to two years unfed, which means without adding any new raw sludge. After that, you take it out and dry it on an accelerated basis. That combination will reduce the pathogens down to nothing. And you've done your vector attraction reduction in the anaerobic digestion phase, which also reduces pathogens."

CREATING PROOF

The Gogebic-Iron Wastewater Authority storage building contains a batch of material produced in this way; it has the look, feel and scent of very dry but high-quality black earth. Bowman notes that this method does not explicitly meet any of the EPA 503 criteria for qualification as Class A material. The Chicago district documents Class A status by testing batches.

Instead, the Gogebic-Iron Wastewater Authority will opt for scientific proof that the method reliably yields a Class A material in local climate conditions; this would make testing of batches unnecessary. To that end, the Gogebic-Iron Wastewater Authority has engaged scientists from Michigan Technological University to conduct pilot-scale tests supported by laboratory studies to improve understanding of the physical, chemical and biological mechanisms by which pathogens are inactivated during the treatment. The results of the studies will be shared with scientists at the Water Environment & Reuse Foundation for peer review before submittal to the EPA.

The basic process in simple: "We'll make a batch of cake solids and put a date on it. We'll set it aside for up to two years. Then, we'll put it on an impervious surface, start letting it dry, and periodically run a paddle mixer machine through it. When it dries, it turns into something like this," Bowman says, indicating the batch already on hand. "It's wonderful stuff."

> "We'll make a batch of cake solids and put a date on it. We'll set it aside for up to two years. Then, we'll put it on an impervious surface, start letting it dry, and periodically run a paddle mixer machine through it."
> **MARK BOWMAN**

GOING PUBLIC

At the same time, Bowman is developing a communication plan to promote the Class A material, assuming the EPA approves the process. "I'm coordinating with local garden clubs, the schools, and others to do various demonstration projects," he says. "At the county fair, I'd like to set up a booth and create some flower gardens on the grounds to show to people as they go by."

He would prefer to charge something for the material, but even if it were given away, the authority would benefit from unloading the expense of running the truck used to land-apply. "Another option would be to give the whole amount to a local contractor," Bowman says. "We could explore a seven- or 10-year arrangement where we would produce the material and he could blend it with soil, or do whatever he wants with it."

A top-performing treatment plant and a high-quality biosolids product would make a good legacy for Bowman to leave as he rides into the sunset. tpo

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Smooth Sailing

CHARGE ANALYZERS HELP A NORTH CAROLINA PLANT TEAM DEAL WITH BIG WEATHER-DRIVEN VARIATIONS IN SOURCE WATER TURBIDITY

By Scottie Dayton

The Yadkin River produced wide and rapid turbidity swings that regularly challenged the city of King Water Treatment Plant operators. Turbidity on dry days averaged 6 to 8 NTU, but heavy rains could raise levels to 800 NTU or higher within 30 minutes.

The operators at the plant in northeastern North Carolina ran six-beaker jar tests and then waited for the results, which could take an hour or so. "By then, the water we were testing had passed through the flocculators and was on its way to the filtration basins," says Ben Marion, plant supervisor. "During storms, we fed alum as hard as we could (100 ppm), but the settled numbers never fell below 6 to 10 NTU."

Looking for solutions, operators in 2014 switched to feeding DelPAC 2000, a polyaluminum chloride (USALCO). "It worked well, but we still lacked a way to jar-test samples quickly," Marion says. "We were in the middle of a plant upgrade, and I wanted my operators to have the best technology possible to run it."

The facility had an outdated streaming current monitor; Marion discussed options with Chemtrac representative Mark Vandiver, who brought a benchtop LCA-2 Laboratory Charge Analyzer that measured the negative surface charge of particles and predicted through a titration process the amount of PAC to feed to neutralize the charge.

The Chemtrac HA8 analyzer with three pH probes and two chlorine probes in addition to streaming current.

"That was the tipping point," Marion says. "We manually titrated PAC with a pipette and five minutes later had the result. When the demo was over, we bought the machine." Its addition to the laboratory influenced the entire treatment train. Later, the plant team deployed more advanced online charge analyzers, further improving process consistency.

CONVENTIONAL PROCESS

The 3 mgd (6 mgd final design) plant renovation opened in November 2015. Two 2,100 gpm vertical turbine pumps from Aurora pumps (Pentair) in the raw water pump station deliver Yadkin River water to a static flash mixer (Lightnin, an SPX Brand) at the front of the plant. Treatment includes feeding of DelPAC 2000 and adjusting pH as necessary.

Water flows from the mixer through eight 5,200-gallon flocculation tanks (four per train) with Lightnin mixers before entering two 280,000-gallon sedimentation basins. Operators add sodium hypochlorite to remove iron and manganese before the water flows to four FilterWorx dual-media filters (Leopold - a Xylem Brand), passing through 34 inches of anthracite over 6 inches of sand with a Leopold IMS cap porous plate support.

Ronnie Gallimore, a King Water Treatment Plant team member, performs a coagulant titration to determine a target coagulant dose.

After filtration, the water is treated with caustic soda and poly-orthophosphate and then stored on site in four above-ground tanks totaling 2.5 million gallons. Sodium hypochlorite is fed to the water before two 350 hp, 4,800 gpm vertical-turbine high-service pumps from Aurora pumps (Pentair) and to a booster pump station for storage in three in-ground tanks totaling 3.5 million gallons.

From the booster station, water is pumped to three elevated storage tanks (1.05 million gallons total) and an in-ground storage tank before distribution to 25,000 customers through 12-inch mains. The system stores 8 million gallons — a three-day supply of water.

BELOW: A Chemtrac DuraTrac 4 Streaming Current Sensor downstream of the flash mixer. RIGHT: Ben Marion, plant supervisor.

BOOSTING PERFORMANCE

Once the charge analyzer was deployed, "The changes in the plant were amazing," Marion says. "Now, it took only minutes to adjust chemical doses during heavy rain, and we were feeding 400 pounds of PAC per day instead of 800 pounds." Reducing the chemical feed lightened the load on the filters, improved filter times, and extended media life.

"Heavy rain used to push the filters almost to our limit of 0.30 NTU and reduce filter run times to six or eight hours," Marion says. "Better flocculation upstream has enabled operators to air scour the filters at intervals of 84 hours versus 48 to 60 hours previously and to replace the anthracite in five or six years instead of annually."

Removing more organics and particulates in the sedimentation basins increased the volume of sludge discharged to the waste well daily. Operators dewatering the material weekly on a Klampress 1-meter belt filter press (Alfa Laval) watched polymer usage drop from 150 pounds per session to less than 100 pounds. "Cake went from 18 to 30 percent solids," Marion says. "Every two weeks, we haul it to a landfill. Even with drier material, our volume rose from 3.5 to 8 dry tons."

> "When the operators learned they could base dosages solely off the streaming current monitor, two threatened to quit if I returned the demonstration unit."
> **BEN MARION**

ENHANCING OPTIMIZATION

In May 2016, Vandiver suggested pairing the LCA unit with a Chemtrac HA4 online Streaming Current Charge Analyzer (HydroACT 4 analyzer and DuraTrac 4 sensor) to confirm online whether enough chemical had been added to neutralize the charge. "The thought of seeing it go through the flash mixer in real time was intriguing," Marion says. "When the operators learned they could base dosages solely off the streaming current monitor, two threatened to quit if I returned the demonstration unit." He didn't.

After six months, the operators had learned what optimization settings worked best in the analyzer. Marion first called other area operators with streaming current monitors in their plants and asked what settings they were running. "It varied widely," he says. "One town was running a plus 30 charge, while another was running a negative 10."

The operators closely tracked system data to determine the streaming current charge range targets for the most effective turbidity reduction. "We learned that running a positive 10 to 15 charge on the upside of turbidity gave us optimal settled numbers, and a negative 10 on the downside kept us one step ahead of it," Marion says. "Then, the storm hit in late April 2017."

MUD AND MAYHEM

The Yadkin River, fed by seven days of downpours, surpassed the 16-foot flood stage and crested at 22 feet. The average river level at the facility is 2 to 2 1/2 feet. "When we came in at 7:30 Monday morning, source water turbidity was around 40 NTU and we were feeding 28 ppm PAC," Marion says. "Within 30 minutes after the rain began, turbidity jumped to 400 NTU. We ran the LCA and got 70 ppm PAC. We then fine-tuned the doses using the online streaming current analyzer. That was huge for us."

Source water turbidity rose to 900 NTU, and runoff held it there for two weeks. Operators maintained a settled number of 3.0 NTU or less without seeing an increase in disinfection byproducts. "Decreasing our chlorine feed in the sedimentation basins — combined with the removal of 99 percent of organics — was leaving nothing on which total trihalomethanes and haloacetic acids could form," Marion says.

Nevertheless, the experience convinced him to upgrade the HA4 analyzer to an HA8, allowing for the addition of two pH and three chlorine sensors. "They all run through the same box, and the best thing is that reagents aren't required to test chlorine," Marion says. "The $200 we save per month on reagents covers the increased tipping fee at the landfill." Most important to the operators: They now have the technology and equipment to meet their top priority of providing the best water to every customer.

An additional outcome of the team's efforts could include recognition by the state Area Wide Optimization Program. Marion says, "We are now meeting the AWOP requirements and hope that by the end of the year we'll be an optimized plant." tpo

Share Your Ideas

TPO welcomes news about interesting methods or uses of technology at your facility for future articles in the How We Do It column.

Send your ideas to editor@tpomag.com or call 877/953-3301


Lauren Bigelow


Don Jensen


Carol Miller

Clearing the Air

THE WATER UTILITY ENERGY CHALLENGE PUTS FIVE UTILITIES INTO COMPETITION TO REDUCE AIR EMISSIONS THAT COME FROM THEIR USE OF ELECTRICITY

By Steve Lund

Five water utilities in the Great Lakes watershed are engaged in a contest to see how well they can change their operations to reduce the air pollution created by electricity production.

The utilities are taking part in the Water Utility Energy Challenge, a competition funded by the Great Lakes Protection Fund and managed by the American Water Works Association. More than 30 utilities applied to participate, according to Lauren Bigelow, CEO of Growth Capital Network and marketing supervisor for the energy challenge.

The utilities selected were the city of Highland Park, Illinois; the city of Ann Arbor, Michigan; Great Lakes Water Authority, Detroit; Onondaga County Water Authority, North Syracuse, New York; and the city of Bayfield, Wisconsin.

WIDE RANGE OF FINALISTS

The competition began in April 2017 and will cover the succeeding 12 months. The winner, to be announced at the AWWA annual meeting in June 2018, will receive a $20,000 prize. Second place will be worth $10,000.

The finalists were selected in part for variety. Bayfield, on the shore of Lake Superior, is tiny, while the Great Lakes Water Authority in Detroit is one of the largest water utilities in the country. Another factor was the kind of records the utilities had before the competition.

"We had to create a baseline, so we needed some historic information," Bigelow says. "We worked with a number of the utilities to see if they had collected that data. It would be hard to say we had reduced X amount of emissions if we didn't have any historic data. We're working with a scientific advisory board. We wanted to ensure results that were pretty unimpeachable."

TRACKING SOFTWARE

The competitors have access to two software packages developed at Wayne State University with backing by the Great Lakes Protection Fund. The software helps utilities operate more efficiently and provides information about the pollution component in the electricity they use, based on the time of day.

One software package, Polluting Emission Pump Station Optimization, or PEPSO, enables utilities to optimize operations for either least amount of electricity consumed or least cost of electricity. The other, called Locational Emissions Estimation Methodology, or LEEM, helps utilities optimize for the least air pollution created by the electricity they use.

DELICATE BALANCE

Most air pollution from power generation comes from coal-fired plants, which generally operate around the clock. So how could changing the time-of-day power usage affect air pollution?

It's all about the marginal generation — which generator will increase production to satisfy the next increment of demand — says Carol Miller, professor of civil and environmental engineering at Wayne State University in Detroit and a developer of the software being used in the Water Utility Energy Challenge.

Coal plants don't always run at capacity, so sometimes a coal plant could be the marginal generator. At other times, sources that produce less air pollution are the marginal generators. The air pollution tied to a decision to turn on a pump, for example, could be different at 2 p.m. or at midnight. "The emissions associated with that decision are different at the two times, and it changes each day and changes with location," Miller says.

Sometimes the least-polluting time to consume electricity is not the least expensive, but software packages can still offer options. "There are times when optimization for least emissions does in fact mean that the cost will go up," Miller says. "But there are also ways to set the constraints on the system such that the optimization will first search for least cost. Then within the multitude of solutions that satisfy least cost, the one that is most sensitive to emissions will be selected."

> "The emission reductions we're seeing on a preliminary level are pretty impressive. We're working with the AWWA to do this as a pilot in the Great Lakes basin. Once we run this for the first time and work out all the bugs, we hope to expand this across the U.S."
>
> **LAUREN BIGELOW**

LEEM tracks mercury, carbon dioxide, sulfur dioxide, nitrous oxides, and lead emissions from all the generators sending power to the grid. Each day, utility operators receive reports telling them the emission rates of those pollutants for the next 24 hours. Carol Miller, a Wayne State University professor and a developer of the software, says the generator supplying a particular utility varies throughout the day, so the emissions associated with electricity use at that plant also vary with time.

MAKING ADJUSTMENTS

With LEEM, "I get a daily look-ahead," says Don Jensen, superintendent of water production for Highland Park. It identifies the optimal times to use electricity based on pollution percentages.

Jensen was surprised by what the report showed. He expected the lower-pollution times would occur at night, when demand is lower and only base load plants would be operating. In his area, many of those plants are nuclear.

"It turns out I was completely wrong," he says. "The lower polluting periods fall between about 9 a.m. and 10 or 11 p.m. I'm guessing that may be when there are more abundant renewables, such as solar and wind, on the grid." That means optimizing for reduced pollution will often conflict with minimizing electricity costs, which usually peak in the middle of the day.

"If it costs you more for energy to pump during the daytime when pollution is lower, you have to pick your poison," Jensen says. The utility has limited storage, so it's constrained by the need to pump to meet demand.

"Our capabilities to adjust are pretty limited," he said. "We're using that look-ahead and trying to shift, if we can, to lower pollution. We have shifted, but it's subtle; it's on the margins. We can't control demand. We have to serve our customers' needs, although we do encourage conservation."

SUSTAINING PRESSURE

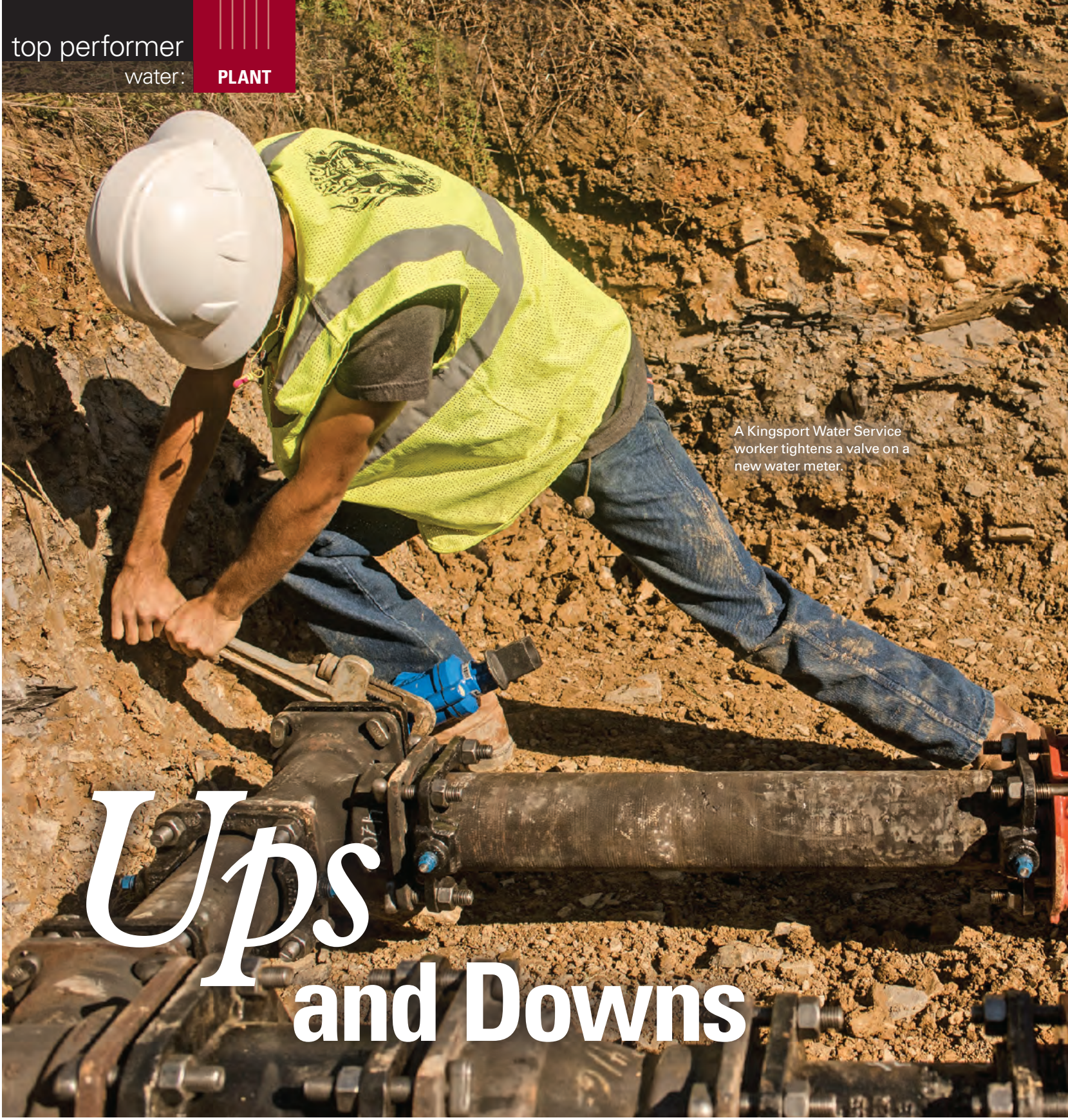
In Ann Arbor, operators face the same constraint, adjusting to reduce air pollution when they can while keeping water pressure at a certain level, says Lynne Chaimowitz, financial analyst. "We're working with the parameters of what we need to provide our customers," she says. "Where there is the ability to make these operational adjustments, we're doing that."

The competing utilities have to work out the balance between costs and pollution according to their own needs, Bigelow says. They will be judged on overall emissions reductions, reductions of mercury, percentage of emissions reductions, innovations in the use of the software, and other factors. The utilities provide monthly reports.

"The emission reductions we're seeing on a preliminary level are pretty impressive," Bigelow says. "We're working with the AWWA to do this as a pilot in the Great Lakes basin. Once we run this for the first time and work out all the bugs, we hope to expand this across the U.S."

Utilities don't have to be in the competition to use the software. "PEPSO is downloadable and accessible for utilities across the United States," Bigelow says. "LEEM data is not available for the entire U.S. yet, but they are working on it." It's available for free at www.awwa.org/competition.

Other organizations collaborating on the energy challenge are CDM Smith, E21, Great Lakes and St. Lawrence Cities Initiative, Growth Capital Network and Wayne State University. tpo



A Kingsport Water Service worker tightens a valve on a new water meter.

Ups and Downs

DISTRIBUTION SYSTEM TEAM MEMBERS DEAL EFFECTIVELY WITH HILLY TOPOGRAPHY AND MULTIPLE PRESSURE ZONES IN KINGSPORT, TENNESSEE

STORY: **David Steinkraus**
PHOTOGRAPHY: **Martin Cherry**

Water Distribution System, Kingsport, Tennessee

BUILT: | **1929**

POPULATION SERVED: | **102,000**

SERVICE AREA: | **120 square miles**

EMPLOYEES: | **77 (water distribution and wastewater collection)**

FILTRATION PLANT FLOWS: | **28 mgd design, 15 mgd average**

SOURCE WATER: | **South Fork of the Holston River**

SYSTEM STORAGE: | **19 million gallons**

DISTRIBUTION: | **847 miles of water mains**

ANNUAL BUDGET: | **$4.4 million (distribution operations)**

KEY CHALLENGE: | **Pressure management**

WEBSITE: | **www.kingsporttn.gov**

GPS COORDINATES: | **Latitude: 36°31′10.91″N; longitude: 82°31′37.09″W**

KINGSPORT IS A CITY OF HILLS AND RIDGES. NESTLED in the Appalachian Mountains of eastern Tennessee, it is also a place where people want to live on the high ground. And that is the challenge for the city's water distribution system.

"We had one customer who moved here from a northern state and complained about low water pressure," says Chad Austin, P.E., manager of the distribution and collections systems for the city, on the Tennessee-Virginia border. "I pulled his meter, turned around, and said, 'Boy this is a beautiful view.' He said, 'Yes, that's why I love it here.' And I said, 'Well, that's why you have low water pressure.'"

Over the years, the city has addressed those pressure problems with a series of booster pumps. Proof of how well the system has done can be found in its awards. In 2016, the distribution system earned an Operational Excellence Award from the American Water Works Association.

The team members running the city's filtration plant are award winners in their own right. In 2017, they earned a ninth consecutive Directors Award from the Partnership for Safe Water.

PIPING ISSUES

When designing for distribution on the tops of ridges, the goal is to reach a pressure of 45 to 50 psi. The Kingsport system includes about 20 percent galvanized pipe, which fell out of favor with utilities because of corrosion issues. Another 20 percent of the pipe is cast iron, laid in 1929 when the system was started.

"We did a master plan a few years ago to identify areas where that pipe needs replacing," Austin says. "We based our work on what our field staff found and also on issues reported by our customers. We try to take care of those in as timely a manner as possible. If there is a water-quality or flow issue, we move on those right away."

Although the team has discussed the advantage of having alternate paths to feed water through the system, that is not possible because of the topography. Elevation at the filtration plant is 1,286 feet, and the highest point in the system is 2,020 feet. "That's why we have so many pressure zones," Austin says.

The system's 15 zones include a main pressure zone with five water tanks to serve the central city. Six main pumping stations are outside the city limits. In some cases, water must pass through three or four main stations to reach the far ends of the system.

The Kingsport team members have helped the water system win nine consecutive Directors Awards from the Partnership for Safe Water.

TEAM APPROACH

If a larger line has problems, the city has seven maintenance crews available, but Austin could not recall any major problems. There are enough interconnections to keep outages manageable. A big outage affects 200 to 300 people. With digital maps available on the technicians' tablets, they can see where all the valves are and figure out which need to be closed to isolate a break and keep the size of an outage down.

Along with its main pumps, the system has 21 booster pumps. Main pump stations vary from 7.5 to 350 hp; most are in the 40 to 50 hp range. Booster pumps are typically 3 to 5 hp. In Austin's 17 years with the utility, technicians have replaced about half of the booster pumps. Each time a station was replaced, engineers adjusted the design and, in some cases, the location to equalize the pressure through the zone.

Only two tanks are elevated to create head pressure. The rest are standpipes on the ridges; some of those also have booster pumps to supply water to buildings along the ridge. Tanks were sited to take advantage of gravity. There have been discussions about new tanks, but no one wants to give up land for them. Instead, the water team looks for operational efficiencies to eliminate the need for new tanks.

"Pressure is low along the ridges and high in the valleys," Austin says. "One of the other challenges came in the late 1980s and early 1990s when we took over some smaller utilities and combined all the operations under one organization."

Chad Austin is distribution and collection manager for Kingsport Water Services.

> “We did a master plan a few years ago to identify areas where that pipe needs replacing. We based our work on what our field staff found and also on issues reported by our customers.”
> **CHAD AUSTIN, P.E.**

DETECTING LEAKS

One strategy for managing pressure is a continual search for leaks. When the city switched to an automated meter-reading system in 2008 and 2009, it also installed about 4,500 leak detectors. “So they’re sitting out there on services and turn on between 2 and 3 a.m.,” Austin says. “They listen for the sound of a leak. When the technician who’s reading meters drives through the area, the leak detector information downloads to his iPad along with the meter readings.

“A lot of our leaks don’t necessarily come up to the ground because we have a lot of karst geology. We’ve had several 6- and 8-inch lines break all the way through and not a drop of water came to the surface. We had to spot the pressure drop and then go look for them.” In one case, the customers having problems were more than a mile from the break.

Jason Brooks, left, distribution specialist, and Russell Watterson, utilities location specialist, work to find a leak in a waterline.

Two employees survey for leaks in areas that have not been checked recently. “That helps us define some leaks that otherwise we wouldn’t have known about,” Austin says. “And it helps us be proactive because in other places, citizens have been very upset about the size of water losses they pay for.”

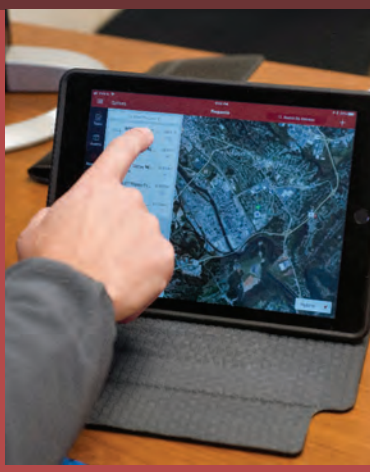
PREVENTING CONTAMINATION

The city also implemented a cross-contamination program before Austin arrived, and in 2009, won an award from the Tennessee Backflow Prevention Association.

Every customer is surveyed to determine what is present — swimming pools, water softeners, irrigation lines and other features — and how great a cross-contamination risk each presents. Kingsport is home to industries that include a paper mill, military ammunition plant and chemical plant. If there is a risk, technicians check to ensure that backflow preventers are installed.

The initiative started a couple of decades ago after an incident involving a trucking company that had a wash bay with a sump. The hose used to wash

TECHNOLOGY IN THE FIELD



Since 2014, water distribution technicians in Kingsport, Tennessee, have used iPad tablets to help manage the system. Before that, digital maps were available through the city’s GIS but were not accessible to technicians in the field.

“We manage all our work through iPads,” says Chad Austin, P.E., who manages the water distribution system. “If something is broken, a technician does a request that is tagged with the name of that asset. In the office, we can use that information to do reports and look at, for example, how often we have fixed a section of line.”

If a line is breaking often, it is moved up on the replacement schedule. Technicians are not limited to looking at waterlines. They can also see sewer and stormwater lines on iPad maps. It helps them understand the whole system so they can operate it better, Austin says. Also on the iPads are lists of what equipment is designated for a job, which people are assigned, their hours, and a material list.

Repair crew leaders carry the iPads and go out with technicians who read meters so they can see, for example, where service has been turned off. “I can open the software and see the status of any request,” Austin says. The Cartegraph operations management system on the iPads and office computers links to the city’s GIS system. Changes made to a map in one system are automatically updated on the other.

A few valves in the Kingsport system can be controlled from an iPad, but most are still manual. Also linked to the iPads are some pressure-reducing and flow-sensing equipment. Kingsport is working on an improvement plan from the Partnership for Safe Water. For the phases that require good recordkeeping and data analysis, the iPads will be helpful.

Tony Bishop, water quality control specialist, grabs a sample from a fire hydrant flush to check the water's chlorine level.

> "With our system spread out the way it is, we can't put a plant anywhere because we simply could not push enough water into some of those pressure zones. But there are good spots where a company would do well in proximity to our larger lines."
> **CHAD AUSTIN, P.E.**

the trucks was lying in the sump one day when a waterline broke, and some of the oily, soapy wash water was sucked into the lines. Backflow preventers are tested annually. At the same time, a technician does another survey to find out whether anything has changed. New customers are surveyed when the tap is installed.

LOOKING FOR NEW CUSTOMERS

Kingsport has extra capacity in its filtration plant and has a tool to attract industries. The chemical plant is just downstream of the water system intake on the South Fork of the Holston River. Founded in 1920, the chemical plant makes products found in paint, adhesives, textiles, sports-drink bottles, pharmaceuticals, medical devices and other goods. The chemical plant has its own water intake for production processes and fire control, but potable water for employees comes from the city. The chemical plant accounts for about 15 percent of the system's average daily production of 15 mgd.

"We want industries, especially if they use a lot of water," Austin says. "With our system spread out the way it is, we can't put a plant anywhere because we simply could not push enough water into some of those pressure zones. But there are good spots where a company would do well in proximity to our larger lines."

The technical staff is a mix of ages and experience. About 30 years ago, the city hired a number of people, and in the past few years, several of them have retired. Austin's section, which includes water and sewer, has 77 people. More than 20 have been with the city for 20 years or more. The same number have been on the team for fewer than five years.

The Kingsport team has a good handle on its system, but that isn't enough. They're working on data collection and analysis as part of the Partnership for Safe Water program. It will help Kingsport better handle all those ups and downs. tpo

1. The Aqua Assist Wastewater product consists of granules with the appearance of table salt. The substrate is a form of silica.

2. The material is typically introduced by metering measured quantities into the aeration basins.

Waste Gobbler

AN AWARD-WINNING FORMULATION FROM DRYLET HELPS CLEAN-WATER PLANTS REDUCE BIOSOLIDS VOLUME AND SIGNIFICANTLY REDUCE OPERATING COSTS

By Ted J. Rulseh

Biosolids can be among the valuable resources recovered from clean-water plants. Yet, few operators would object to producing smaller volumes because the processing, handling and hauling cost money.

Drylet, a wastewater remediation company, now offers a solution that, according to engineering reports, can reduce biosolids volumes by as much as half while also reducing chemical and energy costs and labor — all without capital investment.

Aqua Assist Wastewater is a dry, free-flowing powder that delivers high-performing microbes along with a substrate on which they can readily grow, multiply, and accelerate the breakdown of organic material in the waste stream.

The product received a 2017 Innovative Technology Award from the Water Environment Federation. Luka Erceg, Drylet president and CEO, talked about the product in an interview with *Treatment Plant Operator.*

tpo: What are the advantages of reducing the volume of biosolids in treatment plants?

Erceg: Wastewater treatment plants generate large volumes of biosolids, and even though they tend to dewater the material, they still send a lot of waste to landfill or land-application sites. In general, large volumes of biosolids contribute to higher costs for energy, dewatering, odor reduction, and equipment operation and maintenance.

tpo: What benefits have operators observed in plants that use this formulation?

Erceg: What we do is change the microbial environment of the wastewater treatment plant with much more beneficial microbes. So in the end, what comes out of the plant is a much cleaner biosolids that is far easier to certify as Class A. We see reduced fecal coliforms and other toxics and biologics that you don't want if you're doing land application. Another benefit is that plants have seen 25 to 30 percent ammonia and phosphorus reductions because the microbes are using some of those nutrients for their own beneficial growth.

tpo: Where in the process is this product introduced?

Erceg: That depends on the plant configuration. Some plants use it in primary or secondary clarification; more typically, it is introduced in the aeration basins. Sometimes they move upstream into the collections system to increase the residence time for the microbes to work.

tpo: What exactly is the product formulation? Does it use proprietary microbes?

Erceg: What we really offer is a delivery mechanism. Drylet doesn't produce "wonder bugs." We provide microbes that we know through our research to be highly effective for BOD and COD reduction. And we use a nontoxic, inert substrate that is a highly adsorbent material for the microbes to latch on to.

tpo: What is the effect of adding this substrate to the process?

Erceg: It is not unlike having an integrated fixed-film activated sludge plant. As in an IFAS plant, we add media to the aeration process to increase surface area for microbial growth. For example, one 77 mgd facility implemented an IFAS system and introduced 36.3 million square meters of surface area in the process. That's 471.000 square meters per mgd. For that same plant, our solution would introduce 8.5 million square meters — almost 18 times as much — for promoting microbial activity.

tpo: How would you describe the overall look and feel of the Aqua Assist Wastewater product?

Erceg: It looks like table salt. It's a form of silica that is completely safe to use. The granules are irregularly shaped and from 200 to 600 microns in diameter. One kilogram of our product used on a daily basis can remediate up to 50 percent of the solids in a 1 mgd treatment plant.

tpo: What is the nature of the microbes used in the product?

Erceg: We use non-GMO microbes that are all Level 1 for biosafety. They are very common and are indigenous to people. In fact, most of us carry these microbes in our stomachs. We purchase the microbes from producers and load them on the substrate.

> "Drylet doesn't produce 'wonder bugs.' We provide microbes that we know through our research to be highly effective for BOD and COD reduction. And we use a nontoxic, inert substrate that is a highly adsorbent material for the microbes to latch on to."
>
> **LUKA ERCEG**

tpo: What happens when this material is introduced to the process?

Erceg: There is already microbial activity going on in a treatment plant, and you have the good, the bad, and the indifferent microbes in the process. In activated sludge, you basically grow and increase the volume of those microbes to promote waste digestion — that's the operating system of the treatment plant. We change the operating system by increasing the volume of beneficial microbes. We have 100 times the colony-forming units as the same volume of a liquid culture. And because the microbes are loaded on particles, they are protected from protozoa and other microbes that might feed on them. Because we protect them and promote their growth, we enable faster growth in microbial activity.

tpo: Can you provide examples of plants that have used this formulation successfully?

Erceg: We operate in 41 wastewater treatment plants. A plant in Texas used our product to reseed their activated sludge process. Ordinarily, they would have to haul in activated sludge from another plant; then, it would take about three weeks to really get the microbial activity going. They did it in days by adding buckets of our product. At a 4 mgd municipal utility district plant outside Houston, we showed that we could reduce their biosolids by 35 percent. We've seen clients get as high as 53 percent solids reduction.

tpo: How do you approach the offering of this solution to prospective users?

Erceg: We don't simply sell our product as an additive. We focus on outcomes. So, we work with clients on almost a subscription basis, helping them get to the outcomes they desire. Our interest is to see them showing better effluent along with better solids and less solids coming out of the plant. When they start introducing the product, within 30 days the plant will look different. Within 60 days, it will be operating far different than ever before. In 90 days, the benefits should be flowing through to the income statement. tpo

Brandon Pechin takes a reading from an aeration basin with an Orion dissolved oxygen probe (Thermo Fisher Scientific) at the Lander Street Water Renewal Facility in Boise, Idaho.

"What I love about my job is being on the cutting edge — molding the facility and helping to give it direction."
BRANDON PECHIN

A PASSION FOR ANSWERS

BRANDON PECHIN MET NEW SYSTEM STARTUP CHALLENGES AT TWO IDAHO CLEAN-WATER PLANTS WITH HARD WORK AND A THIRST FOR LEARNING

STORY: **Trude Witham** | PHOTOGRAPHY: **Sallie Shatz**

BRANDON PECHIN HAS NEVER SHIED AWAY FROM A CHALLENGE.

For years, he ran his own property maintenance business. He later helped the city of Boise transition from chemical to biological phosphorus removal at the Lander Street Water Renewal Facility. His can-do attitude won him the 2016 Operator of the Year from the Pacific Northwest Clean Water Association.

"Brandon has been a key team member in several changes in treatment systems operated by the city of Boise," says Royce Davis, plant manager, in nominating Pechin. "These included reducing dissolved oxygen in the aeration basins from 2.0 mg/L to 1.0 mg/L and operating the primary clarifier as an activated fermenter. Some of the million kilowatt-hours saved at Lander Street over 12 months related directly to Brandon asking probing questions."

Pechin was promoted in July 2016 and tasked with starting up the city's Dixie Drain phosphorus removal facility, the only one of its kind in the U.S. Today, he is one of two operators there. "What I love about my job is being on the cutting edge — molding the facility and helping to give it direction," he says. "I'm learning more than I normally would because we're on our own out here."

So far, the startup has gone well: The facility is meeting its goal of 750 pounds per month of phosphorus removed, with a potential of 10 tons per year.

Brandon Pechin, Operator 2, Boise, Idaho

AFFINITY FOR OPERATIONS

Pechin came to the clean water profession after eight years in property maintenance. "My business was doing well but taking up all my family time," he recalls. In 2011, he applied for a building maintenance job with Boise, expecting an easy transition. He read the job description but didn't notice the location: "I had no idea it was at the poop plant!"

After a year at Lander Street, he passed the exam for his Wastewater Operator 1 license, hoping to move to an operator position. "I found that I had an affinity for operations," he says. "The diversity was very appealing. In one day, you can help take a pump apart, conduct a microscopic exam, attend engineering meetings, and then do research on how to improve plant effluent."

Four years after receiving his certification, he was hired as an operator and began on-the-job training. "I was lucky that the senior operators were willing to share information," he says. "I tried not to ask the same questions twice so I wouldn't waste their time." He now holds a Level 2 license (4 is the highest) and recently earned an associate degree in biology-natural resources from the College of Western Idaho with a focus on water sciences. That took three years of night classes. Next, comes a test for his Level 4 license.

MAJOR INFLUENCES

Pechin credits his mentors for much of his success. His first mentor was Davis, his current boss: "Royce has been a leader in every sense of the word and continues to push his people to better themselves through education, teamwork and a positive workplace."

Another major influence is process coordinator Ron Gearhart, who helped him understand process biological concepts and see the bigger picture. The plant's operation supervisors make a difference in his life by "being open and sharing their success and mistakes in their careers and even in their personal lives."

Although now responsible for the Dixie Drain facility, Pechin looks back fondly at his 3 1/2 years at Lander Street: "I still think of this place as home." There, he earned the Regional Operator Award from the Pacific Northwest

Clean Water Association's Southwest Idaho Operators Section and later Plant Operator of the Year. "I was surprised that I won since I'm relatively new to wastewater treatment. But I work with great people who all deserve an award."

The 15 mgd design (13 mgd average) activated sludge plant was built in 1948 — one of the first in the state. Lander Street and the 24 mgd (design) West Boise plant treat wastewater for 220,000 people. In 2011, the Lander Street plant implemented chemical phosphorus removal and then replaced it with biological removal in 2015. Equipment incudes:

- Five rectangular primary clarifiers (one used as an activated primary clarifier for creating volatile fatty acids through fermentation)
- Five aeration basins in a step-feed configuration and a dissolved oxygen setpoint of 1.0 mg/L
- Three secondary clarifiers
- UV disinfection (TrojanUV)
- Methane-driven influent pumps (Waukesha Cherry-Burrell, an SPX Brand)
- Chemical feed pumps (Watson-Marlow Fluid Technology Group)
- SCADA system with Wonderware software (Schneider Electric software)

The team at the Lander Street facility includes, from left, Mike Hames, Tom Wylie, Brian Schmidt, Ben Cannady, Dylan Manley, Royce Davis, Ben Blough, Jared Petrie, Shane Curry, Nicholas Solorzano, Dave Slaughter, Leon Cretal, Micky Walker, Nick Angelopoulos, Jay Irby, Rod Rodriguez, Brandon Pechin, Corky Raub and Freddie Babauta. Not shown: Steven Beberness, Ty Waterman, Clint Gearthart, Dale Steele, Mike Duehlmeier, Jesse Hartman and Ryan Ketterling.

Methane from the treatment process heats water in boilers for the process and to fuel two Waukesha engines (GE Energy) that drive the wastewater pumps. Biosolids are digested and pumped seven miles underground to the West Boise plant where they are belt pressed and applied to city-owned cropland. Effluent is discharged to the Boise River.

MANY ACHIEVEMENTS

Pechin's many responsibilities at Lander Street included assisting with special projects such as stress, pilot, and optimization testing of equipment and processes. He also trained and observed new operators.

His greatest challenge was the switch to biological phosphorus removal: "We had a perfectly fine working facility, but we wanted to do better than the minimum standard defined by our permit. We had to justify that we could make biological removal work and prove it at each level, right up to the U.S. EPA. The engineers who came in here said it could never be done without plant modification, but we didn't spend any money the first year. It was all done with two trash pumps."

They spent some money the second year to buy a more permanent pumping setup (a Vaughan chopper pump). "With any new startup, there will always be gremlins," Pechin says. "This was the first of its kind, and we all learned together — myself, the engineers and the contractors. Gearhart, Davis, and the operations staff all helped out, and I feel very grateful to the people I worked with."

In the bio-P process, a primary sludge fermentation process creates volatile fatty acids, leading to the growth of polyphosphate-accumulating organisms. "The PAOs have an affinity for phosphorus in the wastewater," Pechin says. "Through anaerobic and anoxic cycling, the phosphorus is released and a luxury uptake occurs. Then, those PAOs with bellies full of phosphorus are wasted to the digesters."

The city joined an energy cohort with Idaho Power and third-party Cascade Energy: "The third party asked questions like whether we needed to operate all the pumps or whether we could cycle them on and off. We ended up changing the wet-well levels so the pumps wouldn't run as often."

The plant now pumps more with digester gas-powered pumps, running fewer of the Aurora Layne/Verti-Line pumps. In addition, airflow to the aeration basins is regulated more efficiently. "Brandon helped profile the aeration basins and stabilize bio-P," Davis says. "He also helped the plant achieve impressive effluent phosphorus results with drastically reduced chemical consumption." The plant saved more than $200,000 per year in chemical costs.

TAKING A BREAK

When not operating treatment facilities, Brandon Pechin spends as much time as he can with wife, Stacey, and 12-year-old son, Carter. "I am the offensive- and defensive-line coach for Carter's returning championship football team, the Goodwood Outlaws," he says. "So, in a way, I have 22 sons to look after." His son is also on a lacrosse team that travels around the Northwest. The family also enjoys boating, camping, and barbecues with family and friends.

Pechin doesn't get to slow down very often: "My time is maxed out, and some nights, I can barely sleep because my mind won't turn off. For me to improve, I must work harder. What I do doesn't always come easy, so I have to put in the extra time."

His advice to other plant operators? "Commit to your time off. You have to unplug or you will burn out, and then you're only hurting yourself."

"I was lucky that the senior operators were willing to share information. I tried not to ask the same questions twice so I wouldn't waste their time."
BRANDON PECHIN

Brandon Pechin, City of Boise, Idaho

POSITION: | **Operator 2**

EXPERIENCE: | **6 years**

EDUCATION: | **Associate degree in biology-natural resources, College of Western Idaho**

AWARDS: | **2016 Plant Operator of the Year, Pacific Northwest Clean Water Association**

GOAL: | **Help other operators learn about bio-P and plant optimization**

GPS COORDINATES: | **Latitude: 43°38′22.16″N; longitude: 116°14′33.62″W**

Pechin, shown checking the oil of a Power Mizer blower (Spencer Turbine), takes pride in continuous learning and has presented training classes to other operators.

ALWAYS LEARNING

With the success of bio-P, Pechin was ready to start up the 135 mgd Dixie Drain facility at the confluence of the Boise and Snake rivers. The process includes sedimentation, polyaluminum chloride addition and flocculation.

"We divert 128 mgd of agricultural runoff from the Snake River," he says. "Then, we treat it and send it to a 32-million-gallon pond." The newly formed floc settles to the bottom and is dredged and pumped to a drying bed. Evaporation then leaves a clay-like product of aluminum phosphate.

The facility operates May 1 to Sept. 30. The rest of the year, Pechin returns to Lander Street to work on research and run benchtop tests. Working with him at Dixie Drain are Steven Beberness, operator 2, and Dru Smedshammer, mechanic. "I love that I learn something new every day," Pechin says. "In fact, I almost have a fear of not learning." He has learned about the metabolism of microorganisms, how to balance chemical reactions, and the impact of flow rate on receiving water temperature.

He especially enjoyed presenting a training class on wastewater microbiology at the 2016 Southwest Idaho Operators Section conference. He shared his experience researching different organisms and identifying PAOs through staining techniques.

Pechin is glad he chose wastewater treatment. "I can't imagine doing anything else now. Every day I make a positive impact on the community and the environment." For the future, he aims to give back by making information on bio-P available to other operators.

"My goal is to work toward a role that involves more process optimization, research and data collection," he says. "Then, I'll package this information for operators to use. I've learned that there isn't one way of doing something that is absolutely correct. I prefer to see how the pieces fit together and then figure out what works for me. I have a passion for finding answers." tpo

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By Ron Trygar

WASTEWATER

The plant effluent coliform count fails to meet required standards for disinfection. The chlorine residual is normal. Inspection of the disinfectant supplies and equipment reveal no problems. What is the most probable cause of the elevated effluent coliform count?

A. Capacity of chlorinator is too low
B. Too little solids in the effluent
C. Chlorine demand is too high
D. Contact time is too short

ANSWER: D. To effectively kill the coliform bacteria, an adequate dosage of the disinfecting chemical is needed with a long enough contact time. In the case shown above, the chlorine residual is normal and the chlorine supply and equipment are working well. Had the chlorine demand been too high (C), the chlorine residual would not be normal; it would be very low, and that would affect the ability of the chlorine to disinfect. Some state regulatory agencies require specific minimum hydraulic retention times in chlorine contact tanks. For example, Florida Administrative Code requires no less than 15 minutes of contact time at peak hourly flow to ensure effective disinfection of coliform bacteria.

DRINKING WATER

Which condition causes faster formation of total trihalomethane?

A. Low pH and warm water temperature
B. High pH and warm water temperature
C. Low water temperature and high pH
D. High hardness and low water temperature

ANSWER: B. The formation of total trihalomethane is dependent on pH and temperature, among other factors. Trihalomethanes form in water treatment and water distribution systems when organic material containing humic and fulvic acids reacts with free chlorine residual. Free chlorine residual can be in the form of hypochlorous acid (HOCl), the hypochlorite ion (OCl^-), or both. Higher pH levels, over 8.0 for example, tend to favor the formation of the hypochlorite ion over hypochlorous acid. The hypochlorite ion is very reactive with organic acids and can form various combinations of trihalomethane. The four trihalomethanes of concern are chloroform, bromodichloromethane, dibromochloromethane, and bromoform. Warm water temperature will certainly allow faster and more thorough chemical reactions, thereby creating total trihalomethanes faster than in colder water conditions.

ABOUT THE AUTHOR

Ron Trygar, a certified environmental trainer, is the senior training specialist for water and wastewater programs at the University of Florida's TREEO Center. He has worked in the wastewater industry for more than 30 years in a variety of locations and positions. He holds a Florida Class A wastewater treatment operator license and a Florida Class B drinking water operator license. tpo

Beyond Class A

WATER ENVIRONMENT & REUSE FOUNDATION RESEARCH PROJECT LOOKS TO DEFINE AND HELP ENABLE PRODUCTION OF HIGH QUALITY BIOSOLIDS THAT THE PUBLIC WILL READILY ACCEPT AS VALUED PRODUCTS

By Ted J. Rulseh

For years, Class A Exceptional Quality status has been a major goal for clean-water agencies seeking beneficial use of their biosolids.

Class A EQ means the ability to apply biosolids to land and distribute the material to community members essentially with few restrictions. But what happens when, for whatever reason, a biosolids product rated as Class A EQ fails to win acceptance from the public? Stated in another way, what constitutes a High Quality Biosolids product that the general public readily accepts and considers valuable?

Answering that question is the goal of the High Quality Biosolids from Wastewater research project that's being conducted by the Water Environment & Reuse Foundation. Its aims since startup two years ago include defining the criteria that can make biosolids a true high-quality product, documenting the effectiveness of High Quality Biosolids in meeting product requirements, and developing guidance to identify and assess markets for the high-quality materials.

William E. "Bill" Toffey, executive director of the Mid-Atlantic Biosolids Association, is a member of the project team. He talked about the research program and the quest for High Quality Biosolids in an interview with *Treatment Plant Operator.*

tpo: What is the nature of the team working on this research, and what is your role?

Toffey: The lead principal investigators are Trudy Johnston, principal of the Material Matters specialty consulting firm, and Christopher Peot, residuals manager with DC Water. The team includes researchers from Virginia Tech, the University of Maryland, Penn State University and Kansas State University. There is also a group of advisors. As one of the team members, I'm responsible for the communications component of the project.

tpo: Why is there a need for research on High Quality Biosolids?

Toffey: The federal 503 regulations set minimum standards that apply to Class A EQ biosolids, essentially a process for further reducing pathogens, meeting a vector attraction reduction standard, and meeting the higher of two pollutant concentration standards. These standards are designed to protect public health and the environment, but they do not relate to the public acceptability of products used for purposes like landscaping, horticulture and residential gardening. We're trying to develop effective measurement approaches to help wastewater agencies classify and characterize their biosolids products for these uses.

tpo: Aren't there already a number of well-accepted and established biosolids products?

Toffey: There are several such programs, and the classic one is Milwaukee's Milorganite, where they developed demand for the product, branded it and labeled it for specific uses. The other side of the coin is that there is no particular set of standards by which to distinguish products that are as stable and easy to handle as Milorganite. Therefore, agencies seeking to mirror the success of Milorganite have difficulty procuring the needed equipment and designing comparable programs.

tpo: What makes some biosolids products that attain Class A EQ status less than ideal in terms of public acceptance?

Toffey: Their moisture content may be high. They may be lumpy. They may be smelly — that's the biggest issue. We've confirmed that a poorly digested, heat-dried biosolids product has potential to attract flies if it is rewetted. So while drying may yield Class A EQ biosolids, that's not sufficient for creating a product that can be defined as high quality.

tpo: What is the consequence of Class A EQ products that fail to meet the criteria for public acceptance?

Toffey: One problem is that in states where there have been failures to produce biosolids that have public acceptance, regulators are wary of giving the freedom to distribute the product. There is a tendency among those state agencies to still require various steps designed to avoid odor nuisances and public complaints. They may require a state permit, restrictive setbacks, or nutrient management plans. For a wastewater agency that has invested heavily in equipment to achieve Class A EQ, it's disappointing to still have their biosolids regulated in a manner very similar to when they had a Class B material.

> "We've confirmed that a poorly digested, heat-dried biosolids product has potential to attract flies if it is rewetted. So while drying may yield Class A EQ biosolids, that's not sufficient for creating a product that can be defined as high quality."
> **WILLIAM E. "BILL" TOFFEY**

tpo: Is your team taking lessons from agencies that market biosolids successfully?

Toffey: Yes. Tacoma (Washington) TAGRO, for example, is a partnering agency in our project. We examined TAGRO for characteristics that when measured demonstrate suitability and acceptability. Odor is certainly part of that, so we have an odor panel. We also measure emissions by taking gas samples off the product and making objective assessments. In Tacoma, although the material comes out of their digesters in apparent compliance with Class A EQ standards, they nevertheless have additional processing. They mix it with a combination of bark and sand, and they let it cure before they ship it out. That additional processing step causes changes to the biosolids. We're trying to understand what those changes are and how they might apply to other products.

tpo: Is vector attraction a significant issue?

Toffey: Yes. We worked with the research lab of Dr. Ludec Zurek at Kansas State, who is a specialist in entomology and microbiology and does vector attraction reduction studies. He explores the role of houseflies in spreading diseases. He subjected various Class A EQ biosolids to a test of whether they attracted flies. Some products did, and others did not. We're trying to identify the physical characteristics of biosolids to which flies just aren't attracted.

tpo: Based on your investigation, what will it take to produce biosolids that are truly high quality?

Toffey: We've pretty well concluded that some form of digestion results in better products but that some additional step is needed even after anaerobic digestion to reduce the potential for unacceptable odors. That's true even when thermal hydrolysis has been applied as a preprocessing step to digestion. There is just enough lingering protein ready to decompose into odorous compounds so some amount of additional curing or composting is useful.

tpo: So digestion alone doesn't seem to be doing the job when it comes to odor reduction?

Toffey: We're seeing that the amount of volatile solids destruction that occurs during digestion is an important measure in terms of the stability of the final product. To meet national standards, you need to have 38 percent volatile solids destruction, but that is not a high hurdle. We're showing that substantially higher volatile solids destruction is necessary in order to bring the odor potential down to a lower level.

tpo: As a practical matter, to the extent that standards are developed for High Quality Biosolids, how do you see that playing out in terms of compliance?

Toffey: The 503 regulations were fixed back in 1993, and we're stuck with a regulatory system that doesn't easily accommodate change. Instead, I foresee an industry initiative similar to the way the U.S. Composting Council came up with test methods for composting, and the American Biogas Council is developing standards for digestate management. I envision our industry coming together around methods we can deploy on a voluntary basis to take biosolids to a level beyond the 503 regulations. Wastewater facilities would have processing standards enabling them on a consistent basis to deliver a product customers could rely upon, whether they be professional landscapers, companies that make soil products, or residential customers. Everyone in the value chain needs some assurance that the process is under control and reliable.

tpo: Where do High Quality Biosolids fit in the bigger picture in which many agencies still operate successful beneficial use programs with Class B material?

Toffey: There is still a significant role for Class B biosolids cake in the evaluation of options, even for large wastewater systems. The particulars for each city are very different in terms of the amount of agricultural land available, the nature of the wastewater system, and how much room there is at the treatment plant for processing. One thing that's happening is that the gap between creating a Class A and Class B product is not as wide as it once was. As new equipment is introduced for advanced digestion, as competition for thermal hydrolysis rises, and as energy efficiencies are brought into drying technologies, the cost of producing Class A biosolids can come down, and it becomes easier for agencies to go to Class A.

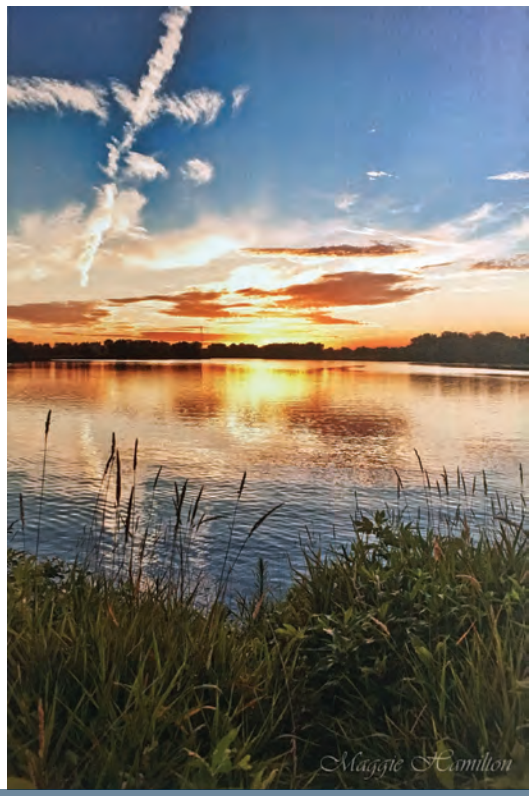
> "I envision our industry coming together around methods we can deploy on a voluntary basis to take biosolids to a level beyond the 503 regulations."
>
> **WILLIAM E. "BILL" TOFFEY**

tpo: What do you see as the ultimate benefit of this research project?

Toffey: I believe that if there were commonly agreed to measurements applied to biosolids that could be shown to produce high-quality products suitable for landscaping and other recycling, everyone involved would benefit. Equipment manufacturers could then design their processes to meet the standards. Regulators could modify their regulations to incorporate the standards. Treatment plants could apply the standards to process control.

tpo: How do you envision the future of biosolids recycling?

Toffey: One area we're looking at is how effective biosolids can be as an ingredient in specialty soils designed to meet urban soil needs. There is growing interest in biosolids-based soil products because they are effective when used in green infrastructure, such as rooftop gardens and stormwater detention basins. In California, there is a trend toward using biosolids to restore fire-ravaged landscapes. To the extent that we can explain the characteristics that make High Quality Biosolids appropriate as ingredients in urban soils, we can help develop demand for those products being created by wastewater agencies. tpo



Pretty Pictures

ART COMPETITIONS AND LANDSCAPES WITH NATIVE PRAIRIE PLANTINGS HELP SPRUCE UP A BRAND-NEW WATER TREATMENT FACILITY IN AMES, IOWA

By Jeff Smith

ABOVE LEFT: Selected by utility employees as the Best in Show was Gary Hoard's photograph on metal, "Leaf on Water." Hoard earned a $400 prize. ABOVE RIGHT: A canvas print, "God Watching Over Ada Hayden," was People's Choice. Artist Maggie Hamilton received a $100 prize.

An August 2017 open house and ribbon-cutting at the 15 mgd Ames (Iowa) Water Treatment Plant welcomed the public and launched a program to include works of art as a part of the plant's decor and culture.

The Water and Pollution Control Department, in partnership with the city and the Ames Public Art Commission, sponsored a contest to solicit artwork to be judged for entry into an exhibit at the ceremony. Artists submitted photos and descriptions of up to three items, each related to the theme of water and no bigger than 48 inches in any dimension.

"We were really pleased with the good mix of media and quality of the artwork that came in," says John Dunn, P.E., department director. "As it got closer to the deadline, it just seemed like the quality of the art kept going up, day after day."

From 92 entries, 17 were selected for exhibition and final judging at the open house. Chosen as Best in Show by vote of utility employees was artist Gary Howard's photograph on metal, "Leaf in Water," which earned him the $400 prize. A canvas print, "God Watching Over Ada Hayden," by Maggie Hamilton won a $100 prize as the People's Choice, selected by attendees.

> "We were really pleased with the good mix of media and quality of the artwork that came in. As it got closer to the deadline, it just seemed like the quality of the art kept going up, day after day."
> **JOHN DUNN, P.E.**

In addition to those items, the Ames Water Treatment Plant purchased a resin and mixed-media piece, "Waterfall," by Megan Endriss as well as Kristen Brown's oil and acrylic, "Undertow."

"All four pieces start a collection that will be added to each year," Dunn says. "Our goal is to build a captivating library of water-themed public art owned by the citizens of Ames." The art will hang in the long white walls of the administration building. Future works will be purchased annually to add to the collection for public viewing.

The public response to the open house and ribbon cutting ceremony was overwhelming, Dunn says. Previous open houses at the old plant usually had about 450 attendees; about 750 were expected at the new plant. "We actually had more than 1,100 signatures in our guest book, and not everyone signed the book," Dunn says. "I would guess at least 1,500 people toured the plant and voted on the artwork."

The new water plant occupies the former site of a federal research center that relocated decades ago. The highly desired property fronts a primary roadway into the city but had been ignored by developers who became dis-

couraged by the bureaucratic challenges of acquiring the property. The city's own efforts to acquire the land spanned more than two years.

Beyond normal landscaping of trees, hedges, flowers and lawn grass, native prairie grasses will be planted over most of the 41-acre site. Students from the Iowa State University landscape architecture classes help design demonstration plots, each created around a U-shaped walking path on a 7-acre portion of the site that separates the plant from its nearest commercial neighbor.

"People can walk the path to see examples of water-efficient, manicured lawns for the urban look; or if they want a more natural landscape look, they can see what that looks like, too," Dunn says. Next to the parking lots, bioretention cells and treatment ponds for runoff will be created.

The old water plant was built in 1927, but after many expansions and updates, a consultant's study determined that it could not accommodate future growth. It will be demolished, and its 9.5 acres will be converted to green space.

Early in the design phase of the new plant, Dunn and water utility staff met with Public Art Commission members to define the art contest. "It was clear that the hallways of a larger new facility were going to seem empty if we didn't have artwork hanging on them," Dunn says.

In the future, during years without open houses, the annual art exhibits will be held at locations such as the botanical gardens. "We are really proud of the whole plant, but the art competition exceeded everything we expected," Dunn says. "Some local artists who just happened to be in town and attended the open house said, 'I'm going to submit something next year.' So, we're looking forward to that." **tpo**

"Waterfall," a mixed media piece by artist Megan Endriss (above), and "Undertow," an oil and acrylic piece by artist Kristen Brown (right), were purchased by the water utility for display in the new administration building.

> "People can walk the path to see examples of water-efficient, manicured lawns for the urban look; or if they want a more natural landscape look, they can see what that looks like, too."
>
> **JOHN DUNN, P.E.**

Staff, consultants and contractors celebrate the startup of the new water treatment plant in Ames, Iowa.

Share Your Ideas

***TPO* welcomes news** about interesting features of your facility's grounds, signage or buildings for future articles in the PlantScapes column. **Send your ideas to editor @tpomag.com or call 877/953-3301.**

Reuse, Recovery and Energy Management

By Craig Mandli

Asset Management

BROWN BEAR R31 SERIES

R31 Series paddle aerator attachments from Brown Bear

R31 Series paddle aerator attachments from Brown Bear can be used for biosolids drying and aeration of compost windrows. It attaches to high-flow skid-steers and high-flow compact track loaders, and it is designed for flows of up to 50 gpm and pressures up to 5,500 psi. It is available with or without the universal skid-steer hitch and in either 8- or 10-foot widths. The 31-inch-diameter unit provides an economical mechanical solution for accelerated air drying on pads and in drying beds, forming windrows, blending bulking agents or additives, pulverizing and aerating, or water mixing for aerobic windrow composting. The rapid handling rate exposes all of the material to oxygen so noxious odors are minimized. Drive to the aerator rotor is through the high-flow hydraulic system of the carrier, via piston motor to a planetary gear reduction and then via an oil bath-lubricated final chain drive. **641-322-4220; www.brownbearcorp.com**

BioCon thermal dryer from Kruger USA

KRUGER USA BIOCON

The BioCon thermal dryer from Kruger USA processes wastewater treatment plant biosolids to reduce costs associated with hauling as well as generate a marketable biosolids end product. It is a dual-belt dryer designed for safe and efficient operation, creating an end product dried to a minimum solids content of 90 percent that meets Class A requirements. The end product is suitable for final disposal via most agricultural routes, providing economic benefits to municipalities. End product characteristics, such as density and size, can be further enhanced depending on the needs of the local nutrient marketers. It reduces the required volume of dried product storage and can be paired with an end product storage system such as a bagging station or silo system. **919-677-8310; www.veoliawatertech.com**

LYSTEK INTERNATIONAL THERMAL HYDROLYSIS SYSTEM

Thermal hydrolysis system from Lystek International

The thermal hydrolysis system from Lystek International reduces costs, volumes, and greenhouse gases by converting municipal and industrial wastewater treatment facilities into resource-recovery centers. This is achieved by transforming organic waste streams into value-added products and services, such as the LysteMize process for optimizing digester performance, reducing volumes, and increasing biogas production; LysteGro, a high-value, nutrient-rich biofertilizer; and LysteCarb, an alternative source of carbon for BNR systems. **888-501-6508; www.lystek.com**

ROTO-MIX INDUSTRIAL COMPOST SERIES

Industrial Compost Series mixers from Roto-Mix

Roto-Mix Industrial Compost Series mixers come with a GeneRation II Staggered Rotor, a rotary design that combines gentle tumbling with quick, complete mixing to ensure rapid decomposition and quality compost. Ingredients are lifted up to the side augers that move the material end to end for a fast, thorough mix. Total movement of material in the mixing chamber eliminates dead spots. The rotor lifts the material past the wedging point of the lower side auger, providing a fluffier mixture while lowering power requirements. A conveyor is used to build windrows or static piles. Mixers are available in 16.7-, 23-, 27.8- and 34.1-cubic-yard capacities as stationary, trailer or truck-mount units. **620-338-0090; www.rotomix.com**

Automation/Optimization

ADEDGE WATER TECHNOLOGIES INGENIUS

InGenius control panels from AdEdge Water Technologies

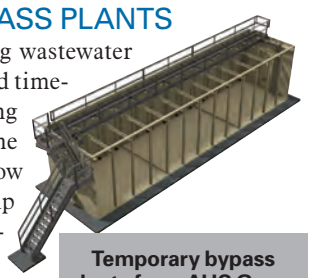
InGenius control panels from AdEdge Water Technologies are custom-engineered programmable logic control panels designed to meet site specifications for monitoring and integrating treatment systems with auxiliary equipment and controls for water systems. The panels integrate the process in one place for safety, monitoring, ease of service, and installation. They are NEMA 1-4, 4X, 12, and 13 certified, and constructed from thermoplastic, stainless steel, painted steel and fiberglass. They have a hand on/off selector, backwash indicator, LED lamps, security key latch, and probe-mounted displays for flow, pH, chlorine, TDS, and turbidity. They include level and relay controls, auxiliary power supplies, power converter (110- to 24-volt or 12-volt and AC to DC), surge protection, Ethernet networking, audible/visual alarm indicators and a SCADA interface. **866-823-3343; www.adedgetech.com**

AquaNereda sludge system from Aqua-Aerobic Systems

AQUA-AEROBIC SYSTEMS AQUANEREDA

The AquaNereda aerobic granular sludge system from Aqua-Aerobic Systems replicates the same effluent quality as an enhanced BNR facility but without the use of chemicals. The reduced footprint and low energy requirement of the process provides an alternative for high-performance plants. The biological treatment technology purifies water based on bacteria growing the compact granules. **800-940-5008; www.aqua-aerobic.com**

AUC GROUP TEMPORARY BYPASS PLANTS



Temporary bypass plants from AUC Group

Major repairs or upgrades to existing wastewater treatment plants can be difficult, costly and time-sensitive. Treating the existing flow during repairs or upgrades is a critical aspect of the procedure. In most cases, wastewater flow cannot be stopped or diverted. AUC Group offers a fleet of portable, modular components prepared to serve temporary wastewater treatment requirements. It is designed

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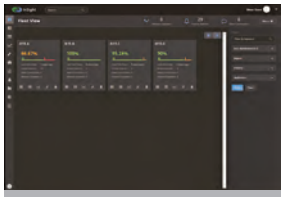
to treat flows up to 1,000,000 gpd. It allows communities to maintain continuity of wastewater treatment service; supports rapid deployment and demobilization services; and offers a wide variety of treatment options, including clarifiers, aeration basins, digester basins, and disinfection basins. **713-983-3255; www.aucgrouplp.com**

GE WATER & PROCESS TECHNOLOGIES INSIGHT

InSight from GE Water & Process Technologies is a next-generation asset performance management solution that combines advanced data and analytics to help water treatment professionals optimize asset reliability and availability, enhance productivity, and maximize profitability. It uses multiple sources of data — from manual data entry to automatic data collection through wireless sensors and integrated control systems — to provide a complete digital picture of an operation. Once the data is captured, operators can visualize, diagnose, alert and report on a wide array of information at a site level or across an entire enterprise. Integrations with critical business systems, like ERP and service management software, help further streamline and automate plant operations. Users can benefit from enhanced visibility of assets and interdependencies, deeper insights into key performance indicators, lowered maintenance costs and extended equipment life, and reduced unplanned downtime. **866-439-2837; www.gewater.com**



InSight from GE Water & Process Technologies

KAESER COMPRESSORS SIGMA AIR MANAGER 4.0

The SAM 4.0 from Kaeser Compressors brings the Internet of Things to industrial plants with its adaptive control, data storage, analysis, and predictive maintenance capabilities while ensuring a reliable, consistent supply of compressed air. It offers complete compressed-air system management by tying compressors, blowers, or vacuum units together into a secure Sigma Network. With 3Dadvanced Control, it continuously analyzes the relationship between various parameters and proactively calculates the optimum combination to achieve optimum efficiency. Built-in maintenance reminders and messaging capabilities enable predictive maintenance. With its user-friendly, 12-inch, color touch screen, it shows at a glance the operating status, pressure history, flow, power consumption and error messages in real time. Advanced networking capabilities mean data can be accessed anytime, anywhere. **866-516-6888; www.us.kaeser.com**

SAM 4.0 air manager from Kaeser Compressors

KSB SES SYSTEM EFFICIENCY SERVICE

SES System Efficiency Service from KSB can show operators ways to increase the energy efficiency of pump systems and prolong their service lives. Whatever the application is in energy, industry, water or wastewater, by recording extensive measurement data, it is possible to evaluate the operation of a system and identify potential savings as well as any causes of damage. Regardless of the installation type and manufacturer, the service assesses the operating range of pumps from ratings of 30 kW. It offers recording of process variables and vibration levels through on-site measurements, including pressure, rotational frequency, fluid and bearing temperature, analog signals to 0/4-20mA, and vibration. It helps determine the effective power, performs frequency analyses to identify causes of damage, and reports and presents findings, including an action plan and profitability analysis. **804-222-1818; www.ksbusa.com**

SES System Efficiency Service from KSB

Biogas

GEOMEMBRANE TECHNOLOGIES GAS COLLECTION COVERS

Geomembrane Technologies custom-designs, fabricates and installs gas collection covers to capture biogas from the anaerobic digestion process. The biogas can be converted to generate process heat or electricity, helping offset energy costs. They fit tanks and lagoons of all sizes. These durable, gastight covers collect biogas while containing foul odors from wastewater treatment. The covers are also safe to walk on, and the insulated option provides additional buoyancy and helps maintain consistent temperatures. The cover also helps minimize greenhouse gases. They are constructed with high-quality, specialized material and last upward of 20 years. **855-484-4630; www.gticovers.com**

Gas collection covers from Geomembrane Technologies

Double Membrane Biogas Holder from JDV Equipment

JDV EQUIPMENT DOUBLE MEMBRANE BIOGAS HOLDER

The Double Membrane Biogas Holder from JDV Equipment is easy to install, has low upfront capital costs and requires low operating capital. Its design allows for variable biogas storage within the inner membrane at constant pressure during gas production and utilization, while the air-inflated outer membrane provides gas pressure and protection. The outer membrane is constructed of a high-tech, cross-woven fabric that's coated with PVC- and UV-ray protection, proven to endure the weather elements. Sensors monitor the volume of gas present, giving operators full control of optimizing the utilization of biogas to feed generators and/or heating systems. Storing digester biogas can eliminate flaming from the digester, and it can help reduce or completely eliminate the need for electric grid power when generators and/or hot-water boilers are incorporated into the facility design. **973-366-6556; www.jdvequipment.com**

Boiler

WALKER PROCESS EQUIPMENT, A DIV. OF MCNISH CORP., SCOTCH MARINE BOILER

Scotch Marine fire-tube type boilers from Walker Process Equipment, A Div. of McNish Corp., employ an efficient, forced-draft, dual-fuel burner system that uses digester gas as the primary fuel and can use either natural gas, propane, or fuel oil as the alternate

Scotch Marine boilers from Walker Process Equipment, A Div. of McNish Corp.

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fuel if digester gas pressure is low or not available. They are supplied with a complete electrical control system that includes a modulating control system that reduces the thermal shock on the boiler that otherwise occurs with an on/off control system. They are constructed according to the ASME Boiler and Pressure Vessel Code, Section IV and inspected by an independent, qualified inspector and stamped with the ASME H designation. Each unit is shop-assembled and thoroughly tested prior to shipment. **630-892-7921; www.walker-process.com**

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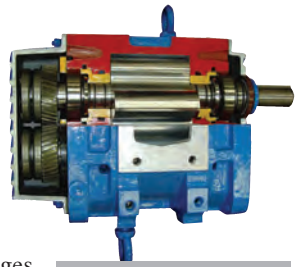
BOERGER BLUELINE ROTARY LOBE PUMP

The BLUEline Rotary Lobe Pump from Boerger is a self-priming, valveless, positive displacement pump used for the conveyance of viscous and abrasive materials. There are 21 pump models in six series with pulsation-free operation, fully reversible rotation, dry-run capabilities and flow rates up to 7,500 gpm. The pumps are stable and wear-resistant with a maintenance-in-place design that allows for all wetted parts to be easily replaced through the front cover without the removal of pipe or drive systems. **612-435-7300; www.boerger.com**

EURUS BLOWER ZG



ZG blowers from Eurus Blower

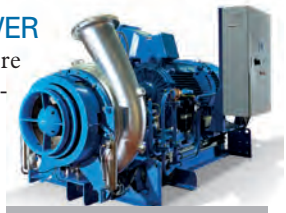
ZG tri-lobe aeration blowers for MBBR, biosolids and/or equalization tanks from Eurus Blower are rated to 15 psig and flows to 6,000 cfm. They have integral-shaft ductile iron impellers, dual-splash lubrication, oversized roller bearings, piston ring air seals, Viton lip seals, as well as low vibration and noise characteristics. Packages have an integrated intake filter/silencer with washable filter media, heavy-duty base/integrated discharge silencer, vibration dampers, OSHA guard and a V-belt drive with auto belt tensioner. Options include motors, check valves, safety valves, flexible connectors and sound enclosures. **630-221-8282; www.eurusblower.com**

ReliaPrime emergency bypass station from Gorman-Rupp

GORMAN-RUPP RELIAPRIME

Designed to deliver all the benefits of sound-attenuated silent pumps, the ReliaPrime emergency bypass station from Gorman-Rupp operates on natural gas. The engine-driven pump comes with autostart and level controls that allow it to start and stop in response to the liquid level. The unit includes a 3-inch Ultra V Series pump capable of passing a 3-inch spherical solid, and it offers a soundproof, lightweight aluminum enclosure with lockable door panels that can be removed for maintenance of the pump or engine. The unit is a complete backup package that's ready for hookup for emergencies and power outages, primary pump repair, and additional pumping capacity. **419-755-1011; www.grpumps.com**

HOWDEN ROOTS SG TURBO BLOWER



SG Turbo Blowers from Howden Roots

SG Turbo Blowers from Howden Roots are designed to provide plant operators with efficiency across the actual operating range. Exceptional turndown capability is built in as standard to ensure that when plants are operating at low load, the efficiency of the aeration system is unaffected. They are available in a choice of 15 frame sizes with a capacity flow of up to 80,000 cfm. With achievable efficiency levels exceeding 87 percent, the blowers maintain effectiveness through the full flow range, including the key 60 to 80 percent window and dropping to as low as 40 percent capacity when required. **800-557-6687; www.howdenroots.com**

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Conditioning pump from Vaughan

The Vaughan conditioning pump is a Vaughan submersible chopper pump mounted on a portable stand that's fitted with a high-velocity mixing nozzle. The unit recirculates the contents of the wet well, chopping and mixing to produce a homogeneous mixture that is more easily pumped out. Floating mats are removed, and solids accumulated on the floor are resuspended. The pump is mounted on a portable stand, easily used in multiple applications at a single job site, facility or municipality. **888-249-2467; www.chopperpumps.com** tpo

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- ❒ Kruger USA BioCon thermal dryer
- ❒ Lystek International thermal hydrolysis system
- ❒ Roto-Mix Industrial Compost Series mixers

Automation/Optimization
- ❒ AdEdge Water Technologies InGenius control panels
- ❒ Aqua-Aerobic Systems AquaNereda sludge system
- ❒ AUC Group temporary bypass plants
- ❒ GE Water & Process Technologies InSight
- ❒ Kaeser Compressors SAM 4.0 air manager
- ❒ KSB SES System Efficiency Service

Biogas
- ❒ Geomembrane Technologies gas collection covers
- ❒ JDV Equipment Double Membrane Biogas Holder

Boiler
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FREE INFO ON THESE PRODUCTS — RETURN FOLLOWING FORM

By Craig Mandli

Treatment plant uses microturbines to generate heat and power

Problem

In upgrading the boiler used to heat anaerobic digesters at the 15 mgd Sheboygan (Wisconsin) Regional Wastewater Treatment Plant, the plant's superintendent wanted to solve two problems at once: use excess biogas and reduce electricity.

Solution

The plant ultimately in-stalled 10 30 kW **C30 combined heat and power microturbines** from **Capstone Turbine.** The city agreed to purchase all the electricity produced and provide all the needed biogas fuel.

RESULT:

The microturbines generate up to 2,300 MWh per year. The exhaust heat maintains the proper digester temperature and heats the plant buildings in winter. The microturbines can generate 1 million Btu/h, amounting to 73,000 therms per year — enough to heat 60 homes. **818-734-5300; www.capstoneturbine.com.**

City uses digesters to rid lift stations of hydrogen sulfide

Problem

The city of Taylorville (Illinois) Street/Sewer Department faced issues with hydrogen sulfide in three lift stations and with biofilms further downstream in the delivery piping to the wastewater treatment plant. The discharge manhole H_2S readings were over 700 ppm, and local residents complained of odors.

Solution

The city purchased three **Little John Digesters** from **DO2E Wastewater Treatment.** After the first month of running the digesters with ozone, the average H_2S levels at the three lift stations were 42 ppm.

RESULT:

"These digesters have made a tremendous difference not only in odor control, but also in heavy matting and FOG removal," says Richard Wiseman, street and sewer superintendent. "The FOG and heavy matting have never reformed in the stations nor down the collection lines. We have received no further complaints." **251-937-8200; www.do2e.com.**

Shredder used on university food court waste increases biogas production

Problem

The West Lafayette (Indiana) Wastewater Treatment Plant uses anaerobic digestion and wanted to increase biogas production after rehabilitation of aging digesters.

Solution

Dave Henderson, plant operator, read about Purdue University's food court sending 20 tons of food waste a month to landfills. The plant team and the university work together using a **4-SHRED-H food waste shredder** from **JWC Environmental.** The high-strength organic material is macerated and fed to digesters to produce biogas for electricity generation.

RESULT:

The digestion process aided by the shredder produces around 37 cfm of biogas. The plant generates 15 percent of its electricity — 728,000 kWh — for $50,000 in annual savings; Purdue University saved money by reducing landfilling. **800-331-2277; www.jwce.com.**

Twin-auger mixer assists city in composting biosolids

Problem

Kodiak, Alaska, could not landfill its biosolids or efficiently compost the materials because mixing conditions were suboptimal.

Solution

The city purchased a **Knight VT 144 Vertical Maxx stationary mixer** from **Kuhn North America** to help better blend biosolids and wood-chips for composting. Kuhn also supplied a belt conveyor that moves discharged compost to a collection bunker.

RESULT:

"The most obvious benefit of using the mixer is how fast we can mix and make compost," says Steve Gauna, lead compost operator. The process creates an ideal mix of biosolids and bulking agent to compost in 40 minutes versus 120 minutes previously. Labor cost per ton has been reduced significantly. **608-897-2131; www.kuhnnorthamerica.com.**

Pump is a fit in challenging install

Problem

The water treatment plant at a southern Florida municipality faced a challenge replacing a pump in tight quarters through a window.

Solution

Ruthman supplied a **Deming Model 24HH-2C** 24-inch-diameter, 200 hp **pump** measuring 152 inches. It was dropped in three pieces into a hole 90 inches tall from the pad to ceiling. The pump delivers 9,360 gpm at 55 inches total dynamic head.

RESULT:

The installation was successful. The pump ran so smoothly and quietly that "you could set a penny on the edge and it would not move," says Dan Torongo of Process Systems. **859-824-3100; www.ruthmancompanies.com.** tpo

1. AGRU AMERICA POLYETHYLENE PIPES AND FITTINGS

Agru America's pipe and fittings are made from polyethylene 100/4710 for durability and corrosion/abrasion resistance. The products available include large-diameter pipe, HDPE pipe fittings, Mine-Line pipes, electrofusion fittings and equipment, ball valves, metric solutions and semifinished products. **800-373-2478; www.agruamerica.com**

2. WALCHEM W900 SERIES CONTROLLER

The Walchem W900 Series controller gives complete control of chemical metering pumps and valves in a broad range of water treatment applications. With easy, icon-based programming on the large touch-screen display, the W900 can be configured to control multiple outputs using one of many pre-engineered algorithms. Four I/O slots permit flexibility to utilize almost any type of sensor, including pH/ORP, conductivity, disinfection, fluorescence, temperature, level, and flow. Internet connectivity allows for control via remote access. 5**08-429-1110; www.walchem.com**

3. HAYWARD FLOW CONTROL TBH SERIES BALL VALVE

The Hayward Flow Control TBH Series True Union ball valve with System2 Sealing Technology delivers extended lifetime performance versus conventional valves. The System2 technology incorporates a floating seat design, utilizing the valve's upstream seat as a backup to the downstream seat while enhancing the sealing of the downstream seat. **888-429-4635; www.haywardflowcontrol.com**

4. PROCOMSOL HM-BLE HART MODEM

The HM-BLE HART Modem from ProComSol contains a rechargeable lithium-ion battery that lasts for days on a single charge. The low-energy features of the Bluetooth 4.0 standard also allow for longer device life between charges. The connect between the modem and the handheld device is wireless, so there are no wires to trip over and it can be used to configure hard-to-reach HART devices safely from the ground. **216-221-1550; www.procomsol.com**

5. ENDRESS+HAUSER MICROPILOT FMR6X RADAR LEVEL INSTRUMENT

Endress+Hauser's Micropilot FMR6x 80 GHz free space radar level instrument is suitable for use in tanks and silos with complex geometries, obstacles, baffles and/or nozzles. Its small beam angle of 3 degrees provides level measurement at distances up to 410 feet with accuracy up to 1 mm. Outputs include 4-20mA with HART and an optional open collector switch output or two 4-20mA outputs. The instrument's antenna is designed to resist sticky buildup and condensation; built-in mapping performs false echo suppression, easing commissioning. The FMR6x is suitable for use in SIL 2 and SIL 3 hazardous locations. **888-363-7377; www.us.endress.com**

6. GODWIN PUMPS, A XYLEM BRAND, NC150S DRI-PRIME PUMP

The NC150S diesel dewatering pump from Xylem features Godwin Field Smart Technology that provides remote monitoring and control of

FREE INFO ON THESE PRODUCTS — RETURN FOLLOWING FORM

wastewater:
product spotlight

A modular grinding solution

By Craig Mandli

NETZSCH Pumps North America offers the N.Mac Twin Shaft Grinder

Because today's waste streams are filled with wipes and other stringy solids, strong grinders are an essential part of most treatment plant headworks. These grinders can often be expensive and difficult to maintain, though. **NETZSCH Pumps North America** offers the **N.Mac Twin Shaft Grinder** to ease those concerns.

The N.Mac is built with modular assemblies and interchangeable components that facilitate universal parts servicing. According to Jeffrey Bye, director of customer service, engineering, and projects for NETZSCH Pumps North America, those features came at the request of customers.

"We benchmarked the competitor's products and then made improvements on those basic designs," he says. "We developed our grinders to have modular cartridges that are easy to work on for simple, fast servicing."

The N.Mac is designed to fragment a variety of materials and is ideal for wastewater treatment. Available in both channel and inline (flanged) housing construction, the N.Mac can be installed into effluent channels or upstream from a pump.

"These grinders are employed on the influent side of wastewater treatment plants and in pump stations to grind debris before entering the pumping process," Bye says. "They can also be used for accepting and processing at biosolids and FOG stations."

They offer quenched lubricated mechanical seals for dry running capability. For higher flow applications, the grinders can operate in parallel, enabling partial servicing while in operation. For convenience, they can be mounted upstream before the pump (inline model) or on top of the auger (channel model). They can also be stacked for successive particle size reduction. An optional control panel is equipped with an autoreverse feature to retract jammed media. Dual recessed and self-collapsing lifting tabs make pullout for servicing simple.

Models feature from one to six cutter cartridges per shaft. Cartridges come preassembled with worry-free, prestacked spacers and blades, and they are available in different materials depending on the application. The cycloidal gearbox is maintenance-free for up to two years. The grinder comes standard with different cutting gear sizes for different shaft speeds, resulting in better grabbing and grinding. The unit officially launched in North America in fall 2017, but it has been in service in Brazil for two years.

"There has been very positive acceptance to this product," Bye says. "We are seeing very high customer satisfaction in current field installations." **610-363-8010; www.pumps.netzsch.com**

the pump from any smartphone, tablet or desktop computer. Cellular and satellite connectivity and GPS enable the tracking, monitoring and control of the pump in real time, wherever it is located. The pump also features Flygt N-Technology for self-cleaning reliability and sustained hydraulic efficiency. A sight glass makes it easy to tell when oil needs replacing, and a 25 percent increase in pump shaft diameter enables longer pump life. **856-628-6294; www.xyleminc.com**

7. SENSOREX SENSOPRO CONDUCTIVITY MONITORING SYSTEM

The SensoPro Toroidal Conductivity Monitoring System from Sensorex combines a TCS3020 probe with the new EX2000RS transmitter, featuring Modbus communication for robust system integration. The TCS3020 probe used in the SensoPro system measures conductivity using toroidal sensing technology. These sensors don't cause polarization or become fouled, and they rarely require maintenance. The transmitter includes one analog output and can monitor conductivity, percent concentration, total dissolved solids, and salinity. **714-895-4344; www.sensorex.com**

8. BADGER METER DYNASONICS ISONIC 4000 FLOWMETER

Badger Meter's Dynasonics iSonic 4000 flowmeter accurately measures flow rate and total volume of water and other liquids flowing through weirs and flumes. It employs a noncontact ultrasonic level sensor to measure the water level and is programmed using three front-panel push buttons, offering a wide variety of primary flow elements. It interfaces with most SCADA systems and sends level, flow rate and total volume information over Modbus RTU. A rugged, powder-coated, aluminum enclosure protects internal components and extends asset life. **800-876-3837; www.badgermeter.com**

9. A.Y. MCDONALD 8300 E-SERIES JET PUMP

The all iron 8300 E-Series jet pump from A.Y. McDonald is offered in 1/2 through 1 1/2 hp with flows up to 32 gpm. It has a 1-inch outlet and 1 1/4-inch inlet, contains an easy switch between 115 and 230 volts, and has a 304 stainless steel insert on the impeller. **800-292-2737; www.aymcdonald.com**

10. LUDECA EASY-LASER XT660 BELT ALIGNMENT SYSTEM

The LUDECA Easy-Laser XT660 laser shaft alignment system offers dot laser measurement technology, allowing for measurements on larger machines and over longer distances. Advanced measurement capabilities, such as continuous sweep and multipoint, are now available. The rugged measuring units with integrated Bluetooth wireless have operating times up to 24 hours. Custom PDF alignment reports can be exported to a USB flash drive or via Wi-Fi directly to email for documentation. **305-591-8935; www.ludeca.com** tpo

(continued)

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water:
product spotlight

Predicting equipment failure

By Ted J. Rulseh

FORECYTE from Nidec Motor

Equipment failure at a water treatment plant often leads to big costs, not to mention stress on the operations staff.

Nidec Motor's FORECYTE stand-alone remote monitoring platform takes that stress off, as battery-powered wireless sensors are used to measure equipment vibration and temperature. This allows operators to transition from reactive/preventive maintenance over to predictive maintenance since it predicts when equipment failure might be imminent, allowing operators to use and maintain their equipment more effectively.

The FORECYTE device attaches to equipment magnetically; collects continuous, real-time data; and enables operators to visualize deteriorating equipment health. The data is sent wirelessly from the sensor to a gateway and from there through either Ethernet, Wi-Fi, or cellular to a cloud portal where it is aggregated, stored, analyzed, and visualized using a web interface. Users can access the data anytime from anywhere using a browser on a web-enabled device.

Thomas Schardt, Nidec Motor senior director of Internet of Things, or IoT, says that innovation in low-cost sensor, communication, and analytical technology is driving demand for remote wireless condition monitoring in multiple industries, including water and wastewater, manufacturing, and food and beverage.

"End users expect access to real-time data at a much lower cost compared to traditional route-based monitoring," Schardt says. "There is a global trend for companies to use IoT to gather real-time data and achieve quantifiable results that deliver better performance and cost savings."

The monitoring technology can be enhanced with predictive analytics. Using algorithms, the monitoring data can be modeled to identify patterns that help users intervene on imminent breakdowns and predict future events. Additional sensors and analytics being developed by Nidec Motor will empower users to make smarter, performance-based equipment decisions, ultimately reducing operating costs and extending equipment life.

"We recognize an increasing demand to monitor and assess machine health condition in order to avoid unexpected downtimes and loss of production time," Schardt says.

Using the information, operators can identify and address failing equipment early and schedule the ideal time to perform service. The FORECYTE technology helps users identify the root cause of problems and define the timing and scope for predictive maintenance. The platform is scalable and can be integrated with SCADA and legacy systems.

888-637-7333; www.nidec-motor.com

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- ❒ **4.** ProComSol HM-BLE HART Modem
- ❒ **5.** Endress+Hauser Micropilot FMR6x radar level instrument
- ❒ **6.** Godwin Pumps, a Xylem brand, NC150S Dri-Prime pump
- ❒ **7.** Sensorex SensoPro Conductivity Monitoring System
- ❒ **8.** Badger Meter Dynasonics iSonic 4000 flowmeter
- ❒ **9.** A.Y. McDonald 8300 E-Series jet pump
- ❒ **10.** LUDECA Easy-Laser XT660 belt alignment system
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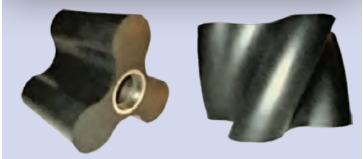
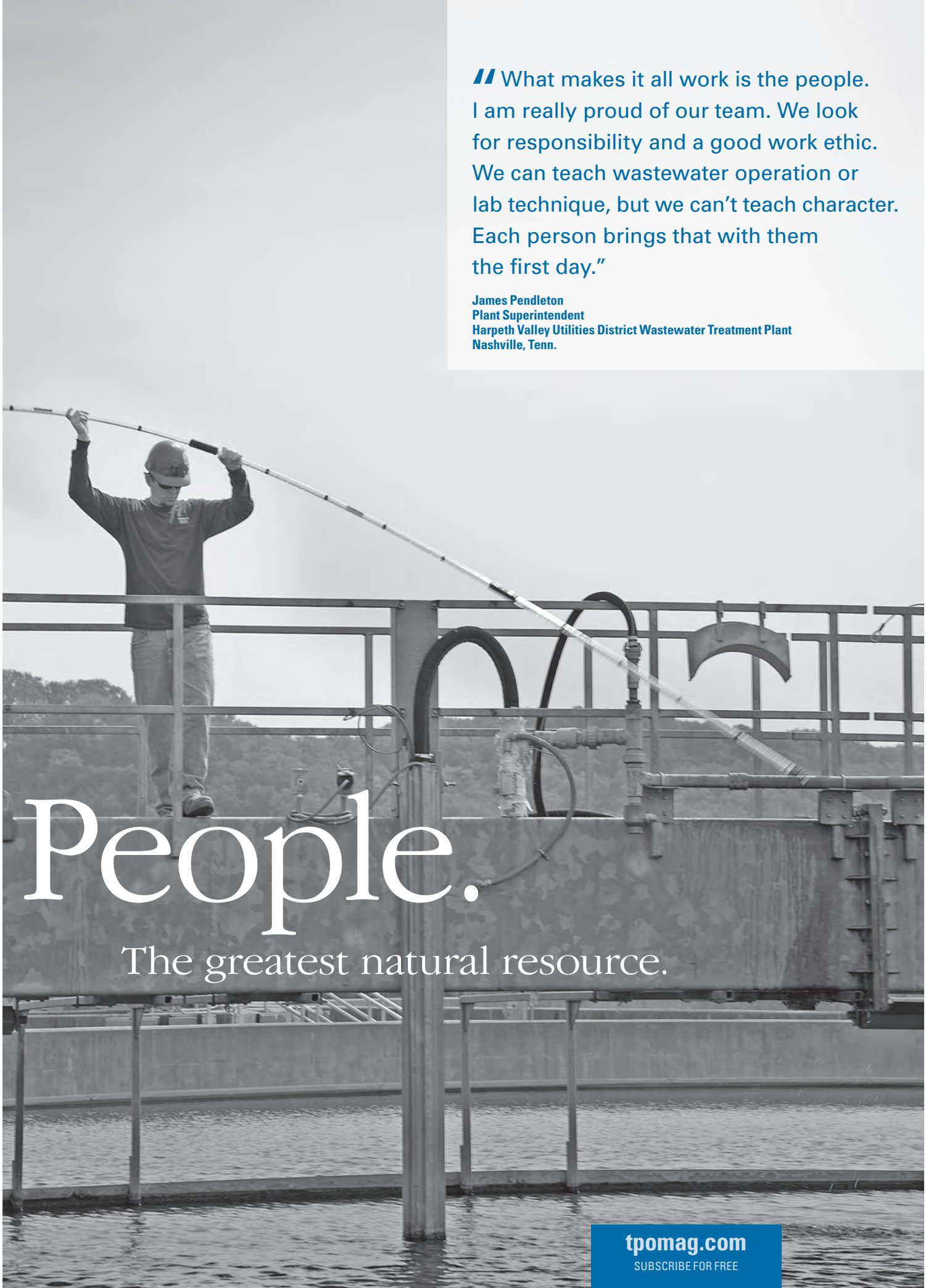
AdEdge Water Technologies joins Endress+Hauser OEM program

Endress+Hauser announced AdEdge Water Technologies joined its OEM Business Partner Program. As part of the OEM Business Partner Program, AdEdge Water Technologies will develop its specifications around Endress+Hauser technologies and provide those technologies across AdEdge Water Technologies solutions sets.

Aqua-Aerobic Systems partners with Pinnacle Ozone Solutions

Aqua-Aerobic Systems and Pinnacle Ozone Solutions have signed an agreement that confirms Aqua-Aerobic Systems as the exclusive municipal distributor for Pinnacle Ozone Solutions' ozone generation systems. The products will be marketed under the Aqua ElectrOzone M-Series brand. tpo





"What makes it all work is the people. I am really proud of our team. We look for responsibility and a good work ethic. We can teach wastewater operation or lab technique, but we can't teach character. Each person brings that with them the first day."

James Pendleton
Plant Superintendent
Harpeth Valley Utilities District Wastewater Treatment Plant
Nashville, Tenn.

worth noting

people/awards

For the ninth straight year, the city of **Forks (Washington) Wastewater Treatment Plant** received an Outstanding Performance Award from the Washington State Department of Ecology.

ADI Systems received the New Brunswick Bioscience Achievement Award from BioNB, New Brunswick's bioscience agency. The company provides wastewater treatment and waste-to-energy technologies for industrial processors.

The town of **Greeneville, Tennessee,** received a $525,000 Community Development Block Grant for updating its wastewater treatment plant from chlorine to UV disinfection.

Dragoon Brewery in Tucson, Arizona, won the Arizona Pure Water Brew Challenge by making the best-tasting beer using recycled wastewater. The event included nearly 30 craft breweries from throughout the state.

The city of **Williston, North Dakota,** held a ribbon-cutting ceremony for its new $105 million Water Resource Recovery Facility.

For the fourth straight year, the **Colville (Washington) Wastewater Treatment Plant** received an Outstanding Performance Award from the Washington State Department of Ecology.

Joe Hudson, water resources director from the city of Statesville, North Carolina, retired effective Dec. 31 after 31 years, starting with the city in 1986.

The **Western Regional Water Reclamation Facility** in Petersburg, Kentucky, received the Kentucky Infrastructure Authority's H2O Award.

The city of **Prineville, Oregon,** received a 2017 Award for Excellence from the League of Oregon Cities for a wetlands project that expanded its wastewater capacity while lowering residential and business system development charges, stabilizing rates, improving the Crooked River, and creating a new public trail system and gathering place.

Kam Reeves, Wayne State College Class of 1979, received the school's Alumni Service Award. Reeves has served as the department head and superintendent for the Ottumwa (Iowa) Water Pollution Control Facility since 2013.

Yabing Nollet, Rebecca Alm, Adam Sealock and **George Sprouse** received the Eddy Wastewater Principles/Processes Medal for their study, "Investigations into Improving Dewaterability at a Bio-P/Anaerobic Digestion Plant." They work for the Metropolitan Council Environmental Services division at the Pig's Eye Treatment Facility in St. Paul, Minnesota.

The **White Mountain Summer Homes Water Improvement District** was named Water System of the Year 2017 by the Rural Water Association of Arizona.

John "Red" Lipscomb, chief water and wastewater operator in Parsons, West Virginia, received the 2017 Water Operator of the Year award from the West Virginia Rural Water Association.

For the seventh straight year, the **Wilkesboro (North Carolina) Water Filtration Plant** received a North Carolina Area Wide Optimization Award from the state Department of Environmental Quality.

The **Buffalo Pound Water Treatment Plant** won the taste-test competition at the annual Western Canada Water and Wastewater Association conference in Saskatoon, Saskatchewan.

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