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HOW WE DO IT:
Flushing a Lake Michigan water intake | 30

SUSTAINABLE OPERATIONS:
Small but profitable solar energy | 20

IN MY WORDS:
A new operator training resource | 42

Ronald Mobley
Chief Operator
Central City, Ky.

Creative Problem-Solving

A KENTUCKY PLANT MEETS THE CHALLENGES OF AN AGING WORKFORCE AND EXCESS CAPACITY | 36

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contents

January 2019

top performers

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» Let's Be Clear: A resource for young professionals » Top Performers: Glasgow (Kentucky) Wastewater Treatment Plant | Tiffini Adams, Snyderville Basin Water Reclamation District, Park City, Utah | King (North Carolina) Water Treatment Plant | Sangamon County (Illinois) Wastewater Reclamation District » How We Do It: Lime stabilization in Russellville, Arkansas » Sustainable Operations: Utilizing brewery waste in Boulder, Colorado » In My Words: A pilot test for direct potable water reuse » PlantScapes: Rain gardens and bioswales in Fayetteville, Arkansas » Hearts and Minds: San Antonio Confluence Conference for youth » Technology Deep Dive: A new compact membrane bioreactor

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They're Never Too Young

MY GRANDSON TUCKER IS 6 YEARS OLD. HE ASKED ME TO TAKE HIM TO THE 'WATER WASTING TREATMENT PLANT.' HOW COULD I SAY NO?

By Ted J. Rulseh, Editor

On a visit with the grandsons last summer, 6-year-old Tucker out of the blue began talking about the "water wasting treatment plant." Apparently he had learned about such things on an episode of a *Curious George* TV program.

"Don't you mean wastewater treatment plant?" I say.

"No, water wasting treatment plant," Tucker insists.

All right then. "Well," I say, "did you know you have a water wasting treatment plant right here in town?" (That's Plymouth, Wisconsin.)

Tucker's eyes light up. "Can I go see it?"

"Yes," I say. "I'll take you there in the morning. I know the man who runs it, and he might give you a tour." Now Tucker is excited. For the next hour, we talk about water wasting treatment plants and look at treatment videos on my smartphone.

The next morning, the first words from Tucker are, "Can we go see the water wasting treatment plant?" And so I buckle Tucker and his 4-year-old brother Perrin into their car seats and drive them to the plant, about a mile outside Plymouth along the Mullet River. On the way, I make sure to say that under the very streets we are driving lay the pipes taking sewage to the plant.

In the office, we are greeted by Chris Duwe, lead operator, who kindly gives us permission to walk around the grounds, with just an admonition to "be safe." I took the boys first to the primary clarifiers. Now, how do you explain wastewater treatment to kids this young? As simply as possible. So, I tell Tucker, "In these tanks, the poop sinks down to the bottom, and then the water flows out over the top."

The next stop is at the aeration basins, where we meet Tyler Wollersheim, one of two operators on the team, the other being Mike Hoefler. I introduce us and ask Tyler to explain what is happening in the swirling brown water full of tiny bubbles. "Here we pump in air," he says, "so the little bugs can breathe and eat up the bad stuff that's left in the water."

"You can only see them through a microscope," Tucker observes — something he had learned from me the evening before.

And Tyler responds, "He'll make a good operator someday."

Next I take the boys to the final clarifiers and tell how the bugs sink to the bottom and the clean water flows out the top. I also show them the Capstone Turbine Corp. microturbines that burn the plant's biogas. Nearby,

Tucker Kulow (right) and brother Perrin.

Tucker left knowing that the "water wasting treatment plant" makes three things: clean water, fertilizer, and electricity. For a 6-year-old, that's enough.

Tucker spies, and is fascinated with, the "sewage truck" that applies biosolids to farm fields. Perrin notes, "It smells bad."

At that point, Mike Penkwitz, plant superintendent, came out to greet us. I had met Mike at an operator conference in Plymouth about a year earlier. He shows the boys the tertiary filter building, the lab, the SCADA system and a few other highlights.

Tucker is attentive throughout. Mike tells Tucker that if not for the treatment plant, all the sewage would go into the Mullet River and people would get sick. "And the fish would be harmed," Tucker adds. So true.

He left with that bit of knowledge — and also that the "water wasting treatment plant" makes three things: clean water, fertilizer and electricity. For a 6-year-old, that's enough. In fact, I'm sure it's more than many adults know. Tucker couldn't wait to tell his mom and dad what he had seen, and he made sure to mention that, "The man with the white hair showed us around."

The lesson: It's never too early to teach kids about water and wastewater. Tucker was fascinated, Perrin mildly entertained. They may soon forget what they learned, but as Mike Penkwitz told me, they can always come back for a refresher. tpo

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RECLAIMED WASTEWATER

Key to Conservation

As the wastewater collection and treatment agency as well as the water distribution agency for its service area, the Orange Water and Sewer Authority has found a way to conserve water by reclaiming wastewater and using it in situations where regular water might have been used instead. Treated effluent from the authority's wastewater treatment plant is sent back to the campus of the University of North Carolina at Chapel Hill, where it's used for irrigation and for chilled water in climate control systems.

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OVERHEARD ONLINE

"When one team member mislabeled a vial and the others didn't catch it, all of us were willing them to see their mistakes and fix them."

First-Time Operations Challenge Judge Shares Competition Insights

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FULL CIRCLE

Plant Celebrates 75 Years

More than seven decades ago, El Paso, Texas' population growth was stretching the border city's water supply and requiring new approaches that would enable the city to continue to thrive. As EPWater observes the 75th anniversary of its Robertson Water Treatment Plant, the city's utility is now at a similar crossroads. Over the next three decades, El Paso is expected to grow to 1.3 million people. That growth comes with a responsibility to ensure a sustainable supply of high-quality water.

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COMBATING WET WIPES

A Viral Campaign

A series of strikingly illustrative photographs from the removal of a massive pump blockage recently brought a spike of public attention to Charleston, South Carolina's so-called "flushable" wipes problem. After noticing rising levels and determining a blockage was the cause of a backup in one of its 100-foot-deep wet wells, Charleston Water System contracted a diving team to jump in and remove the blockage. Read about the diving operation and Charleston's social media campaign in this online exclusive article.

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Up From the Rubble

ORREN WEST AND HIS DENVER METRO TEAM EXPERIENCED THE JOYS AND STRESSES OF STARTING UP A BRAND-NEW WASTEWATER TREATMENT FACILITY

STORY: **Steve Frank**
PHOTOGRAPHY: **Carl Scofield**

When Orren West asked his friends at the Water Environment Federation's Technical Exhibition and Conference what they thought about a job offer he was considering in the fall of 2012, the feedback was strong and uniform: It was a once-in-a-lifetime opportunity.

From the late 1960s through the early 1980s, many clean-water operators took the technical challenge and joy of starting up a greenfield plant. Not many have that opportunity today, but West got it when he signed on as the first superintendent of the new 28 mgd (design) Northern Treatment Plant at the Metro Wastewater Reclamation District in Denver.

The advanced facility lies 20 miles north of Metro's 220 mgd Robert W. Hite Treatment Facility. The Northern plant, Metro's first and only satellite treatment facility, was built to serve a growing population north of Denver. "My friends confirmed my feeling that it was a once-in-a-lifetime opportunity," West recalls. He phoned and accepted the position from his hotel room at WEFTEC.

UP THE RANKS

West began his clean-water career in Texas in 1988 as an operator in the city of Luling. "I knew nothing about wastewater until I took the job, and I knew right away that I could make a career out of it," he says. Two years later, he went to the Austin Water Utility as a wastewater operator. In 2001, he became a supervisor. Three years later he moved up to plant superintendent, and three years after that he became a division manager.

In 2012, he got a call from engineers at Denver Metro who were working on the still-in-predesign Northern plant. "I was not considering leaving Austin Water, but I started doing the research, learning more about Metro

Orren West, superintendent of the Northern Treatment Plant, Metro Wastewater Reclamation District

The tertiary floc sedimentation facility at the Northern Treatment Plant.

> "There were some long days. We spent a lot of time, effort and energy on seeding and making sure we had the right microbial population when it was time to go live."
>
> **ORREN WEST**

Orren West, Metro Wastewater Reclamation District

Denver

POSITION:
Superintendent, Northern Treatment Plant

EXPERIENCE:
30 years in the industry

EDUCATION:
Associate degree, information systems

CERTIFICATIONS:
Class A Wastewater Operator

Awards: 2017 Plant Operation Merit Award, Rocky Mountain Water Environment Association; 2008 William D. Hatfield Award, WEA of Texas

GOALS:
Be a difference-maker in the industry

and this new facility," West says. "The first thing that really stood out was that they were hiring the superintendent before they ever broke ground."

When he came for his interview, "The first place I drove was right here to the site. All that was here was a chain-link fence and sign saying, 'Future home of Metro facility.' During the interview, I talked about being an operator and having an operator's background. 'I'm not a construction inspector,' I said. And they said, 'That's not what we're hiring you for. We want an operator on site all day, every day during construction.'" He joined Metro in late 2012.

"I was on site here when there was nothing but grass, rubble and one little trailer sitting right about where the administration building is," West says. Metro integrated him into the construction oversight team as plant superintendent. The contract was design-build. West wasn't the decision-maker for construction, although he made some suggestions. His real job was to learn and understand the plant he would soon run.

STAFFING UP EARLY

The Metro district began hiring Northern plant operators almost a year before initial discharge. The facility coordinator, assistant superintendent and two lead operators were hired first. That core group then helped hire the remaining operations staff. "We started from day one with the idea that the team was super important," West says. "We were very intentional about allowing people ownership right away — getting buy-in."

Hiring staff members early paid off when they began training to operate the plant. "For a lot of this facility, our operators got to drive it before it was live," West says. "We had countless hours of training that everyone was able to participate in. The amount of training on all of this equipment was almost astronomical."

Typically, he says, "A huge challenge is getting training to cover all the shifts. But we were all here since the plant was not yet online. Everybody was in the same room, so we all heard the questions and the answers together."

To get a feel for the plant, they practiced. "As pipes and tanks came together, we pumped clean water in a circle to test pumps, pipes, valves and controls," West says. "We got to see how to send water from A to B without doing any treatment or discharges. There was no risk, and it was a great tool."

In addition to West, the plant team includes Thomas Acampora, Northern Treatment Plant assistant superintendent; Kim Cowan, assistant super-

The team at the Metro Wastewater Reclamation District's Northern Treatment Plant includes, from left, Ryan Robinson, Guy Koett, Brandon Adrian, Kim Cowan, Steve Sanchez, Norm Henderson, Grant Sharp, Orren West, Kent Ritchie, Ibrahim Bajraktari, Chris Thyfault, Maritza Franco, Steve Summers, Tom Acampora, Larry Chadwick, Denise Manguso, Chad Grooms and Sarah Gomez.

Northern Treatment Plant, Metro Wastewater Reclamation District
PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
$CBOD_5$	128-228 mg/L	0.63-1.64 mg/L	17 mg/L monthly average
TSS	154-382 mg/L	0.97-3.99 mg/L	30 mg/L monthly average
Ammonia	31.3-40.4 mg/L	0-1.53 mg/L	9.61 mg/L lowest monthly average
Nitrate + nitrite	N/A	2.82-5.40 mg/L	10 mg/L daily maximum
Total phosphorus	5.0-7.7 mg/L	0.08-0.36 mg/L	2.5 mg/L 95th percentile

intendent; Larry Chadwick and Grant Sharp, lead operators; Ibrahim Bajraktari, Elias Carson, Maritza Franco, Kent Ritchie and Norman Henderson, operators; and Christine Thyfault, operator technician. Ten additional employees perform maintenance, laboratory, administrative and other support functions.

RAMPING UP

As go-live approached, the team seeded the plant with live microorganisms from Metro's main plant: "There were some long days. We spent a lot of time, effort and energy on seeding and making sure we had the right microbial population when it was time to go live. We had to have enough time to get adequate seed in, but not so long that it wasn't viable any longer."

Startup in October 2016 went smoothly, though it took about an hour longer than anticipated for the first effluent to appear as a crowd of employees and guests looked on anxiously. "We were compliant when the first water went over the weir," West says.

The liquid process begins with preliminary treatment consisting of a step screen (HUBER Technology) and vortex grit removal (WesTech Engineering). In primary treatment, screened wastewater blends with tertiary chemical solids and polymer before clarification.

Secondary treatment includes step-fed biological nutrient removal with unaerated and aerated zones and ammonia-based dissolved oxygen control followed by clarification. Tertiary treatment includes alum coagulation, two-stage flocculation with polymer addition, high-rate settling with chemical solids recirculation, and sand filters with Leopold - a Xylem brand - underdrains. Effluent is UV disinfected (Ozonia North America, LLC) before release to the South Platte River by way of a cascade aeration structure, supplemented with oxygen if needed for permit compliance.

PROCESS INNOVATION

The plant, designed for 28 mgd (expandable), now treats 4 mgd on average, although the flow is expected to increase rapidly with residential growth. "Our flows are low enough in the early morning that it's problematic," but excess capacity has the offsetting benefit of providing redundancy, West observes.

The plant uses two unique processes on the solids side. In post-aerobic digestion, anaerobically digested sludge is returned to the tank after digestion to aerate it by way of the plant process blowers. The PAD process is designed to aerate the anaerobic solids and thus nitrify the ammonia, reducing the sidestream load back to the plant.

"PAD has been an interesting process to learn," West says. "Operators often note that we don't have a book to reference; instead, we are writing the

(continued)

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> "PAD has been an interesting process to learn. Operators often note that we don't have a book to reference; instead, we are writing the book."
>
> **ORREN WEST**

book. PAD has performed well at times but has required a lot of tinkering on our end. Starting up a brand-new process has provided a lot of learning opportunities. We seeded the PAD process with thickened waste-activated sludge from the Hite facility, so the nitrifiers were there."

The Northern plant is the second facility in the country employing unified fermentation and thickening (UFAT), a gravity thickening process that follows primary clarification. "This process allows us to generate enough carbon for the biological process so that we rarely need to add supplemental carbon," West says.

CHALLENGING STARTUP

The biggest challenge in going live with the new plant was making the entire plant work right from day one. "It's not like an upgrade or expansion where you add one process, a clarifier or whatever, and focus on that," West says. "Here it was everything. It all had to come together right now."

Operators monitor the plant from a control room using advanced equipment and can perform the same functions from the field using iPads. The plant was also designed with public education and outreach in mind. There are multiple interactive displays in the lobby of the administration building, and the tour route can easily accommodate buses.

The Rocky Mountain Water Environment Association recognized West and the plant staff with its 2017 Plant Operation Merit Award for successfully bringing the plant online. From grass, rubble, and one little trailer to a fully functioning, compliant facility, West and his staff have Metro's Northern Treatment Plant off to a great start. tpo

IT'S IN HIS DNA

Orren West came to Denver's Metro Wastewater Reclamation District in 2012 to head up the still-in-design Northern Treatment Plant. He brought along a 20-year tradition of competing in the Water Environment Federation's Operations Challenge, held at WEFTEC.

"I'd been doing it so long it was in my DNA," West says. He already knew team members at the Littleton/Englewood Wastewater Treatment Plant because he'd met them over the years at the Ops Challenge, so he began by working with them through the Rocky Mountain Water Environment Association. As he settled in at the Metro district, he talked up the Ops Challenge and kept his eyes peeled for team candidates. He volunteered to lead the effort.

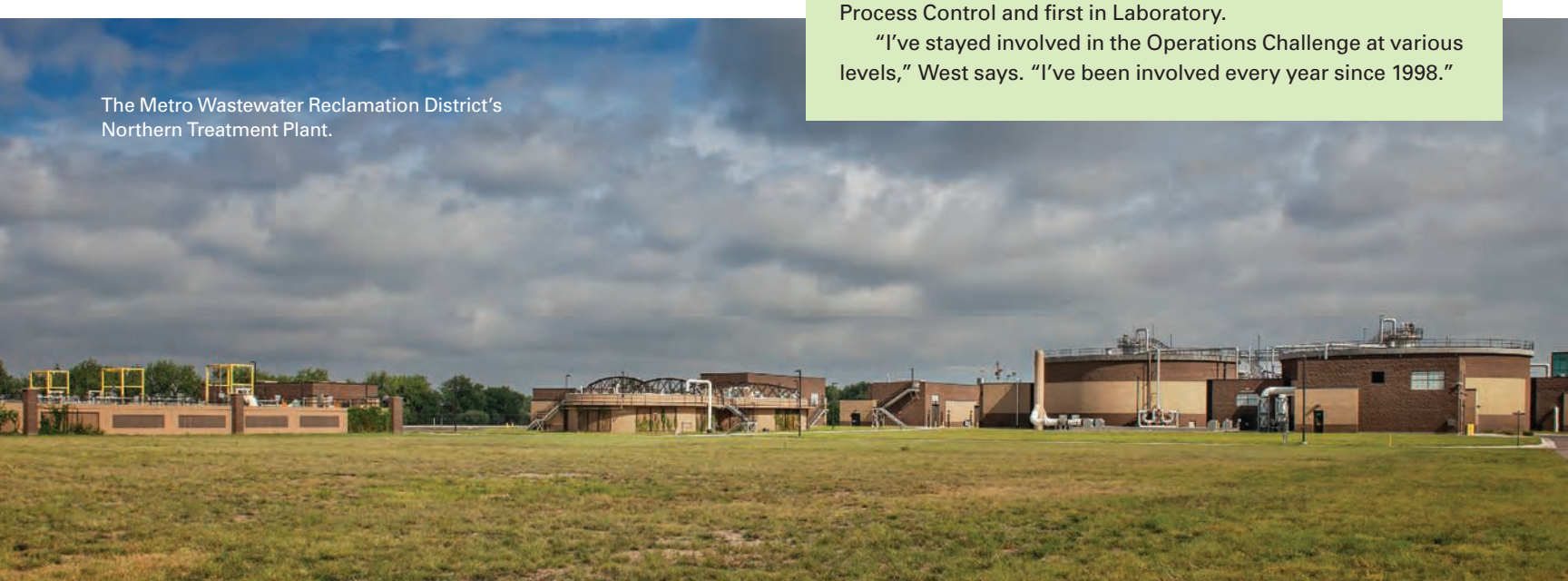
The district found the team a practice venue, and West began recruiting team members. Metro sent its first team, Elevated Ops, to WEFTEC 2015. West was proud of their performance. It helped build momentum, enhanced recruiting and led the district to start a second team in 2016. West coached both teams that year.

Elevated Ops won Division 2 of the national competition in 2016. Team members included Kelsey Gedge (captain), Matt Duncan, Lance Wenholz and Josh Mallorey. West coached.

The second team, Metro Bravo, included Quintin Schermerhorn, Donat Luigi, Jay Halliwell, Melanie Verke, and Brenda McMillan. They placed 17th in Division 2 in the first year.

Elevated Ops placed second in the Division 1 Godwin Maintenance Event at WEFTEC 2017 and fifth overall. Metro's second team, the Heroic Hites, placed seventh overall in Division 2. The members were Rebecca Miller, Schermerhorn, Victoria Kosinska and Michael Grengs. McMillan coached the team. In 2018, the team took third place overall — second in Safety, third in Maintenance, second in Collections, second in Process Control and first in Laboratory.

"I've stayed involved in the Operations Challenge at various levels," West says. "I've been involved every year since 1998."



The Metro Wastewater Reclamation District's Northern Treatment Plant.

An Island Adventure

A UNIQUE LEARNING EXPERIENCE TAKES SPRINGFIELD FIFTH-GRADERS OUT OF THE CLASSROOM AND INTO THE WASTEWATER TREATMENT PLANT

By Sandra Buettner

For 15 years the Springfield (Massachusetts) Water and Sewer Commission has hosted fifth-graders from the Springfield Public Schools at the wastewater treatment plant to teach them first-hand about the water cycle and how wastewater fits.

The program, "A Day at Bondi's Island," was conceived in 2002 when SUEZ, the operations contractor, brought up the idea. SUEZ wanted to partner with the commission on an education and outreach program to give back to the communities SUEZ serves in the Springfield region.

At Bondi's Island, the commission treats wastewater from more than 36,000 households in Springfield. All told, the commission serves a population of 250,000 including wholesale customers outside of Springfield. The system comprises 469 miles of wastewater collection piping including 148 miles of combined sewer and 34 pumping stations.

PHOTOS COURTESY OF SPRINGFIELD WATER AND SEWER COMMISSION

In the Incredible Journey water cycle game, students pretend to be water molecules and move through the water cycle. They must determine what state of matter they are in and how they change (melt, freeze, evaporate, condense) as they move from one location to another.

WORKING GROUP CONVENED

The program was created by a working group of representatives from SUEZ, the commission, the school system, and a professor from Springfield College. After a year-long process, the group decided that hosting the students at a specially designed classroom at the wastewater treatment facility would make the program memorable.

A nonprofit World Is Our Classroom entity was created, consisting of an executive director and two teachers who gave additional input on how to design the program.

World Is Our Classroom administers the program and worked with the schools' science teachers to marry their science, technology, engineering and mathematics (STEM) curriculum to the newly created water program.

"Because girls and minorities were underrepresented in STEM-related careers, it was important to the school system to create a program targeting this diverse group and introduce the industry to them," says Don Goodroe, area manager for SUEZ, the program sponsor. "While that was the initial goal, the result was that all the students love the program. We get such great feedback from many of them."

THE STUDENTS' DAY

The students arrive at the classroom at 9 a.m. with workbooks they received previously and get a brief overview of the day's activities. "The classroom and the program itself were designed to take learning out of the traditional setting and enable students to see real-life jobs in their natural environment," says Nora Burke Patton, executive director for World Is Our Classroom. "This is also known as place-based education."

> "[The students] are exposed to operators, mechanics, engineers, lab techs and managers. They get to see all the roles, and it opens their eyes to future job opportunities." **DON GOODROE**

The day starts with the whole class taking part in four activities:

- In **Molecules in Motion,** the children act out the changing states of matter from solid to liquid to gas by dancing to music that goes from slow to fast, representing the molecular motion that relates to temperature.
- **Water Cycle** is a board game that shows the students how pollution from humans and animals affects the water cycle and how wastewater treatment cleans the water.
- **Microscope Operation** engages students by showing them the many organisms in a drop of water by way of microscopes hooked up to TV screens
- **Scavenger Hunt** gives the students descriptions of basic machines like levers, planes, pulleys and hoists; the kids are then sent around the plant to find examples.

After the activities, lunch is served and the students tour the plant. "They are exposed to operators, mechanics, engineers, lab techs and managers," Goodroe says. "They get to see all the roles, and it opens their eyes to future job opportunities."

The day ends with the Design Challenge in which the children break into groups of five. Each group is given a pitcher of simulated dirty water and some tools that could be used to treat it; they are asked to apply the concepts they learned from the day and the equipment they saw to create an engineering solution to clean up the water.

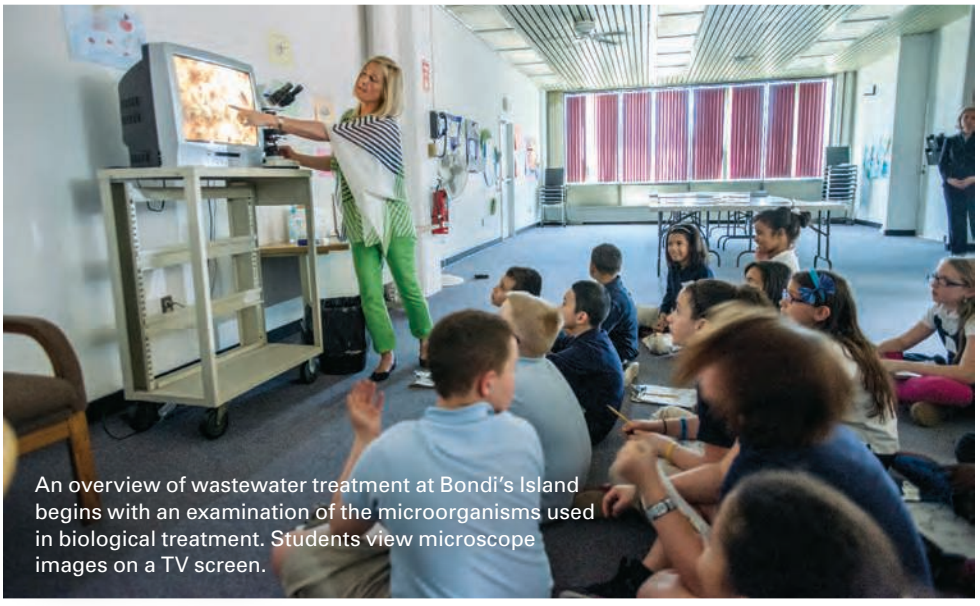
OVERWHELMING FEEDBACK

Feedback from the students has been overwhelming, as shown by thousands of thank-you notes, posters and photo collages. Suggestions from students and teachers on how to enhance the program are worked into the curriculum from year to year. Since the classes began in 2003, some 30,000 fifth-graders have taken part. An intern now working in the commission's water treatment plant in the lab went through the program when she was in fifth grade.

World Is Our Classroom and SUEZ have since taken the concept and spread it to other communities in the region. In addition, the commission has applied the model in its watershed area; seventh-graders come to visit the reservoir and drinking water treatment plant.

"The World Is Our Classroom program has grown into one of the cornerstones of the Springfield Water and Sewer Commission's mission to serve its customers," says Joshua Schimmel, commission executive director. "Each year we welcome thousands of our youngest customers to visit our facilities, enabling them to form memorable connections between lessons in the classroom and the environment around them, and to learn about the important role the commission's work plays in their everyday lives.

"This level of customer outreach and awareness is invaluable in building current and future support for our mission, for critically needed investment in water infrastructure, and for generating interest in water careers." **tpo**



An overview of wastewater treatment at Bondi's Island begins with an examination of the microorganisms used in biological treatment. Students view microscope images on a TV screen.

What's Your Story?

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

A guided tour of the facility emphasizes the technologies used to treat wastewater. The group visits process steps to see practical applications of science and technology at work.

Students from Deer Creek-Mackinaw (Illinois) Intermediate School at a field trip presentation by solar developer Jason Hawksworth of Hawk Energy Solutions.

Small but Profitable

A CENTRAL ILLINOIS VILLAGE PROVES THAT A WATER OR WASTEWATER PLANT SOLAR ENERGY PROJECT DOESN'T HAVE TO BE BIG TO BE ECONOMICALLY VIABLE

By Steve Lund

The wastewater treatment plant in the Illinois village of Deer Creek is small at 132,000 gpd (design), but not too small to use solar power to cut its electric bills.

The village was so pleased with its first venture into solar power that it built another solar array for its water production system, and a third for the village office and community center.

The village of 700 people about 20 miles east of Peoria secured a grant from the Illinois Clean Energy Community Foundation and put a 40 kW solar array online in late 2014. The electricity powers the pumps that move wastewater into the village's wastewater treatment lagoons.

Lori Lewis, village clerk, recalls the system coming online at a time when solar generation was low, so the electricity produced wasn't impressive at first. "Fall and winter are slowest generation months," she says, "But by the time we had operated it the first year around, our summer months built up the credit and got us through the following winter.

"We generate enough power through the summer to take us all the way through the winter months. And each year since that first year, we have generated just enough power to cover our expenses. We pay a minimal electric bill for the delivery system, but we do not pay anything for the power because the solar system has generated all that we needed."

LAGOON SYSTEM

The Deer Creek wastewater treatment plant consists of four connected lagoons. Wastewater flows by gravity to a 35-foot-deep wet well and lift station. Three 5 hp pumps move the water up to the first lagoon, and it flows by gravity through the series of lagoons and a rock filter before discharge to Mud Creek. There are no aerators or mixers in the lagoons; the electrical demand comes only from two buildings and the three pumps in the wet well.

Still, the electric bills were $600 to $900 a month, a significant expense for a small village, according to Jim Hackney, village president. An electrician by trade, Hackney had some experience with solar power from working on an array at a local school, so he and the village board were receptive when Jason Hawksworth of Hawk Energy Solutions brought up the idea for the wastewater system.

"We came up with a system that would work at the wastewater treatment plant," Hackney says. "It has worked very well. The lagoon system is somewhere in the neighborhood of a 98 percent offset. We just have to pay the metering charges because we need commercial grid power to start the motors and other equipment, and for backup."

LOW MAINTENANCE

The solar array requires minimal attention from village personnel. "Basically, there's no maintenance at all," Lewis says. "We just keep an eye on it and make sure we do online monitoring. The panels can be monitored remotely. We monitor them to make sure they are always working. If there is any disconnect, we are notified immediately."

When the village expanded its water production capacity with a second well and a new 150,000-gallon elevated water storage tank (replacing a 50,000-gallon tank), a second solar array was constructed next to the water production plant. "With the connection of the second plant, we will have 100

> "It's a rent-to-own system, basically. We pay the developer a negotiated rate lower than the Ameren Illinois rate for the electricity the system produces for five years. In the sixth year, we can buy the system out at a highly reduced rate."
> **JIM HACKNEY**

percent redundancy, so if there is a disaster, we have a new well big enough and a new treatment plant to supply the town," Hackney says.

The drinking water plant produces about 50,000 gpd. The town anticipates some growth, which is one reason for expanding capacity. The wastewater plant is already large enough to handle a population significantly larger than what Deer Creek has today.

DIFFERENT FINANCING

Deer Creek's first solar plant cost about $160,000, but about 60 percent of that was covered by the grant from the Illinois Clean Energy Community Foundation. That system is owned and operated by the village. The second system (25 kW) is owned and operated by Hawk Energy Solutions; the village has a power purchase agreement with an option to buy.

"It's a rent-to-own system, basically," Hackney says. "We pay the developer a negotiated rate lower than the Ameren Illinois rate for the electricity the system produces for five years. In the sixth year, we can buy the system out at a highly reduced rate."

The 25 kW system provides 50 to 60 percent of the power for water production. The break-even points from both projects are favorable to the village. "We'll recoup our investment on the wastewater treatment plant in year number eight," Hackney says. "On the drinking water plant, that's probably out there around the 10- or 11-year mark."

Now Hawk Energy Solutions is building a third solar plant, a 12 kW system, to provide power for the office and community center.

EDUCATION OPPORTUNITIES

The solar array at the wastewater treatment plant gets regular visits from students at the local intermediate school. "One of the classes does an alternative energy project," Lewis says. "The students come out and look at our site and check things out."

Hawksworth enjoys taking part in the field trips and has given presentations on solar energy to students in Washington, Illinois, where his company is based. "If I get invited to do something of that nature, it's a tremendous opportunity to teach kids about solar," he says. "I've done it a couple of times, and I look forward to doing it again. It's a good opportunity for them to learn what's out there and the changes that are taking place in the energy sector."

Since putting up the array at the wastewater treatment plant, Hawk Energy Solutions has been in talks with other central Illinois communities for similar solar projects, and Hawksworth expects some to get underway in 2019. As Deer Creek shows, the size of the plant doesn't matter much.

"Those projects are going to be extremely viable," Hawksworth says. "Solar has the same impact on a small plant as it does on a large plant, just on a smaller scale." **tpo**

The Mahomet facility produces effluent containing monthly averages of 6.15 mg/L nitrate and 0.63 mg/L total phosphorus.

Great Things in a Small Package

THE AWARD-WINNING MAHOMET WASTEWATER TREATMENT PLANT PACKS A LOT OF TREATMENT CAPACITY AND QUALITY INTO A SEVERELY CONFINED FOOTPRINT

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

The Mahomet (Illinois) Wastewater Treatment Plant sits in a tight 5-acre triangle: on one side a railroad track, on another side the Sangamon River, and on the third side a subdivision.

That posed a major challenge about 10 years ago as growth in the community, a bedroom suburb of Champaign-Urbana, required a capacity expansion. Complicating things further, the Illinois EPA issued total maximum daily limits for nitrate and phosphorus discharges to the river.

Jason Heid, water and wastewater superintendent, along with his operations team and engineering firm, were up to the challenge. They converted two existing activated sludge package treatment plants into a new extended aeration facility with biological nutrient removal, without having to expand the plant's footprint.

The key to the project was an integrated fixed-film activated sludge (IFAS) secondary treatment process that enabled an increase in design capacity from 0.5 to 0.9 mgd within the existing tankage. The facility now produces effluent containing monthly averages of 6.15 mg/L nitrate and 0.63 mg/L total phosphorus, both well below permit limits.

For its consistently excellent performance, the facility received a 2017 Plant of the Year award (1 to 7.5 mgd) from the Illinois Association of Water Pollution Control Operators and a 2017 Wastewater Plant of the Year award from the Illinois Rural Water Association.

HANDLING GROWTH

The Mahomet plant was built as a package facility in 1961. An extensive 1986 upgrade converted that package plant to an aerobic digester still in service today and replaced it with two package activated sludge extended aeration plants (Sanitaire - a Xylem Brand). The upgrade also included a filter building with three rapid sand filters (Evoqua), along with a clearwell and mudwell.

"In the mid-2000s, knowing we needed to stay ahead of our growth, we looked at another expansion," says Heid, who holds Class 2 Wastewater and Class B Water licenses. "As we sorted out what we wanted to do, we got a letter from the IEPA saying we now had to remove nitrates and phosphorus to meet the new TMDLs." Construction began in fall 2011 and was substantially complete in 2014.

Matt Gregory, left, operator, and Shawn Rideout, maintenance, perform maintenance on a return activated sludge pump (Flygt, a Xylem brand).

Village of Mahomet (Illinois) Wastewater Treatment Plant

www.mahomet-il.gov

BUILT:
1961, upgraded 1986, 2014

POPULATION SERVED:
7,000

FLOWS:
0.9 mgd design, 0.7 mgd average

RECEIVING WATER:
Sangamon River

TREATMENT LEVEL:
Tertiary

TREATMENT PROCESS:
Integrated fixed-film activated sludge, biological nutrient removal, sand filters

BIOSOLIDS:
Land-applied by contractor

ANNUAL BUDGET:
$550,000 (operations)

"The engineers came up with a technology that enables us to use the two existing activated sludge plants and reconfigure them to achieve our desired design capacity without expanding the footprint of the tanks," Heid says. "Each of the existing plants had five cells for activated sludge extended aeration with a 30-foot-diameter clarifier in the middle.

"Those clarifiers were converted to aerobic digesters. The outside rings of the tanks were modified to create an anaerobic cell and two anoxic cells, along with three aerobic cells. Two of those cells, amounting to 40 percent of the tanks, have the IFAS media in them (Veolia Water Technologies). The IFAS media allows us to do ammonia and BOD removal without a bigger footprint.

"The IFAS media is just brilliant. A conventional activated sludge facility can treat about 15 pounds of BOD loading per 1,000 cubic feet. Now we can treat 200 pounds. It's just a huge difference. The design engineers, Larry and Matt Johnson and Narendra Patel, did a really good job of looking to the future."

The facility was built for easy and affordable expansion to a 1.25 mgd design capacity. Two new 46-foot-diameter secondary clarifiers are sized for that next phase. They're installed on the site of a former excess-flow lagoon; a concrete 0.5-million-gallon concrete clarifier in a corner of the site near the river now receives excess wet-weather inflows. The expansion also included rehabilitation of the sand filters with PLC-based controls and new backwash valves.

ESSENTIAL HEADWORKS

The only major new addition to the plant was a headworks building containing a rotary-drum microscreen (HUBER Technology) with quarter-inch holes. "We had the Chevy model on the old plant, and now we've got the Mercedes," Heid says. "It's one of our most important pieces of equipment because we can't let trash get through and still operate the plant.

"The IFAS tanks have screens that keep the media inside. You can't let rags in there like you could with a regular activated sludge plant. If rags get into the tanks, they're not coming out. They're going to get stuck on a wall screen or on the screens between the cells." The headworks also includes a rapid-rate chlorine disinfection system for high wet-weather flows, along with alum feed storage tanks for phosphorus removal and a climate-controlled electrical room for all the plant's submersible pumps and mixers (Flygt - a Xylem Brand).

> "The IFAS media is just brilliant. A conventional activated sludge facility can treat about 15 pounds of BOD loading per 1,000 cubic feet. Now we can treat 200 pounds. It's just a huge difference."
> **JASON HEID**

After screening, the flow enters a splitter structure before entering the two secondary treatment trains. "In those tanks we have a lot of internal recycling to accomplish nutrient removal. In each tank, the anaerobic cell is for phosphorus reduction; the anoxic cells are for nitrate. Then we have two aerobic cells with IFAS media and control logic and a third cell with fine-bubble aeration and no media.

"There are several flow schemes we could use to accomplish BNR, but we use the modified University of Cape Town process, since we have found it to be the most robust."

From secondary treatment, the flow moves on to the clarifiers, which have fiberglass weir covers to free operators from weir cleaning. The effluent then goes to the sand filters for tertiary treatment. A nonpotable water system supplies water to clean the headworks screen and other plant equipment, and for grounds irrigation.

LAND-APPLIED BIOSOLIDS

Waste activated sludge is pumped to the aerobic digesters, equipped with coarse-bubble diffusers. An airlift pump decants the digesters; thickened biosolids gravity flow to a pump station that delivers the material to a

Jason Heid, water and wastewater superintendent

FROM WINGS TO WASTEWATER

Jason Heid launched his wastewater treatment career in the U.S. Air Force. That role wasn't his first choice.

"The Air Force had a very high retention rate, and for the other jobs I wanted, there was up to a year wait," Heid recalls. "The job I took was called environmental support specialist. It was something to get me in the door."

Before he knew it, after basic training and schooling, he was treating water and wastewater at Air Force facilities, ending with Chanute Air Force Base (since closed) in Champaign County, Illinois. Upon discharge from the service, he returned to his native Pennsylvania.

Soon after the move, he got a phone call from the Urbana & Champaign Sanitary District: "I packed up, got in my car and found an apartment in Champaign. I can say I was probably unemployed for one week in my whole life."

He worked six years as an operator at what was then a 17 mgd wastewater treatment plant. Then he and a friend left for Mahomet to work as part-time employees, with plans to also operate plants at other small communities on a contract basis.

After eight months, the water and sewer and street and alley superintendents in Mahomet died tragically in a trench accident. Heid observes, "The next thing I knew, I was here full time."

A nonpotable water system delivers water for plant equipment cleaning and ground irrigation.

1-million-gallon holding lagoon, also decanted periodically. Each fall, a contractor land-applies the biosolids on farms by knife-injection.

"At some time in the future, there will probably be some phosphorus regulation for the farmers and we'll have to change to a different process," Heid says. "For now, our storage capacity allows us to land-apply just once a year after the crops are out in fall."

The plant functions with a small team who also takes care of the village's water plant, the water distribution system and wastewater collections system. Team members are Matt Gregory, water and wastewater operator (Class 2 Wastewater and Class B Water licenses), and Shawn Rideout, Reed Coleman and Kyle Welborn, maintenance workers.

The small staff makes efficiency paramount. Heid believes in performing maintenance and repairs in-house to the fullest extent possible: "When you pay someone to do

Process automation helps a small plant team keep effluent quality high and attend to essential maintenance.

Water quality measurements are taken using a portable multimeter (Hach).

> "Our philosophy is that we don't Band-Aid anything. If something needs fixing, we fix it right and be done with it. We don't have enough staff to be fixing things more than once."
> **JASON HEID**

Mahomet Wastewater Treatment Plant
PERMIT AND PERFORMANCE (Monthly Averages)

	INFLUENT	EFFLUENT	PERMIT
CBOD	104 mg/L	3.6 mg/L	10 mg/L
TSS	219 mg/L	2.8 mg/L	12 mg/L
Nitrate	33 mg/L	6.15 mg/L	10 mg/L*
Ammonia	15 mg/L	0.16 mg/L	1.5 mg/L
Total phosphorus	4.4 mg/L	0.63 mg/L	1 mg/L

* Annual average

maintenance, it doesn't get done as often because it costs a bloody fortune. If you want to pull a submersible pump to change a seal, it's going to cost $3,000 because they're going to come with a truck crane to lift the pump out of the ground.

"I'm not going to buy an $80,000 truck to pull 15 pumps. We use a composite Davit crane. There are two pumps to a wet well. We put a crane mount at every wet well that's bolted into the concrete. The crane breaks down into three pieces so we can take it anywhere we want. We put the pumps on a stainless steel chain and crank them up.

"I sent Shawn Rideout to the firm where we bought the pumps. At their maintenance shop outside St. Louis, they have every pump and mixer we use. They showed him how to break everything down and do every repair. Our philosophy is that we don't Band-Aid anything. If something needs fixing, we fix it right and be done with it. We don't have enough staff to be fixing things more than once."

STRESS ON PREVENTION

"Another philosophy I have is to carry spares wherever I think there might be a need. For example, our HUBER screen has a variable-speed drive that controls the speed of the drum. If that drive goes out, we're out of service. I asked HUBER to send me a spare and program it. It's on the shelf and ready to go. Any spare part I can think of that might be useful, I try and get it so if something goes wrong, we can deal with it and move on."

Preventive maintenance is also a top priority. The plant has three Howden Turblex 100 hp high-speed turbo blowers connected to Hach dissolved oxygen meters in the aerobic tanks. "We can run the whole plant with one blower operating at 75 percent," Heid says. "We have the two other blowers for backup and for the next phase of expansion.

"We have somebody come out once a year and go through those blowers from top to bottom, in addition to the regular maintenance we do. They get a laptop out and download everything off those blowers, making sure there are no issues, making sure everything is balanced correctly, and going through the machine histories."

The preventive approach applies to the collections system as well. Since 2005, in alternate years, Heid has ordered cured-in-place lining in the sewer system. "That way we don't have to go out and cut tree roots out of the sewers," he says. "If you have a 10-inch line and one joint is full of roots, you don't have a 10-inch line anymore. You have maybe a 4-inch line. So in wet weather, you could have backups and surcharges."

The collections system maintenance program now also includes regular line cleaning and televising: "We had 18,000 feet done last year, and it only cost $18,000. It showed us potential candidates for lining."

RELYING ON TEAMWORK

In leading his team, Heid strives to make work life as pleasant as possible: "I treat everybody the same, with respect. I try and help them enjoy the work. Anything I tell them to do is not something I haven't done."

The career has been rewarding for Heid: "I've been here for 24 years, and the job has just grown with the town. The plant has doubled in size. That means the treatment doubles and the technology doubles. There was no reason for me to go anywhere else. And the village takes good care of me. The board is extremely supportive."

And the Mahomet plant continues to churn out high-quality effluent from its little corner of town. **tpo**

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The completed reflection pool in front of the South Wastewater Treatment Plant's administration building.

Natural Reflection

A KINETIC SCULPTURE AT A KING COUNTY TREATMENT PLANT IS DESIGNED IN ALL ASPECTS TO REPRESENT WATER AND ITS MOVEMENTS

By Jeff Smith

A kinetic sculpture entitled Water Plant functions in a landscaped reflection pool in front of the administration building at the King County's South Wastewater Treatment Plant in Renton, Washington.

At the center is a surplus 2,400-pound stainless steel impeller from a decommissioned 36-inch centrifugal pump. Five machined stainless plates rest under the impeller and form a flowering plant's petals. Laboratory funnels serve as the plant's five anthers. They are secured at the ends of lever-action, stamen-like arms traced with copper tubing that transport water to the funnels. Together, the components harness the power of water, gravity and balance to produce a continuous but random discharge of water into the pool.

COLLABORATIVE PROCESS

Created in 2010, the sculpture was a two-year collaboration between artist Donald Fels, the plant team members, metal fabricator Benson Vess, and the commissioning agency, 4Culture.

Jordan Howland, manager of public art with 4Culture, coordinated a nine-member committee of citizens, art and design professionals, plant staff, and county representatives to review 13 artists' proposals. Three were chosen for personal interviews before Fels was chosen.

Funds for the sculpture were provided through the 1% for Art Ordinance program managed by 4Culture, the cultural funding agency for King County, which incorporates the work and thinking of artists into public works projects. Design and construction of the South plant LEED Silver administration building in 2009 generated the $150,000 artwork budget.

Fels wanted to use as much recycled and industrial surplus material as possible, make the water feature's movement mimic natural and treatment plant systems, and suggest water in all aspects of the piece. The sculpture's base is built from of 10 equilateral triangles, which together create a truncated icosahedron, Plato's solid for water.

A second water feature created by Fels appears to float on the pool's surface. It consists of a stainless steel drumlike surface with drainage holes. Called Rooftop Garden, the landscaped artwork obscures a pump and controls for the pool.

POOL RECONSTRUCTION

The South treatment plant is a 325 mgd design/115 mgd average secondary treatment facility occupying 94 acres. The site includes facilities for biosolids handling, water reuse and alternative treatment technologies. Twelve miles away is the deep-water outfall in Puget Sound. Next to the plant is a public park, Waterworks Gardens, another artist-designed project managed by 4Culture. Its wetlands treat stormwater runoff from the plant's impervious surfaces before discharge into a creek.

The 24-by-52-foot pool where Water Plant is on display was built decades ago as a reflective pool. Over time, other features were added, such as small fountains, a deck, and a flagpole. At one point, rainbow trout were added.

Part of Fels' commission was to redesign the 4-foot-deep pool to complement his water features. All the objects were removed except for a concrete pad now used as a pedestal for the sculpture. Pavers were added and backfilled with contrasting small stones to accentuate the gentle curves of the pool's shoreline. Landscape improvements were made with sedums and other native plants, grasses and stones.

The sculpture is the centerpiece of attention at the plant and serves as a gathering spot for tours, which are a key component of the King County Wastewater Treatment Division's outreach programs. Typically, more than 900 students and visitors tour the site each year. tpo

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AN INNOVATIVE HIGH-VELOCITY PIPE CLEANING SYSTEM SAVES MILLIONS OF DOLLARS FOR A SMALL WATER TREATMENT PLANT ON LAKE MICHIGAN

By Scottie Dayton

Operators at the Two Rivers (Wisconsin) Waterworks noticed flow restrictions in the 24-inch raw water intake pipe in Lake Michigan that limited production to 1.6 mgd, versus the water treatment plant's 3 mgd design.

In late 2015, the Wisconsin Department of Natural Resources told the city to address the problem, which threatened the plant's ability to meet emergency water demands. In May 2017, the city hired Hibbard Inshore of Auburn Hills, Michigan, to inspect the pipe using a SeaBotix LBV 600-6 MiniROV (Teledyne ISCO).

Divers saw layers of zebra mussels on the wooden crib across the intake riser. The 12 to 18 inches of sediment and mussel shells in the pipe was deep enough to mire the ROV after it advanced 9 feet. "The only solution was to replace the line, but our community of 11,000 couldn't afford it," says Ross Blaha, water utility director.

Frank Frosolone Jr. controls the communication cable and hoses supplying air to Corey Gerenda's dive helmet and hot water to his suit as he descends the ladder into the 54-degree F water.

While visiting the Lake Forest (Illinois) Water Plant, Blaha noticed the name Northern Divers USA on the raw water intake pipe. "It was a stroke of luck," he says. "Owner Frank Frosolone Sr. and his team had cleaned the line recently and saved the city millions of dollars. Like us, their water source is Lake Michigan."

In late August 2017, Blaha and Greg Buckley, city manager, watched the divers implement the high-velocity cleaning system at the Glencoe Village (Illinois) Water Plant. "We were sold," Blaha says. Two Rivers Waterworks became the first in the state to use the process, which successfully cleaned the intake pipe.

PLANNING AHEAD

Constructed in 1924, the cast iron raw water intake pipe runs 6,000 feet from a depth of 34 feet to the shorewell. Water flows by gravity, entering the structure through a 90-degree cast iron elbow connected to the drop pipe attached to the plant line. Operators maintain a depth of 15 feet in the 20-foot-diameter well.

PHOTOS BY SCOTTIE DAYTON

Erick Halaburt (foreground) and Tim Campbell on the catwalk with Frank Frosolone Jr. push the 90-degree elbow toward the hole in the wall. Outside, Frank Frosolone Sr. directs the alignment.

The ultrafiltration facility feeds 12.5 percent sodium hypochlorite before finished water enters the plant's high-lift pump station supplying two elevated storage reservoirs and a sealed reservoir serving a second pressure zone. "We store 3 million gallons, enough for 1.5 days," Blaha says. "This project included a temporary water source and permanent piping in the well to facilitate future cleanings."

Brian Hackman, P.E., BCEE, of Strand Associates, helped city officials obtain permits from the DNR and Army Corps of Engineers to work in the lake. Hackman calculated that cleaning the pipe equaled 5 percent of the cost to replace it. Improved hydraulics and less solids loading on the membrane filters would bring further savings.

OUT WITH THE OLD

Beginning in mid-July 2018, truckloads of equipment from a subcontractor began arriving. Foreman Tim Campbell, his assistant Erick Halaburt, and forklift driver Mark Bernal unloaded and staged it. "Cleaning the pipe took slightly longer than three days; preparing for it took 18 days," Frosolone says.

Frosolone hired Hard Rock Concrete Cutters to core drill a 36-inch hole through six rows of bricks in the well wall for the 24-inch cleaning line. Removing the 90-degree elbow and 3 feet of drop pipe from the well required the entire Northern Divers USA team.

Diver Corey Gerenda attached suspension straps to the elbow, aided by Frank Frosolone Jr. topside, and Joe Villarreal, who monitored the communication cable and hoses supplying air to Gerenda's dive helmet and hot water to his suit. (The water temperature was 54 degrees F.)

Frosolone Sr., controlling the Stellar 7630 crane on his truck, lowered the boom's snatch block through a 36-by-48-inch hatch in the shorewell roof. With the straps attached to the block, the crane supported the elbow's weight as Gerenda used an underwater torch to sever the nuts on the flange and cut through the drop pipe. Once the divers were out of the water, Villarreal communicated via radio with Frosolone as he "flew" the fitting out through the hatch with less than an inch clearance on all sides.

As the extending forklift boom pushes the sled-pipe assembly into the lake, the pontoon dive boat helps pull it to a designated red buoy.

SLEDS AND ELBOWS

Frosolone observes, "We use custom-fabricated 72- by 36- by 24-inch-deep sleds to help anchor the HDPE pipes in water, but welding on the 90-degree elbows happens on site based on the current pipe's diameter."

The team spent a day cutting 14-inch elbows with flanges to length, removing half the back of the elbows near the base and welding the fittings to the sleds. "The solid sled bottoms and elevated elbows eliminate drawing in sand and sediment," Frosolone says.

"The elbows connect to 14-inch pipes running back to one of six pumps feeding the custom-built manifold. It sends flows up to 78,000 gpm at 10 feet per second through the intake pipe in the well. Out at the intake riser, water and material blast up like a volcanic eruption."

Meanwhile, Campbell's team moved the pumps and sleds into position along the shore, then began fusing pipe with a McElroy TracStar 900 Series 2 fusion machine. "We needed 150 feet of 12- and 24-inch pipe and six 150-foot lengths of 14-inch pipe," he says.

Back at the shorewell, Frosolone faced another clearance problem as he lowered a 450-pound 24-inch HDPE DR 17 tee through the roof hatch. Diver Gerenda connected the tee inlet to the intake line and a tee outlet to the drop pipe. After placing a rubber gasket between the flanges, he secured them with 10 1.25-inch stainless steel threaded rods with nuts and washers.

Over several days, Frosolone's crew connected two 45-degree elbows to the upper tee outlet, followed by a 90-degree elbow aligned with the hole in the wall. "The elbows had to swing out at an angle from the vertical to rest on the catwalk, enabling us to attach the suspension straps to the overhead hoist," Frosolone says. Campbell and Halaburt helped manhandle the fittings until the flange holes aligned.

OUT TO SEA

Frosolone put the first three pipe assemblies into the calm lake in early August. After Campbell and Halaburt attached a sled to a pipe via flanges, they secured a strap to the front of the pipe. Bernal slipped a lift fork through the loop in the strap, then raised and extended the boom 38 feet, pushing the assembly into the water.

Diver Gerenda swam the cable attached to the front of the sled to the pontoon dive boat offshore. Then he and diver Frosolone Jr. counteracted the force of the waves to help keep the floating pipe on course toward a red buoy.

Helmsman Frosolone Sr. communicated with Campbell via radio on how fast to pull as Bernal pushed the back of the pipe forward, guided by Halaburt's hand signals. Campbell's "all stop" signified that the rear pipe flange was aligned with the pump flange.

With the flange attachment completed, Frosolone tested the 12-inch temporary water supply pump and made a nasty discovery. "Spring storms had added 10 inches to the height of the sandbar, enabling a vortex to form at the sled," he says. "To avoid sucking air, we had to push out the lines another 50 feet."

A three-day wait for additional pipe gave the Mersino crew (Global Pump) time to undo the flange connections and drag the lines back on shore. Fusing the 50-foot sticks and setting all seven pipes in the lake took two days.

> "Previously, we couldn't pump more than 1,000 gpm without seeing 10 NTU or higher. When we tested the pipe by increasing our flow to 1,600 gpm for 15 minutes, turbidity held at 0.90 NTU."
>
> **ROSS BLAHA**

TURBULENT WATERS

"Our start date was Aug. 13, and water industry people were coming from all over to watch," Blaha says. In the August heat, Frosolone and Campbell's people raced to connect the remaining piping.

On schedule, Frosolone flushed the temporary waterline and Campbell set the floats in the well at 10 and 15 feet. The pump, set on automatic, delivers up to 4 mgd. "That's twice our summer demand," Blaha says. "Even better, it didn't increase our chlorine use."

Not knowing where the pipe might be three-quarters blocked added to the challenge of cleaning it. "If I started too many pumps too soon, the velocity could cause a blockage or bulge the pipe," Frosolone says. "Likewise, once

the first pump starts, it can't stop, or material will fall out of suspension and create a plug."

With the dive boat stationed over the intake riser and the team's ROV-1000 (Outland Technology) sending images to the surface, Frosolone started pump No. 1. The water, forced through the custom manifold under high volume and velocity, scoured the pipe without damaging it.

Villarreal sent the ROV images to Frosolone's cellphone. Guided by how much debris spouted from the intake riser, he slowly started the remaining pumps. A brown plume soon stretched out for a mile, returning sediment to the lake.

TAMING TURBIDITY

The pumps ran nonstop for 80 hours, and Frosolone's team monitored them on rotating 8-hour shifts. Every 12 hours, they sent down the ROV to check what was coming out of the riser. After they pumped 219 million gallons through the intake pipe, 100 percent clean water finally appeared.

"Previously, we couldn't pump more than 1,000 gpm without seeing 10 NTU or higher," Blaha says. "When we tested the pipe by increasing our flow to 1,600 gpm for 15 minutes, turbidity held at 0.90 NTU."

Tim Campbell (left) signals forklift driver Mark Bernal to keep retracting the boom as Erick Halaburt helps align the first rod in the 14-inch pump flange.

Cleaning the pipe is underway as the dive boat motors out to the intake riser.

The 72- by 36- by 24-inch-deep sleds helped anchor the HDPE pipes in water. Solid bottoms and elevated elbows eliminated drawing sand and sediment into the pipes.

> "The highest turbidity we've seen with the new riser was 0.51 NTU, our average is 0.31 NTU and the low was 0.21 NTU. Those numbers are phenomenal."
> **ROSS BLAHA**

Because the ROV wouldn't fit in the pipe, Frosolone inspected it using a GoPro camera attached to his custom stabilization platform and a lift bag. "Frank Jr. went down with the apparatus, Ross increased the intake flow and the current dragged it in," Frosolone says. "The inspection proved the line was clean."

To prevent the short intake riser from sucking in lake-bottom debris, Frosolone fabricated a replacement: a 5-foot-high steel riser tapering from 6 to 2 feet square at the bottom. He also made a screen with a hatch for it. After towing the riser suspended by a lift bag into position, the divers bolted it to the intake flange.

"With the old riser and a strong southeast wind blowing over the lake, we'd see 15 NTU or greater," Blaha says. "The highest turbidity we've seen with the new riser was 0.51 NTU, our average is 0.31 NTU and the low was 0.21 NTU. Those numbers are phenomenal." Depending on lake action, Northern Divers USA will clean the intake pipe every three to five years.

FINAL DETAIL

Storms or a rough lake often prevented offshore work. Frosolone used the time to clean the clogged 2-inch chlorine line using air pressure. The line terminated at the riser. "The air compressor ran for three days," Blaha says. "We don't know what was in the line because divers couldn't grab a sample, but it's open now. Frank saved the city $500,000 to replace it."

When the weather cleared, Villarreal mounted a new chlorine feed line around the top of the riser to eliminate fittings and some piping. Additional feed points also dispense the chemical uniformly from all sides. **tpo**

1. The device's color sensor reads at intervals greater than or equal to one minute. The sensor has nanocoated measuring windows to minimize fouling of the optical system.
2. The manufacturer offers two controllers: a two-port model that can house two sensors and a larger controller that can operate four sensors.

Keeping Tabs on Color

AN ONLINE MONITORING SYSTEM HELPS OPERATORS CLOSELY REGULATE COLOR IN MUNICIPAL AND INDUSTRIAL APPLICATIONS

By Ted J. Rulseh

Removal of color from process streams is important in drinking water treatment and in various industrial applications.

To control color, it is first necessary to know how much of it exists both before and after a treatment process. That in turn depends on monitoring. One way to monitor color is by taking grab samples at specified intervals and analyzing them in a lab. A more timely and accurate way is to use instrumentation to monitor color online in the liquid stream.

For that purpose, Hach has introduced the NV3300 scanning UV sensor, an online device for industrial and municipal plant operators who need to monitor color changes. The instrument is a colorimetric probe designed to provide reliable online readings without the use of reagents.

Continuous monitoring enables operators to detect even slight changes in water color so that they can respond quickly and adjust the process if need be. Kyle Perez, product manager for open innovation with Hach, talked about the technology in an interview with *Treatment Plant Operator*.

> "Operators want continuous measurement so that as soon as there is a spike in the color reading, they know about it and can address it."
> **KYLE PEREZ**

tpo: What was the rationale for bringing this technology to market?

Perez: In emerging markets, and in industrial applications domestically, there is a need for color measurement in process control. In high-growth markets, many entities are regulated for color in the same way as turbidity, organics, and other parameters are regulated in the U.S. and Europe. In addition, on the industrial side, textile plants and other industrial facilities that use dyes typically use a color control mechanism to ensure that their process is removing color to a sufficient level before discharge to a municipal wastewater treatment facility.

tpo: If color isn't measured with an instrument like the NV3300, how is it monitored?

Perez: It's typically done with lab measurement of grab samples taken at some interval, usually once daily at most and probably in more cases weekly. Now if you have a change in influent or an upset to your system and you're only testing once a day, you might not see the change. Everything looks good for two weeks, but suddenly you're discharging more color than you thought. Operators want continuous measurement so that as soon as there is a spike in the color reading, they know about it and can address it.

tpo: Does this technology apply to drinking water treatment?

Perez: Color is regulated in many international markets, especially South America. Even where it's not regulated, there are two situations in

> "Color measurement is typically used to monitor for the yellowish tint from rust and metals or the greenish tint from algae. On our probe, we offer four wavelengths and three measurement methods designed around those applications."
> **KYLE PEREZ**

drinking water where color can be an issue. One is where you have algae blooms or algae issues in surface water. The other is in facilities with old piping where rust and metals get into the water. So color measurement is typically used to monitor for the yellowish tint from rust and metals or the greenish tint from algae. On our probe, we offer four wavelengths and three measurement methods designed around those applications.

tpo: In simple terms, how does this technology measure color?

Perez: An LED light source shines through a window. There's another window opposite from it and a path length where the sample flows between. We measure how much of that light source is being absorbed and at what wavelength. The color sensor reads at intervals greater than or equal to one minute. The sensor has nanocoated measuring windows to minimize fouling of the optical system. Options include automatic ultrasonic or high-pressure air cleaning, and a titanium housing for media like seawater and some industrial process waters.

tpo: How is the instrumentation deployed in the field?

Perez: The sensor is typically mounted on a wall with a flow cell to which the sample is delivered from the source (such as a pipe) by way of tubing. Alternatively, the sensor can be mounted vertically or horizontally directly in an open area process, (such as where the water is not confined to a pipe. We offer two controllers: a two-port controller that can house two sensors and a larger controller that can operate four sensors. Both can communicate with a SCADA system via standard protocols.

tpo: Can one controller accommodate two of the color sensing probes?

Perez: Yes. Probes could be positioned in two locations in a process. For example, a plant looking to remove color from water could mount one sensor upstream and one downstream from the treatment step and monitor percent removal. The sensor cables can extend up to 110 meters.

tpo: Can probes besides the NV3300 be used with this monitoring and control platform?

Perez: Yes. Hach intends to release additional sensors to this platform. We have already released the NX7500 multiparameter UV scanning sensor, which measures nitrate and nitrite, specific organic parameters like TOCeq, DOCeq, BODeq, CODeq, TSSeq, and more. This probe has a wide variety of applications, primarily in municipal wastewater, municipal drinking water, and environmental monitoring applications.

tpo: What has been done to prove this technology before release?

Perez: We have run pilot tests in Europe and in Latin America, where color is monitored from a compliance perspective and not just for process control. It is proven via testing to measure color to specific standards to enable operators to meet regulatory requirements in line with the DIN EN ISO 7887 (methods B and C) standard or the DIN EN ISO 6271 standard. tpo

Creative Problem-Solving

A PLANT IN WESTERN KENTUCKY FINDS CREATIVE WAYS TO DEAL WITH THE CHALLENGES OF AN AGING WORKFORCE AND EXCESS TREATMENT CAPACITY

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

The Central City (Kentucky) Water Treatment Plant was on the point of filling a major new demand when a change in federal rules took it away. That left the plant with greatly expanded capacity but not enough customers.

At the same time, the attractiveness of employment in larger cities made it difficult for the plant, in western Kentucky, to find and retain qualified operators.

With innovation and persistence, the Central City team faced the problems down and overcame them. The capacity issue and its associated issues are under control, and an effort to develop operator candidates locally has dramatically dropped the average age of the team.

Along the way, the Central City team picked up the 2018 Drinking Water Plant of the Year award from the Kentucky Water and Wastewater Operators Association. In addition, the late Marvin "David" Dossett, the plant's former lead operator, received the Kentucky Water and Wastewater Operators Association's 2018 Earl T. Mitchell Award for his dedication and integrity.

THE NEXT GENERATION

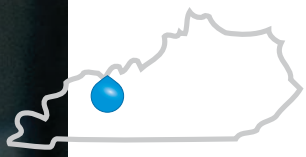
It was Dossett who began the program to develop a source of new operators. "Central City is a small town, but unfortunately we have a large plant that requires Class IVA operators," says Ronald Mobley, chief operator.

Under Kentucky regulations, that classification is at the top of the system and requires a bachelor's degree in science or engineering along with a year's experience in a large plant. The unfortunate part is Central City's location: It's only about an hour's drive from Evansville, Indiana, and Paducah and Bowling Green, Kentucky. All are much larger cities with big plants and bigger budgets for salaries.

In 2014 the mayor agreed to start an in-house training program; Dossett set up the standards and procedures for it before he died. The state provided an emergency allocation "because we were down to me and four operators trying to run 24 hours a day, seven days a week. Basically it was killing us," Mobley says.

Jeff Ford, head of maintenance, checks pumps for proper lubrication.

> "There is a risk that one of the people we invest in will be lured away, but if you don't try, you can't improve. I think we have a program that works, and so far it has paid off for us."
>
> **RONALD MOBLEY**



Central City (Kentucky) Water Treatment Plant

www.cityofcentralcity.com/departments/watersewer

BUILT:
1972, updated 1982, 2010

POPULATION SERVED:
24,093

SERVICE AREA:
479 square miles

EMPLOYEES:
9

FLOWS:
7 mgd design, 2.9 mgd average

SOURCE WATER:
Green River

SYSTEM STORAGE:
5.6 million gallons

DISTRIBUTION:
44 miles of water mains

ANNUAL BUDGET:
$1 million (operations)

KEY CHALLENGES:
Raw water sediment, obsolete expansion

Another issue was age: The average for the team in 2014 was 52. Both problems were solved by hiring young local people, and the best place to find them was the local high school. So the first step was to set up a booth at the school's career day. That produced one recruit, Austin Amos, who is now a Class III operator and will soon test for Class IV.

The next year, Amos went to the career fair and recruited Jordan Hooper who recently passed his Class IIIA exam. At the funeral for Dossett, Mobley began talking to Dossett's grandson, David McDowell. He is now at the Central City plant and recently passed his Class I exam.

In addition to these people and Mobley, who is Class IVA, team members are Jeremy Leach, lead operator, Class IVA; Jason Lacefield, who handles information technology, Class IVA; Gary Dennison, second shift lead operator, Class IVA; Jeff Ford, Class IIIA, maintenance lead; and Matt Mathis, trainee.

STARTING SLOWLY

Training proceeds in stages. "The great thing is, David left an amazing set of procedures and guidelines for me," Mobley says. "I love science and math, so it's easy for me to get trainees excited, and they seem to respond well. And the city has been generous enough to allow the extra expense."

In the first year of employment, the goal is to not overload trainees. They spend some time with Ford in maintenance, learning basics such as how to rebuild a pump. Occasionally they receive a few hours of instruction.

As the time approaches for the first set of operator exams, training periods increase. Employees who reach Class II certification work alone for one shift each week, but a Class IV operator is on call. "We want to give them that one a week so they get used to the pressure of working by themselves," Mobley says.

All the new hires have dropped the median employee age from 52 to about 35. When Mobley came on board, only one plant operator was from Muhlenberg County, where Central City is located. Now all the operators are from the county except Mobley and Leach, and those deep local roots make it less likely they will leave.

"Until a few years ago, all utilities did was steal employees from each other," Mobley says. "If someone offered you more money, you'd leave. That's no way to build a stable crew, and to be successful you need a stable crew."

The employee-poaching problem was made worse by a statewide shortage of Class IV operators. "Most are older, in their 50s or 60s, and the pay is not what it needs to be for that much training," Mobley says. "There is a risk that one of the people we invest in will be lured away, but if you don't try, you can't improve. I think we have a program that works, and so far it has paid off for us."

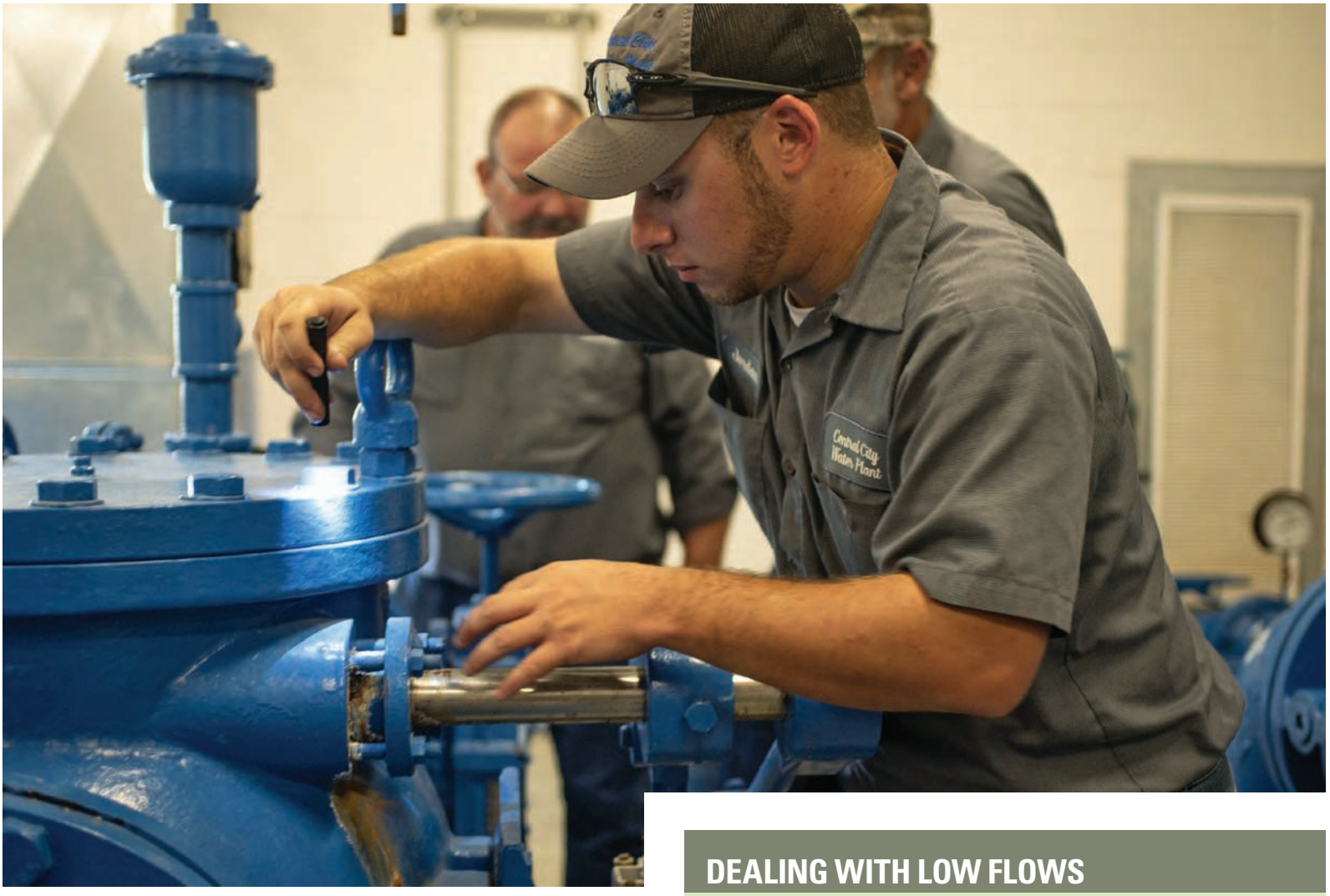
CONVENTIONAL PROCESS

Water for the Central City plant is drawn from an intake about a half-mile north of the plant on the Green River. Potassium permanganate is fed at the intake. A 20-inch pipe brings raw water to a three-compartment splitter box with flash mixers. Carbon comes in just before the splitter.

From there, water is treated with heavy polyaluminum chloride for coagulation before it flows into two twin step-down flocculation chambers and then a pair of four-chamber, zero-sludge sedimentation basins. These are a new design that came with an expansion several years ago. The basin bot-

> "I love science and math, so it's easy for me to get trainees excited, and they seem to respond well. And the city has been generous enough to allow the extra expense."
> **RONALD MOBLEY**

Jordan Hooper, left, operator, and Jeff Ford, head of maintenance, perform routine maintenance work on the scraper motor for the sedimentation tanks.



Jordan Hooper services a resting pump.

toms are shaped so that settling solids flow into pits. An arm slowly sweeps the bottoms, and every four to six hours the pits are emptied.

Chlorine is injected into the water after it comes out of the sedimentation basins and before it goes over the weirs. Filtration is done in six rapid sand filters of standard construction with rock, anthracite and sand. Filtered water enters a small clearwell and then is sent to a pair of larger clearwells — glass-lined tanks with a combined 1-million-gallon capacity. Two high-service pumps (National Pump) push the water out into the distribution system.

FLAGGING DEMAND

Combined with the local market, the upgraded and expanded plant produced the other major challenge for Central City. The plant serves almost all of Muhlenberg County through water districts that buy from the city.

Among the customers of those districts are several coal companies. The largest customer, responsible for 50 percent of demand, is the Tennessee Valley Authority, the federal corporation that provides electricity to part of Kentucky and parts of six other states.

In 2009, the city ran up against a development limit: The plant could meet existing demand but no more, and no new businesses or coal mines were allowed. So the city worked with rural development agencies to get funding and authorization to expand the plant to a design capacity of 7 mgd with an expected average of 5 mgd.

As that was happening, the federal government began encouraging power plants to abandon coal and switch to natural gas. That greatly reduced demand for water from the water districts, which began aggressively following water-

DEALING WITH LOW FLOWS

When you have to run a large system at much less than its design capacity, there are problems that can't be avoided. "You just can't take a 5.3 mgd flow and cut it to 2 mgd without having some issues," says Ronald Mobley, chief operator at the Central City (Kentucky) Water Treatment Plant.

To help cure a water-age problem in the distribution system, the water plant is shut down for four hours a day to force greater turnover in the tanks. With the plant off, the flow through the city is typically only 600 to 800 gpm, but a large customer on the system was demanding about 2,000 gpm. When that customer shut off its valves, they slammed shut. A hydraulic shock wave came back along the pipe.

"We were having pipes — a few — actually blow holes in their tops," Mobley says.

One help in finding and solving the problem was the SCADA system. It allows operators to watch demand trends, Mobley says. Operators saw a flow and then sudden large spikes.

Another part of the water-age solution had been to shut down some storage tanks. But when the large customer put demand on the system, customers in another part of the city lost pressure.

The answer to the hammering and pressure loss involved putting one tank back into service. But when it was put back into the system, the water-age problem returned in that area. Engineers are still working on a short-term fix for that one, Mobley says.

The team at the Central City Water Treatment Plant includes, back row, from left, Jeff Ford, head of maintenance and Class IIIA operator; David McDowell, Class I operator; Austin Amos, Class III operator; and Jason Lacefield, information technology and Class IVA operator. Front row, Jeremy Leach, Class IVA operator; Matt Mathis, trainee; Ronald Mobley, Class IVA chief operator; Jordan Hooper, Class IIIA operator; and Gary Dennison, second-shift lead Class IVA operator.

loss reduction programs. All this plus a slight rate increase dropped demand to about 3 mgd, where it is today. Unused capacity led to a problem: Violation of the limits on disinfection byproducts because water was sitting too long in the system.

SEEKING SOLUTIONS

"We tried to do some short-term things, but when the demand didn't return, we had to face the market as it was," Mobley says. For short-term fixes, the team looked at all the treatment steps upstream of the filters. They were more aggressive in using potassium permanganate. They used carbon daily and were aggressive in feeding it. They moved the chlorination point back to almost at the filters.

"Our primary process became optimized, but we were still having trouble," Mobley says. "We were barely in compliance at the plant site." After finding that half the chlorine residual was lost in the Central City distribution system, they shut down three tanks. That left 2 million gallons of storage in the city and 1 million gallons at the plant.

They did more experiments to find the best location for the chlorine injection. Every four hours they sample chlorine concentration upstream of the filters. A second chlorine analyzer on the effluent side of the clearwells tells operators how much the chlorine has degraded. As a result of testing, they added a second chlorine injection point just upstream of the high-service pump. The two injections and continuous readings from the analyzers allow operators to fine-tune the chlorine concentration just before water leaves the plant.

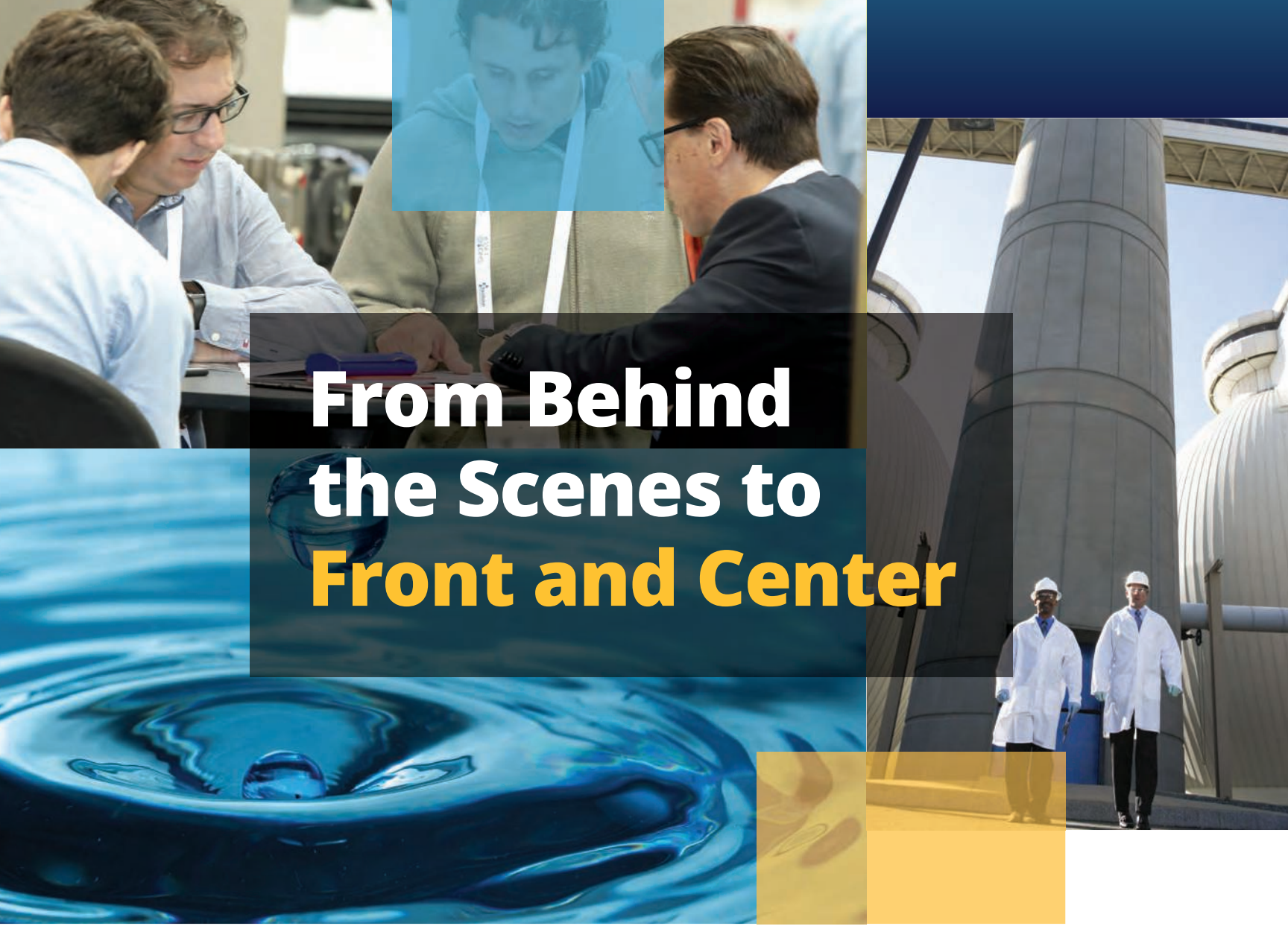
In the end, the plant was running at half its allowed byproduct concentration. Yet one challenge remained: While the plant was meeting its limits, byproducts were still above limits in the city.

The final change was shifting to a 20-hour run instead of 24 hours.

Before that change, the team found the storage tank in the northern part of the city was turning over only about 11 percent of its water each day. The other tank, in the southern part of the city, was turning over about 30 percent because that's where some large customers are. Shutting the plant off for four hours and letting the SCADA system control demand resulted in about a 30 percent turnover in the north tank and almost 50 percent in the south tank.

The Central City team is not resting. With the help of a consultant, they recently finished a study of water aging in the entire distribution system. The intake site is getting sluice gates. New equipment will monitor corrosiveness of the water leaving the plant, and there is a lab upgrade in progress to add equipment and some space.

It's all designed to adapt the system to low flows not likely to increase anytime soon. If the recent past is prologues, the plant team will pass the test with flying colors. **tpo**



From Behind the Scenes to Front and Center

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Sidney Innerebner with the WEF mascot

A Potent Training Toolkit

A NEW SERIES OF BOOKS FROM THE WATER ENVIRONMENT FEDERATION GIVES OPERATORS A COMPREHENSIVE, UP-TO-DATE AND LEARNER-FRIENDLY PRESENTATION OF WASTEWATER TREATMENT PROCESSES

By Ted J. Rulseh

There's always demand for high-quality wastewater operator training materials. The Water Environment Federation (WEF) is answering the call with a new series of three *Wastewater Treatment Fundamentals* books, envisioned as "training for the operator of the future."

The books and their online counterparts are designed to help operators prepare for certification exams and qualify for continuing education credits. The material is fully up-to-date and peer-reviewed, and it draws on the expertise of hundreds of water-quality professionals.

The first book in the series, *Wastewater Treatment Fundamentals I: Liquid Treatment*, was released last fall. Besides the basics of liquid treatment processes, the book covers critical aspects of biological treatment, nutrient removal, and disinfection in significant depth. It aims to help operators prepare for the first three certification levels.

The second volume, *Wastewater Treatment Fundamentals II: Solids Handling and Support Systems*, is scheduled for release in fall of this year. The third volume, covering advanced treatment processes such as membranes and ion exchange, will be published later.

Sidney Innerebner, Ph.D., P.E., CWP, owner of Indigo Water Group in Littleton, Colorado, is the author of the first two books. She is an experienced operator and trainer, and her company offers services that include utility planning, biological process and collections system modeling, regulatory assistance, performance evaluations, process assistance, plant optimization, and contract operations for small wastewater systems. She talked about the book series in an interview with *Treatment Plant Operator*.

tpo: What is the central idea behind this series of training manuals?

Innerebner: The intention is to have one-stop training for operators so they don't have to seek out information from a bunch of different sources when studying for their certification exams. We also want to help train the operators of the future. Treatment plants keep getting more complex, and so operators need a bigger, better knowledge base, especially for nutrient removal and everything we've learned about activated sludge over the past 30 to 40 years.

tpo: What background do you have that prepared you for this project?

Innerebner: I started as a chemist at the Rocky Flats nuclear weapons facility in Colorado. After five years there, I took a position as a trace metals chemist with the Littleton Englewood Wastewater Treatment Plant, which is now called South Platte Water Renewal Partners. While there, I went to school at night to get my masters and Ph.D. in environmental science and engineering. I was also involved in operations, starting there and later as the operator in responsible charge at several facilities. I've been a trainer for almost 30 years, and I'm a past chair of the WEF Plant Operations and Maintenance Committee.

> "Treatment plants keep getting more complex, and so operators need a bigger, better knowledge base, especially for nutrient removal and everything we've learned about activated sludge over the past 30 to 40 years."
> **SIDNEY INNEREBNER**

tpo: Why is this series necessary when so many other training resources are available?

Innerebner: There are other training resources out there, but what makes this series different is that it's current and peer-reviewed. A lot of training materials have been in existence for quite a while and are pretty out-of-date, especially when it comes to biological nutrient removal and activated sludge systems. The amount of knowledge operators need for certification exams and to run their facilities has surpassed what is in the older materials.

tpo: What areas does the first volume in this series cover?

Innerebner: It has 10 chapters that cover the entire liquid side of the process. It starts with headworks and then goes through lagoons, trickling filters, rotating biological contactors, activated sludge and nutrient removal — all the basics of biological treatment. There's a section on basic chemistry because operators need some knowledge in that area. The last chapter covers disinfection. The intent is for this book to get operators through at least their Grade 3 exam, or their B level exam, depending on the state.

tpo: How did you decide on the content for this book, given the vast scale of the subject?

Innerebner: The book is based on the need-to-know criteria defined by the Association of Boards of Certification, or ABC. They have a list of things that operators are expected to know at the different testing levels. Those criteria are updated regularly. In fact, ABC issued an updated list of need-to-know criteria while I was working on this manual. They added lift station and collections systems troubleshooting to the treatment exam because wastewater operators often handle collections system duties. That means I need to add a lift station section to the second volume.

> "The book is easy to learn from. It has short sections followed by practice questions. There are more than 1,000 practice questions in all. It's loaded with color pictures, diagrams and infographics."
>
> **SIDNEY INNEREBNER**

tpo: Is this a book that a plant supervisor could give to an operator in training?

Innerebner: Yes, and the hope is that courses and certification programs at community colleges will actually use it as their textbook. I know the Ohio Water Environment Association plans to use it for developing all their training materials.

tpo: How does the peer-review process work?

Innerebner: I write a chapter, and then it goes out for comment. Depending on the chapter, the peer review could involve 15 to 30 people who are subject matter experts. They tell me what they thought I got wrong or what I could explain better. Then there are regional differences. I'm in Colorado and the technologies in our facilities aren't necessarily the same ones that facilities on the East Coast or in Nebraska have. Peer review has been really good for making sure the book covers everybody, not just the experiences of people from one region or another. Once the comments are addressed, they go back to the reviewers so they can see how I addressed them. If everyone is happy, the chapter then goes to a secondary review committee. Then, it's off to the editor and typesetter.

tpo: Learning from a book can be difficult. What makes this book effective as a teaching tool?

Innerebner: The book is easy to learn from. It has short sections followed by practice questions. There are more than 1,000 practice questions in all. It's loaded with color pictures, diagrams and infographics. Operators can learn a great deal from looking at the pictures and seeing for themselves how things operate.

Every chapter has a summary table at the end — a bullet list of everything covered in the chapter. Operators looking for a quick refresher can read that and see if they got all the main points. If they take the online course that goes with book, it's more interactive. There are videos to watch, and at the end of each chapter there's a final exam. WEF is seeking approval so that operators taking those exams can earn training units.

tpo: Beyond sample questions, are there any in-depth problem-solving exercises?

Innerebner: Several of the chapters have more complicated scenarios to work through. The operators are given a paragraph of information about a realistic facility situation, and they're asked to work through that. For example, in the activated sludge chapter there's an exercise where they have to set the return activated sludge rate and the waste activated sludge rate and select the target sludge age.

tpo: How would you describe the writing style in this book?

Innerebner: I try to relate the concepts back to something people already understand. For example, a lot of wastewater professionals come from mechanical backgrounds. In wastewater training, bacteria are often explained by microbiologists as these magic, fuzzy things. But the way to think about a bacterium is as a little combustion engine. An engine needs two things to operate: fuel and oxygen. In our case, the fuel is BOD, or sometimes ammonia. When you burn the fuel, you get certain waste products. Those are the kinds of explanations that connect with operators. We don't want the material to be scary or intimidating.

tpo: How did you deal with all the terminology in the industry?

Innerebner: I tried to not use a lot of jargon. Some of it is unavoidable because we are an acronym- and jargon-heavy industry. So the book has many little sidebars. Any place where I introduced a term, or where a term has a different meaning in wastewater than in common language, or where a term appears that hasn't been mentioned since a previous chapter, the definition is in a sidebar on the page so operators don't have to go and look things up.

tpo: Are there any resources available to help trainers make use of this book?

Innerebner: A trainer's kit is in process and should be available very soon. All of the graphics and tables from the book will be included, along with PowerPoint presentations that highlight key concepts in the book and include definitions and quiz questions. Trainers will be able to print handouts that include the chapter summaries, reference lists, a list of acronyms, problem-solving exercises and more. We hope that will make it easier for colleges and instructors to adopt our materials.

tpo: Once this series of books is complete, what would you recommend as an effective training package for operators seeking certifications?

Innerebner: If they're studying for an exam, I would suggest books I and II, along with *Basic Laboratory Procedures for the Operator-Analyst,* which WEF released in 2012. It explains the most common lab procedures for wastewater. Those three books would comprise a really nice, complete source. Operators taking their grade IV or A level exams will also need book III — advanced treatment. tpo

The City of Waynesboro wastewater treatment and water treatment plants.

A Source of Pride

THE WAYNESBORO WASTEWATER TREATMENT PLANT DELIVERS QUALITY EFFLUENT WITH NEW EQUIPMENT, A SOUND MAINTENANCE PROGRAM AND A DEVOTED STAFF

STORY: **Jim Force**
PHOTOGRAPHY: **Kevin Blackburn**

From wastewater plant management to the operational staff, Public Works department, and community, pride was busting out all over Waynesboro after the town won the 2018 Virginia Rural Water Association Plant of the Year.

"We received the award at the association's annual conference, and we took it back for a special presentation at the next City Council meeting," recalls Ross Morland, P.E., plant engineer. "The mayor presented the award to the plant staff, and members of the council congratulated them and thanked them for their hard work. There were handshakes all around. We'd received pats on the back and local appreciation in the past, but the state award was a first for us."

While Morland is pleased with the honors he and his staff have received, he's not surprised. Located in the Blue Ridge Mountains, the Waynesboro plant meets a stringent discharge permit for biological nutrient removal, hits nearly all its key performance indicators, and is staffed by a dedicated group of operators who take a personal interest in the plant's success. "Everybody's willing to pitch in and help out," Morland says. "I couldn't ask for a better group of employees."

MAJOR UPGRADE

In the old days, Waynesboro operated a 1954 trickling filter plant designed for 4 mgd. Upgrades in 1967 and 1989 added traveling bridge sand filters for tertiary treatment and rotating biological contactors as a polishing step to meet lower BOD requirements.

The system experienced frequent sanitary sewer overflows and faced a consent order to improve its collections system and to expand treatment plant capacity to handle excess flows. Working with the Hazen and Sawyer design firm, the city began an upgrade to 6 mgd in 2006 and finished the $32.6 million project in August 2010.

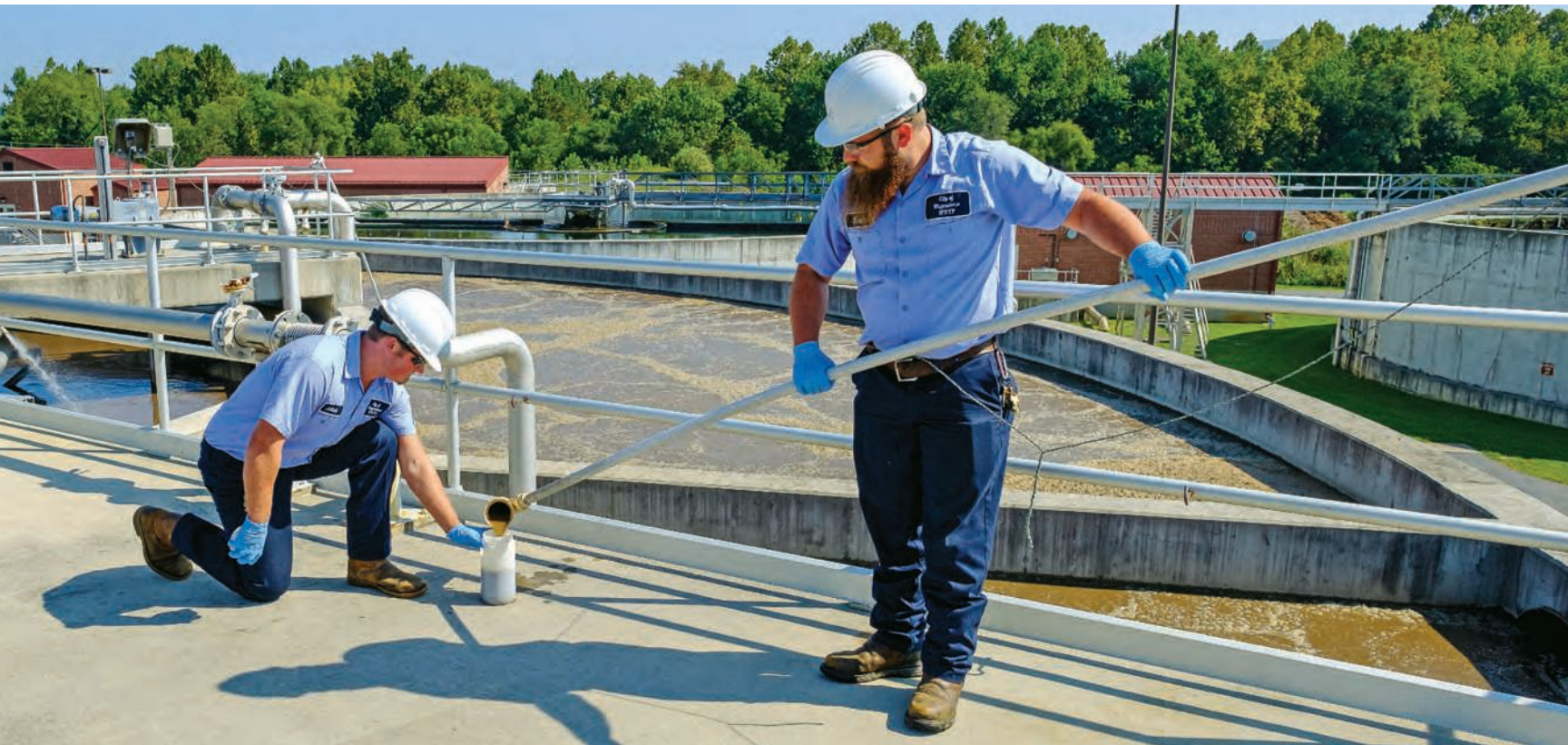
At the head end of the new plant, a bypass manually cleaned bar screen and two automatic mechanical screens (all from MN Water Treatment Products) remove rags and debris. Two 350 gpm vortex cyclone units (E & I Corporation a Div. of McNish Corporation) remove grit after the flow passes through a Parshall flume to a pair of tanks for a five-stage Bardenpho activated sludge process designed for BNR.

In the first stage, anaerobic treatment occurs, followed by the anoxic zone, then an aerobic zone, a second anoxic zone, and the final aeration zone. Philadelphia Mixing Solutions' mixers mix the contents, and Sanitaire - a Xylem Brand fine-bubble diffusers disperse air delivered by three Aerzen blowers.

Treated water settles in a pair of circular clarifiers before passing through a six-layer gravel bed filter. Disinfection occurs in a three-channel TrojanUV3000Plus UV unit with low-pressure, high-intensity lamps. Alum is fed for phosphorus removal in a splitter box and in the return activated sludge pump station. Carbon is fed at the start of the second anoxic zone in the BNR tanks for denitrification.

A Siemens Industry Process Instrumentation HydroRanger 200 ultrasonic level transmitter measures influent and effluent wet well levels, chemical tank levels and effluent flow. High-quality

Jake Long, left, technician, and Scott Balsley, chief operator, take mixed liquor samples for process control and compliance testing.



The team at the Waynesboro Wastewater Treatment Plant includes, seated front, from left: Brad Wiliams, maintenance worker; and Scott Balsley, chief operator. Standing: Dustin Fisher, operator; Tony Reed, lab technician; Ross Moreland, plant engineer; Marvin Godbey, lab director; and Jake Long, technician.

A lab technician reviews bacteria counts using a PentaView digital microscope (Celestron).

Waynesboro (Virginia) Wastewater Treatment Plant

www.waynesboro.va.us

BUILT:
2010

POPULATION SERVED:
21,900

FLOWS:
6 mgd design, 2.45 mgd average

TREATMENT LEVEL:
Secondary

TREATMENT PROCESS:
Activated sludge, biological nutrient removal

RECEIVING WATER:
South River

BIOSOLIDS:
Landfilled

ANNUAL BUDGET:
$1.53 million (operations)

effluent is released through a cascading aeration channel before discharge to the South River. The plant achieves exceptional annual average discharge concentrations of 1.17 mg/L total nitrogen and 0.11 mg/L total phosphorus. It also meets tight limits for TSS, CBOD and ammonia called for by the Virginia Department of Environmental Quality, or VDEQ.

Biosolids are anaerobically digested. The primary digester features Jetco mixers, Weir Specialty Pumps (WEMCO) chopper pumps and an external heat exchanger. The primary and secondary digesters are covered by Envirex (Evoqua Water Technologies) Dystor digester covers. Solids are thickened before addition to the digesters, then dewatered on two belt presses. The resulting cake is landfilled.

KEYS TO SUCCESS

Waynesboro has also made strides in preventive maintenance and asset management. “Our planned maintenance management program was established about two years ago,” Morland says. “We’re getting all our data into the

database (Cartegraph) so we can plot inspection schedules and rotation of equipment. In the past we were simply following a spreadsheet. Now when guys get caught up for the day, they can go to PM schedule and stay ahead of it."

It's the same way with asset management. "It was made easier with a brand-new plant," Morland says. "Now we're able to define the critical needs and life expectancy of each piece of equipment. It's been a huge improvement." Waynesboro uses a list of key performance indicators to track success and share progress with operators, as well as its director and town manager and members of the Town Council. Specific indicators include:

- Compliance with regulations
- Number of overflows in the sewer system and pump stations
- Planned versus unplanned maintenance
- Cost of treatment versus a five-year average
- Level of fulfillment of staff positions
- Staff training hours
- Lost-time work days
- Number of customer concerns and complaints.

The team met nearly all the targets in 2017. The indicators are important for measuring department successes, for budget planning, and for operator communications, Morland says. "We share the results with staff. They can see our goals and what we are trying to achieve."

Tony Reed, lab technician, prepares slides for a bacteria count.

BOOSTING MORALE

That information may be one reason the Waynesboro staff has such a positive attitude. "Each of us looks forward to coming to work each day," Morland says. "There's a strong workplace culture here. Lines of communication are open. There's no micromanagement. Operators are free to approach their tasks on a day-to-day basis and choose what they want to work on."

> "There's a strong workplace culture here. Lines of communication are open. There's no micromanagement."
> **ROSS MORLAND, P.E.**

GETTING WITH THE PUBLIC

Waynesboro doesn't hide its wastewater treatment plant from the public. It's in full view at a number of community events, and students and community groups tour the facility regularly.

"We do a lot with our school kids all the way through high school and college," says Ross Morland, P.E., plant engineer. "All our staff members were born here or near here. They take a lot of pride in the treatment plant and actively participate in school tours and public events."

Tours are only one part of the program. At the community's annual fly-fishing exposition on the South River, and at Public Works Day, the entire Public Works department, the treatment plant, and its staff are on display. "I think it's a major reason why we won the Virginia Rural Water Association award," Morland says.

The flyfishing event takes place over two weekends each spring and brings hundreds to the riverbank in the middle of town to watch demonstrations, learn about fish and fishing, and try their hand at hooking a native rainbow or brook trout, or a planted smallmouth or largemouth bass.

The wastewater treatment plant has an informational booth at the event, promoting environmental conservation and showing the public how the plant helps protect the South River, a tributary to the Shenandoah River and part of the Chesapeake Bay watershed.

People also learn about the plant at the annual Public Works Day, which Waynesboro hosts in conjunction with a national program conducted by the American Public Works Association. The days include a catered lunch for the Public Works staff and special recognition for deserving employees, followed by games, demonstrations, and crafts for the public.

"We usually start the open house in midafternoon, and it lasts until 8 p.m.," Morland says. He estimates that last year about 300 people showed up to enjoy the day and learn about Public Works operations and water quality. Still, the tours — about 10 per year — are the backbone of the public education effort. The tours involve public, private and home-schooled children, university students and professors, and special interest and environmental groups. "We've developed good relationships with the teachers, including science teachers at each elementary school and teachers in the gifted and talented programs," Morland says.

Jo-el Nelson, who teaches an Advanced Placement environmental science courses at the Shenandoah Valley Governor's School about 15 minutes from the plant, agrees. "It's fascinating for our students to see all the treatment processes in our community," she says. "It's really cool to learn where the water goes from our homes and industries, and to see how they do things at the plant like fixing leaking pipes with balloons and using robots. It's a lot better than seeing things in a textbook."

Nelson has 14 to 20 seniors in each class. She says many of the students go on to careers in environmental sciences. The Waynesboro plant staff also works directly with high school and college students, offering internships and mentoring programs. It's not unusual for older students to take an interest in the plant and job shadow or end up as summer employees.

Waynesboro (Virginia) Wastewater Treatment Plant PERMIT AND PERFORMANCE

	INFLUENT*	EFFLUENT*	PERMIT
CBOD	70 mg/L	<2.0 mg/L	5 mg/L
TSS	175 mg/L	<1.0 mg/L	20 mg/L
Total nitrogen	N/A	1.17 mg/L	3.0 mg/L
Total phosphorus	6.82 mg/L	0.11 mg/L	0.3 mg/L

**Annual averages*

The team includes Scott Balsley, chief operator; Ted Brown, Matt Neyman, Dustin Fisher and Robb Peterson, operators; Cliff Doughty, chief maintenance technician; Brad Williams and Jakob Long, maintenance workers; Marvin Godbey, lab director; and Tony Reed, lab technician. The staff gets together frequently for meetings. "We work together on problems and talk over ways to resolve them," Morland says. "Everybody comes together to help with studying and understanding the treatment process and what our different roles are. Whether it's replacing a piece of equipment, or fixing a pump station, or what kind of pizza to have for lunch, everybody has buy-in. That goes a long way toward creating a unified group of operators. Working together smoothly helps keep morale high."

> "We need to stay on top of things. Aging equipment repairs and replacement will be our biggest challenges."
> **ROSS MORLAND, P.E.**

Staff input is based on solid knowledge. All five operators are state licensed, as are both laboratory technicians and one of the maintenance specialists. All are cross-trained. "Nobody is afraid to jump in and help out," Morland says. The town provides an incentive for continued education by offering a 5 percent wage hike to operators who attain each higher license level.

"Our operators are having continued success," Morland says. "They all bring something personally and professionally to the table. They're moving up. Our former chief operator, Troy Eppard, was recently recruited by the VDEQ for his excellent work in the industry and will be missed."

CHALLENGES AHEAD

Morland, who was born and raised in Waynesboro, received his engineering degree from Old Dominion University, and worked for a consulting firm before joining the Waynesboro team in 2011, sees challenges ahead. "We're fortunate to have a brand-new plant, start to finish, but in the future, we'll have to abide by any new regulations on our discharge. And looking ahead two to three years, some of our major equipment will need upgrades or at least serious evaluation."

Continued implementation of the preventive maintenance and asset management systems is also on the list: "We need to stay on top of things. Aging equipment repairs and replacement will be our biggest challenges."

The staff is up to the challenges. In the plant's Virginia Rural Water Association award nomination, Morland wrote, "Since coming online in 2010, the plant has developed a fantastic workplace environment that fosters employee engagement and team support through positive energy, open communications, and strong worker-coworker relationships."

While the award judges may not have experienced the camaraderie in person, they could no doubt sense it when they chose Waynesboro as the Plant of the Year. **tpo**

Ross Morland, plant engineer

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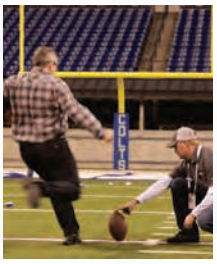

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Reuse, Recovery and Energy Management

By Craig Mandli

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RELINER/Duran Manhole Invert Channels

RELINER/Duran Manhole Invert Channels are molded fiberglass flumes with smooth sewer pipe interfaces that can be used to rehabilitate inverts without flow interruption. The field-installed modular components bolt together inside the manhole and serve as the form for a new concrete bench. They eliminate the inconsistencies associated with field-formed concrete channels. The full-depth lined channels are high-flow and easy to clean and maintain. Standard 8- and 12-inch channel sections fit through a 24-inch manhole frame and will accommodate 6- through 12-inch pipes. Larger sizes are available. **800-508-6001; www.reliner.com**

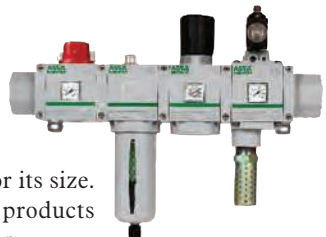
OPTIFLOW 270 Baffle System from Smith & Loveless

SMITH & LOVELESS OPTIFLOW 270

The OPTIFLOW 270 Baffle System from Smith & Loveless addresses the numerous 270-degree vortex grit chambers that are installed throughout North America and elsewhere. It is a simple retrofit baffle system that allows 270-degree grit systems to achieve improved removal efficiencies. Vortex grit removal systems designed to meet previous standards can be upgraded to remove 95 percent of grit down to 150 microns with the retrofit. The baffle system achieves improved efficiencies by directing the flow toward the hopper for an additional pass along the chamber floor, reducing the weir effect at the outlet and ensuring ideal velocities at all times. The retrofit system is available not only for flat-floor vortex grit chambers, but also as a conversion system for sloped and cone-shaped grit chambers. It can be installed for new systems requiring 270-degree layouts. **800-898-9122; www.smithandloveless.com**

Automation/Optimization

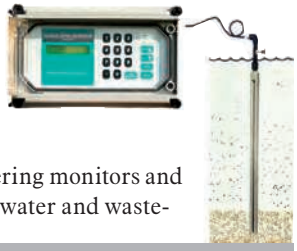
EMERSON ASCO NUMATICS SERIES 653



ASCO Numatics Series 653 from Emerson

The ASCO Numatics Series 653 from Emerson is available in 1/2-, 3/4- and 1-inch port sizes, with a high flow rate for its size. This enables customers to power more products from the same filter-regulator or lubricator, or reduce pressure drop across the system, both of which enable potential energy- and cost-savings. The range of the Series 651, 652, and 653 consists of filters, regulators, filter regulators, lubricators, soft starts, quick exhausts, diverter blocks and shut-off valves. The Series 651, 652 and 653 are ideal for use in any application that requires high volumes of air or where space is limited. OEMs will benefit from the wide temperature range and ATEX and CUTR certification, enabling this product to be used in challenging and harsh environments and applications. The modular air preparation products have a durable construction and are easy to assemble, mount and position. **800-972-2726; www.asco.com**

MARKLAND SPECIALTY ENGINEERING AUTOMATIC SLUDGE BLANKET LEVEL DETECTOR



Automatic Sludge Blanket Level Detector from Markland Specialty Engineering

The Automatic Sludge Blanket Level Detector from Markland Specialty Engineering monitors and controls the solid-liquid interface levels in water and wastewater clarifiers and settlement tanks and automates biosolids removal. Measuring primary, secondary and backwash silt/sludge levels, it allows users to program pumps to operate only when necessary, preventing carryover, optimizing feed density, and improving outflow for reuse. This helps reduce energy usage, wear and tear on pumps, and downtime for maintenance. Its slim profile and use of high-intensity infrared light make it ideal for obstructed or constricted areas. No calibration is required, and a wireless data link is available. **855-873-7791; www.sludgecontrols.com**

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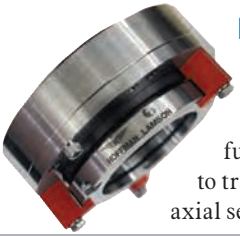

MAX Seal from Hoffman & Lamson, by Gardner Denver

HOFFMAN & LAMSON, BY GARDNER DENVER, MAX SEAL

MAX Seal from Hoffman & Lamson, by Gardner Denver, is a dry seal technology that reduces fugitive emissions by up to 67 percent when compared to traditional seal options. The dry running mechanical axial seal is constructed of 316 stainless steel with replaceable wearing components. It doesn't require a gas purge, reduces lubricant contamination and eliminates bearing contamination from process gas. It is suitable for landfill gas and applications handling toxic and explosive gases, improving the safety of the operation while extending bearing life and lowering total cost of ownership. It is available as an upgrade to the company's new and existing multistage centrifugal blowers. It can be installed on site, and without replacing any major blower components. **724-239-1500; www.hoffmanandlamson.com**

JDV EQUIPMENT DOUBLE MEMBRANE BIOGAS HOLDER

Double Membrane Biogas Holder from JDV Equipment

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**

NOV CHOPPER HOPPER

Chopper Hopper from NOV

The Chopper Hopper from NOV is an all-in-one solution for biogas generation. This powerful and aggressive grinder pump contains both pumping and solids reduction technology and can homogenize objects like whole fruits and vegetables into a pumpable puree or mash. It is available for coarse, medium and fine particle sizes, and it uses angled cutters for grabbing or tearing large objects. The design of the progressing cavity pump allows for low friction with a universal pin-joint, leading to less wear and improved overall performance. This unit is a suitable solution in applications such as food processing, waste handling, rendering or slaughtering of plants, orange peels, waste potatoes and meat products. It is available in carbon, stainless steel or specialized materials of construction. **346-223-3000; www.nov.com/industrial**

Heat Exchanger/Recovery System

WALKER PROCESS EQUIPMENT, A DIV. OF MCNISH CORP., SLUDGE-TO-SLUDGE HEAT EXCHANGER

Sludge-to-Sludge Heat Exchanger from Walker Process Equipment, A Div. of McNish Corp.

The Sludge-to-Sludge Heat Exchanger from Walker Process Equipment, A Div. of McNish Corp., has a concentric tube-in-tube design that uses counterflow circulation of heated thermophilic biosolids and raw influent. This arrangement provides a means to cool thermophilic biosolids and reduces the amount of energy required to heat raw biosolids. It provides heat transfer with low headloss. End castings are removable for cleaning and include built-in water backflushing connections. It complies with ASME pressure vessel code requirements and is stamped with the ASME "U" symbol. Controls include nonflow restrictive temperature sensors and glass tube or dial thermometers to measure inlet and outlet sludge temperatures, as well as thermocouple and resistance temperature detector capable for remote indication of control. **630-892-7921; www.walker-process.com**

High-Efficiency Motors/Pumps/Blowers

AERZEN TURBO G5PLUS

Turbo G5Plus from Aerzen

The Aerzen Turbo G5Plus is the most compact and efficient turbo in its class. It offers Aerzen airfoil bearings with double coating and multilevel frequency converter technology, which reduces the heat loss in the motor to a minimum and, consequently, improves the total efficiency significantly. **610-380-0244; www.aerzen.com/en-us**

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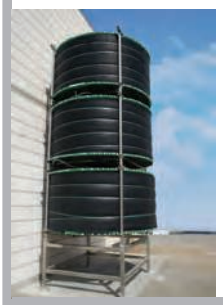
BLUEline Rotary Lobe Pump from Boerger

The BLUEline Rotary Lobe Pump from Boerger is a self-priming, valveless, positive displacement pump used to convey 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**



Membrane Aerated Biofilm Reactor (MABR) technologies from Fluence

FLUENCE MEMBRANE AERATED BIOFILM REACTOR

Membrane Aerated Biofilm Reactor (MABR) technologies from Fluence provide an energy-efficient alternative based on passive aeration, i.e. the diffusion of oxygen through membranes. Available as smart-packaged decentralized systems, or retrofit to existing plants for increased capacity, MABR technology provides simultaneous BOD, TN and TP removal all in a single pass. During the process, an aerobic nitrifying biofilm develops on the surface of the membranes, enabling simultaneous nitrification and denitrification. Effluent exceeds EPA standards. **800-879-3677; www.fluencecorp.com**

GORMAN-RUPP 6500 SERIES

6500 Series centrifugal pumps from Gorman-Rupp

The 6500 Series line of solids- and clean liquid-handling end suction centrifugal pumps from Gorman-Rupp includes sizes from 3 to 16 inches, flows to 15,000 gpm, total dynamic head to 530 feet, and solids-handling capabilities up to 4 inches for applications in wastewater treatment plants, industrial facilities, construction, mining and agricultural uses. The line comes standard with oversized bearings, atmospheric vent, side-access inspection port (on solids-handling models), and an indexable Smart Scroll discharge locator. **419-755-1011; www.grpumps.com**

SG Turbo Blowers from Howden Roots

HOWDEN ROOTS SG TURBO BLOWER

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**

(continued)

KAESER COMPRESSORS CBS AND HBS SERIES

CBS and HBS Series rotary screw blowers from Kaeser Compressors

CBS and HBS Series rotary screw blowers from Kaeser Compressors combine the energy efficiency savings of the Sigma Profile rotary screw airend with the convenience of a complete blower package. Designed to ensure reliable operation for even the most demanding wastewater treatment plant applications, the blowers arrive ready for use and include a premium efficiency TEFC motor, inlet/outlet silencers, full sound enclosure, starters/drive, a full complement of sensors, and an onboard controller. Units are available with wye-delta start or variable-speed drive. Models include Sigma Control 2, which monitors all pressure, temperature and other sensors, and includes expanded communication features. The Ethernet port and built-in web server enable remote access and seamless integration into wastewater treatment plant control/monitoring systems. Modbus, Profibus, Profinet and Devicenet industrial communication interfaces are available. **877-596-7138; www.us.kaeser.com**

ROBUSCHI USA TRI-FLOW 825

Tri-Flow 825 vacuum blower from Robuschi USA

The Robuschi USA Tri-Flow 825 vacuum blower is capable of continuous operation at 18 inches Hg. The open-airflow bearing housing allows more air circulation and additional cooling, which allows it to run continuously at deep vacuum. The tri-lobe design combined with helical gears allow it to run quieter, enabling use of smaller silencers and freeing up available payload and space, while keeping noise complaints to a minimum. It offers 4,805 cfm free air capacity and the ability to hit 18 inches Hg. **866-428-4890; www.gardnerdenver.com/robuschi**

SCREENCO SYSTEMS PATZ SHAFT DRIVE PUMPS

Patz Shaft Drive Pumps, distributed by ScreenCo Systems

Patz Shaft Drive Pumps, distributed by ScreenCo Systems, are vertical pit pumps that can be used in aboveground or underground storage tanks and include choices of single- or three-phase electric motors. They have high solids and grit capacities with large centrifugal pumps and hardened steel impellers. High capacities include the 3333 series up to 500 gpm, and the 4444 series up to 1,580 gpm. They can be deployed in depths from 3 feet to 12 feet 8 inches. The 6000 and 8000 series have a three-point hitch with PTO drive and can offer up to 3,500 gpm at depths from 6 to 12 feet. They can be used with an agitator nozzle to mix and pump fast. The 616 vertical prop agitator is capable of mixing at 9,000 gpm, keeping grit and solids mixed at pit depths of 6 to 16 feet. **208-790-8770; www.screencosystems.com**

VAUGHAN CONDITIONING PUMP

Vaughan conditioning pump

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**

Series 800 sump pump from Vertiflo Pump

VERTIFLO PUMP SERIES 800

The Series 800 industrial vertical immersion sump pump from Vertiflo Pump can be used for sump drainage, flood control and process drainage to meet EPA and OSHA requirements. It is designed for severe service at heads to 230 feet and temperatures to 350 degrees F and operates in pit depths to 26 feet and up to 3,000 gpm. It includes carbon line shaft bearings, a semiopen impeller with external adjustment, a high-thrust angular contact ball bearing, 416 stainless steel shafts to 1 15/16 inches and a standard NEMA C face motor. Construction materials available are cast iron, 316 stainless steel or alloy 20. **513-530-0888; www.vertiflopump.com**

WILO USA WILO-STRATOS GIGA

Wilo-Stratos GIGA line of centrifugal pumps from Wilo USA

Wilo USA offers an extended range of models for the Wilo-Stratos GIGA line of centrifugal pumps to include 3- and 4-inch models, bringing the total offering to 28 models. The GIGA is a class IE5 space-saving in-line circulator with ECM technology, with a motor-powerhead combination that provides optimal control over the pump, up to 9 hp. The control range is up to three times as high as conventional electronically controlled pumps, and there are multiple control modules available for integration with building management systems. With heads up to 167 feet and flows to 550 gpm, it has high corrosion protection due to its cataphoretic coating, high-efficiency EC motor, optimized hydraulic design and the ability to self-adjust to system demands. **888-945-6872; www.wilo-usa.com** tpo

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WASTEWATER

By Rick Lallish

What process control measure has the most influence on sludge quality and determines the sludge age in an activated sludge process?

A. RAS (return activated sludge)
B. WAS (waste activated sludge)
C. SVI (sludge volume index)
D. F/M (food to mass ratio)

ANSWER: B. In an activated sludge facility, the operator must understand each process control measure. This includes understanding how measures such as RAS and WAS affect sludge quality. Operators must also know when to adjust and use these parameters to operate the plant to meet effluent standards. WAS is the measure that determines how long the mixed liquor suspended solids, or MLSS, remain in the system (solids retention time). WAS also determines the MLSS concentration. High wasting rates leave fewer solids in the system.

DRINKING WATER

By Drew Hoelscher

What form of iron passes through a sand filter and typically causes dirty-water complaints from customers?

A. Ferrous bicarbonate
B. Ferric hydroxide
C. Insoluble iron
D. $Fe(OH)_3$

ANSWER: A. Public water supplies that use groundwater as their source typically have to combat high iron levels in the raw water. Raw groundwater with high concentrations of soluble ferrous bicarbonate will appear clear until the soluble iron is oxidized by dissolved oxygen or a chemical oxidant. To reduce discolored-water complaints, iron should be completely oxidized and removed at the treatment plant. Ferrous bicarbonate that passes through the plant and distribution system may become oxidized inside customers' homes and stain laundry and fixtures.

ABOUT THE AUTHORS

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

By Craig Mandli

Decanter effectively replaces belt press

Problem

For the West Central Conservancy District in Hendricks County, Indiana, the dry matter produced by its belt press was achieving mediocre results in terms of dry substance. They sought a better option.

Solution

The **Flottweg Separation Technology C decanter series** was designed to dewater and thicken the sewage slurry. The decanter centrifuge offers safe and fully automated operation and emits minimal odor because of a closed-system design.

RESULT:

The previous system required 4.5 to 5 gph polymer feed to a belt press. Now, using two centrifuges, the facility feeds 1.75 gph. "Sometimes we can run as low as 1.25 gph," says Bernard Brown, assistant superintendent. "This equates to a real savings because the polymer is roughly $16 per gallon. We can direct where we want the cake to go — to each of the three containers. We can change the feed rate and the polymer dosage rate from one control screen. The automation makes it extremely easy to use. It's easy to train new operators. Generally, we just press the button and walk away." **859-448-2331; www.flottweg.com**

Treatment targets and controls filamentous organism growth

Problem

A large Midwest food and beverage facility needed to optimize sludge settling through better management of filamentous microbes in its biological treatment facility. The company uses an attached growth biological treatment process in addition to trickling filtration and secondary settling. While natural convection maintained adequate airflow in winter, sulfide toxicity in summer was causing overgrowth of filamentous organisms, leading to sludge bulking and higher effluent turbidity.

Solution

Water Warriors implemented a treatment using **SETZYME,** formulated to prevent filamentous growth in trickling filters and activated sludge treatment plants.

RESULT:

After 21 days of treatment, effluent turbidity began to decline. Enzyme addition is being continued at a maintenance dosage to keep the filamentous organisms from establishing themselves in the biofilms on the rock media, especially during high influent BOD conditions. **859-629-2236; www.waterwarriorsbiomedia.com**

Eco-friendly geotextile filtration unit reduces costs and environmental waste

Problem

Oulun Energia power plant in Finland was hauling its waste to a landfill using a vacuum truck at a cost of $400,000 a year. Operators wanted to reduce costs and the environmental footprint.

Solution

The **Flowrox GeoBag** offered an efficient solution. The container has a perforated bag inside. When waste is pumped in, the solids stay in the bag and the water drains to the bottom. The floor is watertight with a drain valve so that the filtered water can be pumped out. The unit can be heated for colder climates.

RESULT:

The plant saved over $200,000 and none of its waste was sent to the landfill. At the end, the process left with a small amount of dried waste, which was reused as an energy source. The filtered water was discharged. **410-636-2250; www.flowrox.com**

Hydrolysis enables plant to capture more biogas

Problem

The Kenosha (Wisconsin) Wastewater Treatment Plant was producing more biogas than it could use but not enough to justify installing another gas engine. The excess gas was being flared.

Solution

The city installed the **PONDUS hydrolysis process** from **Centrisys/CNP.** It includes a tube-in-tube heat exchanger, a hydrolysis reactor, two progressive cavity pumps, and a sodium hydroxide dosing station. The system uses a thermo-chemical reaction at about 140 degrees F that changes the sludge viscosity for a trouble-free, easy flow.

RESULT:

By using the PONDUS process on waste activated sludge, the plant increased gas production by more than 20 percent, enabling installation of a combined heat and power unit. Heat from the engine is used to heat the waste activated sludge and operate the PONDUS system. The plant now produces about one-third of its electricity from biogas. **262-654-6006; www.centrisys.com**

Repair-in-place turns five-week repair into five days

Problem

A pump drive at a wastewater treatment plant in Southern California showed significant wear in some critical rotating components, threatening a gearbox breakdown and a major disruption in operations. A complete overhaul would take four to five weeks in a repair center. The site did not have a spare and was running at peak capacity.

Solution

Philadelphia Gear - A Timken Brand's Onsite Technical Service team proposed to repair the drive in place. Instead of disconnecting the gearbox and shipping it to the shop, the team submitted an order to manufacture the damaged parts ahead of time. This included building up the bevel pinion shaft, bevel gear shaft and output shaft subassemblies at the shop. Each of these left Philadelphia Gear's Western Region Service Center with new bearings mounted, and cartridges and spacers installed. The team then rebuilt the gearbox at the plant.

RESULT:

The overhauled pump drive was in operation in just under five days. As the last phase of the job, the team shipped the damaged rotating elements back to the shop for evaluation. Some damaged components were overhauled and recertified to be used as spares, then long-term preserved and shipped back to the plant. **800-766-5120; www.philagear.com**

Drum skimmer effectively removes FOG from primary treatment cell

Problem

In early 2016, operators of a wastewater treatment facility in Carmi, Illinois, sought to reduce FOG in the primary treatment cell. Recovered material was being removed from the skimmer manually into a bucket. Material needed to be removed more efficiently.

Solution

An **Elastec TDS118 grooved drum skimmer** was placed in the primary treatment cell.

RESULT:

In five months, TSS was reduced by 66 percent. As the year progressed, a prototype skimmer and recovery tank system was developed with fully automated operation. On average, the system removed 473 pounds of FOG per month from the 1 mgd treatment plant. **618-382-2525; www.elastec.com**

Cloth media filters treat combined sewer overflows

Problem

The City of Rushville, Indiana, had to comply with a 2007 consent order for combined sewer overflows polluting the Flatrock River. The city planned to install a 1-million-gallon stormwater storage tank, but it was approached by Aqua-Aerobic Systems with a pilot test proposal using the AquaPrime cloth media filter.

Solution

The pilot study captured events from May to July 2015. The results prompted the city to request a design for an **Aqua-Aerobic Systems AquaPrime filtration system** that could treat both dry- and wet-weather flows. An alum coagulant was to be injected upstream of the filters to meet future effluent phosphorus limits and eliminate fine CSO particles.

RESULT:

Two 14-disk AquaPrime systems started up in July 2017 with a design average flow of 1 mgd (dry) and 12.6 mgd (peak wet-weather). The filters were retrofitted to abandoned sand media filter structures, saving capital costs. The system cost $1 million less than the storage tank proposal. This was the nation's first AquaPrime filter installation for dual tertiary/wet-weather treatment and will keep some 50 million gallons of raw sewage per year from entering the Flatrock River. **800-940-5008; www.aquaprimefiltration.com** tpo

ABB Automation ACQ580 variable-frequency drive

ABB Automation's ACQ580 VFD has a pump-clean feature that dislodges debris from impellers, while the sensorless flow calculations feature provides accurate flow measurement without a flowmeter. The soft-pipe fill mode reduces water hammer damage, and the quick-ramp feature protects submersible pumps. It is compatible with the ABB Ability condition monitoring services, which provides real-time data about the status and performance of the monitored equipment from any location. The VFD also features dry-run protection that prevents pumps from running without water and embedded PID controllers that automate flow, pressure, level and dissolved oxygen. The multipump control feature manages operation of up to eight pumps simultaneously.

800-752-0696; www.abb.com

CAS DataLoggers T&D RTR-502 wireless temperature data logger

The T&D RTR-502 wireless temperature data logger from CAS DataLoggers has a temperature-sensing range of 76 degrees below zero to 311 degrees F and a measurement resolution of 32.18 degrees F. The data logger has an LCD that can be viewed in either Celsius or Fahrenheit; is constructed with a rugged, compact, water-resistant design; and has a large-capacity, 16,000-point memory. Units have a battery life of about 10 months with an option to upgrade to a large capacity battery pack enabling about 4 years' operation. The base station connects wirelessly to the loggers and automatically downloads the recorded temperature data. If an out-of-tolerance condition occurs, notification is shown by a local LED lamp and an email alert is sent immediately.

800-956-4437; www.dataloggerinc.com

product spotlight
water

Upgraded sodium hypochlorite generation

By Craig Mandli

ClorTec DN Gen II from De Nora Water Technologies

Drinking-water treatment plants use various forms of chlorine to inactivate pathogens, oxidize metals or metalloids, and provide disinfection residual for distribution systems. Concerns of safety for chlorine gas and high-strength sodium hypochlorite make on-site generation of sodium hypochlorite an attractive option. To that end, **De Nora Water Technologies** recently upgraded its popular ClorTec line, adding significant operational advantages and enhanced system efficiency to the practice.

The **ClorTec DN Gen II electrochlorination system** features several upgrades designed to offer even greater on-site sodium hypochlorite generation efficiency, easier operation, less maintenance and up to 50 percent footprint reduction. According to Bryan Brownlie, marketing director for De Nora Water Technologies, the unit continues a reputation of reliability and safety that the science has provided after more than 3,500 ClorTec installations.

"De Nora has always prided itself on its electrochemical expertise, as an innovator with more than 355 patents and 3,000 regional extensions," he says. "The investment of time, knowledge, and research and development resources in these product lines is returning some exciting results."

Upgrades to the ClorTec system include a design that allows the duty and standby units to be mounted on the same frame, saving up to 50 percent on the footprint. Other improvements include full access to every component, making operation and maintenance simple, and a liquid flow backboard that can be located anywhere in the building for additional flexibility. Systems generate a 0.8 percent sodium hypochlorite disinfection solution, a chlorine equivalent, using three common consumables: salt, water and electricity. Units range in capacity from 2 to more than 3,000 pounds per day, with systems engineered and offered to meet any specified application demand.

New features ensure optimal performance and efficiency, including nonintrusive level switch and temperature sensor design, optional split flow technology, and water and brine flow controls. Additionally, Smart Monitoring technology and acid cleaning notifications allow users to remotely monitor, troubleshoot and control the operation of their system and provide operation and performance data remotely.

"We have been listening carefully to the market to create a compelling new offering for our second generation ClorTec DN systems, addressing the concerns and needs of operators and engineering contractors alike," Brownlie says. "The launch of our original De Nora ClorTec DN generators in 2015 was just the first step toward this point, and the process is always ongoing."

215-997-4000; www.denora.com

Electro-Chemical Devices S80-T80 cyanide analyzer monitoring system

The S80-T80 cyanide analyzer monitoring system from Electro-Chemical Devices features an S80 pION cyanide sensor and a dual-channel T80 transmitter for a more cost-effective cyanide removal water treatment system. The S80's CN ion electrode is a combination electrode with a silver cyanide/silver sulfide solid-state pressed crystal-sensing element and a double junction reference electrode. The CN ion selective electrode cartridge develops a millivolt potential proportional to the concentration of free CN ions in the measured solution. The typical output is 54 to 60 mV per decade of change in concentration. The speed of sensor response varies from a few seconds in concentrated solutions up to a few minutes in the lower parts-per-million ranges.

800-729-1333; www.ecdi.com

product spotlight
wastewater

Pump with integrated intelligence

By Craig Mandli

Concertor from Flygt, a Xylem Brand

Cleaning out biosolids, sand, grease and other debris from a sump tank is often an unpleasant and costly task. While many pumps are equipped with the latest technology to solve these challenges, the **Concertor from Flygt, a Xylem Brand** expands on the idea of trouble-free pumping to rectify the problem.

This is enabled by a combination of technology and intelligent functionalities to keep a wet well clean and pump clog-free at all times. To reduce sedimentation, odor build-up and unplanned call-outs, designers added built-in sump and pipe cleaning functions in a single integrated wastewater pumping system. The company's trials show that this minimizes unplanned and costly maintenance. An integrated pump cleaning function, together with Adaptive N-technology, detects and resolves clogging from large debris. The pump provides self-monitoring functionality that prevents overheating and motor failures due to external conditions. The motor technology and Energy Minimizer increase the lifetime of the motors, seals and bearings. Finally, the control system inside the pump is placed in a stable environment, which protects it from unfavorable external conditions.

This works because the intelligent unit is capable of sensing the environment it is operating in, as well as the load it is subjected to, adjusting its performance in real time to meet optimization targets. By collecting and analyzing relevant data, the pump system can make smart decisions about how it operates and what relevant feedback to give you. This integrated intelligence is enabled by its Dirigo platform that consists of a motor, control electronics and software. Dirigo is designed to deliver significant cost savings, a more precise level of motor control, reduced risk of clogging, substantial energy savings, and comprehensive data reporting. Thanks to the scalable nature of the system, the operator can add new functionality without having to throw away your initial investment.

This wastewater pumping system is capable of sensing the operating conditions of its environment, adapting its performance in real time and providing feedback to pumping station operators, according to the manufacturer. The control system automatically adapts to the changing pumping environment, delivering the optimal level of performance at a low cost of ownership. The built-in intelligence also makes it easier to set up and operate, as well as allowing for a significantly smaller footprint. It combines a fully integrated control system with IE4 motor efficiency, the state-of-the-art N-hydraulic and intelligent functionalities.
855-995-4261; www.xylem.com/en-US/brands/flygt

Opto 22 GRV-CSERI-4 four-port serial communication module

The serial input/output GRV-CSERI-4 module from Opto 22 plugs into a groov EPIC chassis to provide a mix of analog, discrete and serial signals from any location. This new module provides four independent and isolated serial ports and communicates with RS-232 or RS-485 serial devices. Up to four modules can be installed on the chassis for a total of 16 serial ports, with programmable termination and bias, as well as half- or full-duplex options in RS-485 mode. Baud rates of up to 1 Mbps are supported.
800-321-6786; www.opto22.com

Wanner Engineering Hydra-Cell SM Series Solenoid metering pumps

The Hydra-Cell Metering Solutions SM Series electronic solenoid metering pumps from Wanner Engineering are designed for reliable and economical chemical injection in multiple industries. They feature a hand-operated dial with stroke adjustment from 15 to 200 strokes per minute. Maximum discharge pressure ratings are from 58 to 217 psi depending on the model. The pumps feature a double-ball check valve to help ensure metering accuracy and reduce the possibility of water hammer. An anti-siphon check valve prevents clogging at the injection point and aids in priming the pump. An optional integral relief valve releases abnormal pressure automatically if the pressure exceeds the pump's capability, protecting it from damage. All models are equipped with a protective secondary diaphragm.
612-332-5681; www.hydra-cell.com

JWC Environmental Channel Monster FLEX Grinder

The high-flow wastewater grinder Channel Monster FLEX from JWC Environmental has a modular design that allows for more flexibility of servicing the cutting element and perforated solids diverter element separately. The cutter module can be replaced with a pre-assembled one in the field, eliminating the need to ship the entire unit back to the factory for repair. The FLEX maintains high flow capacity utilizing a perforated solids diverter instead of horizontal screening bars, minimizing material bypass while ensuring all debris is shredded. With flow capabilities from 3.0 to 42 mgd and numerous combinations of grinder heights, diameters of the solids diverter, plus customized installation frames, the grinder is versatile for both in-channel installations or wall mounting within wet wells.
800-331-2277; www.jwce.com tpo

SJE-Rhombus launches new websites

SJE-Rhombus launched four new websites as part of the company's rebranding efforts. Existing sites for www.csicontrols.com, www.primexcontrols.com and www.sjerhombus.com received a redesign, while an additional corporate site was created for SJE-Rhombus at www.sjeinc.com. This new site contains all corporate information, such as history, ESOP, leadership and career opportunities.

Andrew Burland, Dave Amato promoted within Parker Filtration Group


Andrew Burland


Dave Amato

Parker Filtration Group announced the promotion of Andrew Burland and Dave Amato. Burland was promoted to director of sales – engine mobile aftermarket filtration. In this role, he will lead the sales team focused on the mobile aftermarket space and represent a variety of brands, including Baldwin Filters. Amato assumed the position of director of marketing – engine mobile aftermarket division. He will be responsible for leading the inside sales and marketing departments.

Grundfos Pumps opens new facility in Lenexa, Kansas

Grundfos Pumps announced it opened a new facility in Lenexa, Kansas, replacing the previous office in Olathe. The new office features a number of efficient features, including LED lighting, a Grundfos Engineered Systems pump house to maintain water level in an on-site pond and provide supplemental heat to the lobby via geothermal loop. The building, which also features a lecture hall with seating for 100 people, a training area for hands-on pump education classes, and a training video production studio, has been in the works since breaking ground in 2016.

Lippmann-Milwaukee announces staff appointments


Kevin Kiesgen


Bob Meyers


Gary Guthrie

Lippmann-Milwaukee announced three key appointments for the company in the wake of the recent acquisition by McCloskey International. Kevin Kiesgen was reappointed to the role of vice president of sales. He has been with the company for nine years. Bob Meyers was named vice president of business development and was most recently vice president of sales and marketing at Telsmith. Gary Guthrie is now the senior vice president and will lead and integrate Lippmann-Milwaukee into the McCloskey Group.

Centrisys/CNP part of research program to show phosphorus removal

Centrisys/CNP is collaborating with the Milwaukee Metropolitan Sewerage District, the Metro Wastewater Reclamation District of Denver, the Madison Metropolitan Sewerage District and the Massachusetts Water Reclamation Authority to perform Tailored Collaborative Research (TCR), a program of The Water Research Foundation. The groups will work together to demonstrate phosphorus removal and recovery potential of the CalPrex process at the Madison District from September through November.

The TCR will collect high-quality data from the CalPrex process and allow the participating utilities to evaluate high-rate phosphorus recovery prior to anaerobic digestion and its positive effects on operations and maintenance. This will help the utilities better meet stringent biosolids regulations and simultaneously mitigate operations and maintenance issues related to phosphorus levels in sludge. A peer review of the findings will be conducted, and the results will be disseminated to industry professionals through The Water Research Foundation LIFT Link platform.

Kaeser Compressors launches new website

Kaeser Compressors announced it launched a new U.S. site featuring a secure protocol with built-in redundancy, simplified navigation, mobile device compatibility and integration with Google Maps. A comprehensive resources section contains tools to design and optimize a compressed air system, including white papers, e-books, Compressed Air & Gas Institute datasheets, and compressed air tips. Visit the site at www.us.kaeser.com.

Asahi/America acquires Performance Plastics

Asahi/America acquired Louisiana-based Performance Plastics. The fabrication shop will aid Asahi/America in expanding its existing fabrication capabilities and capacity, as well as broaden the company's engineered plastic products and services offerings. **tpo**

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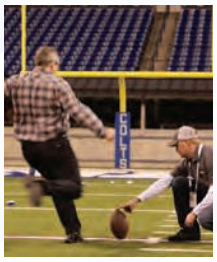

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people/awards

The **City of Long Beach** received a Wastewater Treatment Plant Outstanding Performance Award from the Washington State Department of Ecology for achieving full compliance with the National Pollutant Discharge Elimination System.

The **Water Environment Federation** recognized utilities in the Utility of the Future Today program. These utilities are helping transform traditional wastewater treatment systems into resource recovery centers. They include:

- Beckley (West Virginia) Sanitary Board
- Benton Harbor-St. Joseph (Michigan) Joint Wastewater Treatment Plant
- Carroll County (Maryland) Water Resources Coordination Council
- Charlotte (North Carolina) Water
- City of Detroit Water and Sewerage Department
- City of Fayetteville (Arkansas)
- City of Grandville (Michigan) Clean Water Plant
- City of Tallahassee (Florida)
- City of Wooster (Ohio)
- Clean Water Services (Hillsboro, Oregon)
- Columbus (Georgia) Water Works
- St. Cloud (Minnesota) Public Utilities
- DC Water (Washington, D.C.)
- Delta Diablo (Antioch, California)
- Evesham Municipal Utilities Authority (Marlton, New Jersey)
- Fort Wayne City (Indiana) Utilities
- Great Lakes Water Authority (Detroit)
- Houston Water
- Kenosha (Wisconsin) Water Utility
- Lafayette (Indiana) Renew
- Massachusetts Water Resources Authority (Boston)
- Metro Wastewater Reclamation District (Denver)
- Napa (California) Sanitation District
- Region of Waterloo (Ontario)
- Renewable Water Resources (Greenville, South Carolina)
- Spokane County (Washington) Environmental Services
- Toho Water Authority (Kissimmee, Florida)
- Washington Suburban Sanitary Commission (Laurel, Maryland)
- Water Environment Services (Oregon City, Oregon)
- Western Monmouth Utilities Authority (Manalapan, New Jersey)
- Western Virginia Water Authority (Roanoke, Virginia).

The **City of Como** received a $275,000 grant from the Texas Department of Agriculture to enhance its wastewater treatment plant.

Ilwaco (Washington) Mayor Gary Forner honored **Tim Pfeifer,** the city's wastewater plant operator, for implementing operational changes, maintaining equipment, and engineering oversights and initiating an energy savings program.

The **Town of Amherst,** Massachusetts, received a $145,027 state grant, which will go to Nanostone Water to treat the wastewater at the town's plant on the University of Massachusetts campus using innovative methods. The goal is to demonstrate the effectiveness of the new methods to produce nonpotable reuse water.

Brandon Wood joined the Village of Canton (New York) Water and Wastewater Department.

events

Jan 14-16
Forum 2019: James Barnard Research Conference on Emerging Themes in Biological Phosphorus Removal and Recovery, Embassy Suites Austin Central, Austin, Texas. Visit www.wef.org.

Jan. 27-30
New England Water Environment Association Annual Conference and Exhibit, Boston Marriott Copley Place, Boston. Visit www.newea.org.

Jan. 29-30
Nevada Water Environment Association Annual Conference, Atlantis Casino Resort, Reno, Nevada. Visit www.nvwea.org.

The **City of Lacombe, Town of Blackfalds, Lacombe County** and the **City of Red Deer** received the Alberta Urban Municipalities Association's 2018 Sustainability in Collaboration Award for excellence in implementing sustainability plans and achieving measurable sustainability outcomes. The four were selected based on the success of the North Red Deer Regional Wastewater System project.

Rea Schafer and **Kristy McAndrew** of the Charles County (Maryland) Department of Public Works received awards from the Water and Waste Operators Association of Maryland, Delaware and District of Columbia. Shafer, superintendent of the Mattawoman Water Reclamation Facility, received the W. McLean Bingley Award for Distinguished Service in Wastewater Treatment. McAndrew received the WWOA award for service to the association.

Megan Ross, P.E., Envision Sustainability Professional, was named utilities director for Pinellas County, Florida. She previously served as director of the Plant Operations Division.

The **Cleveland (Tennessee) Utilities Wastewater Treatment Division** was recognized by the Kentucky-Tennessee Water Environment Association for operational excellence in 2017.

Missouri American Water has been named Best Employer in the Water and Wastewater Industry in the category of Operations by the Hunter Crown executive search and recruiting company.

The **Estherville (Iowa) Water Treatment Plant** earned a 2017 Water Fluoridation Quality Award from the Centers for Disease Control and Prevention.

Dan Gier of Montgomery, Illinois, received a state Potable Water Supply Operators Association award.

The U.S. Poultry & Egg Association presented its 2018 Clean Water Award to **Wayne Farms** in Pendergrass, Georgia, and **Pilgrim's** in Guntersville, Alabama, for excellence in wastewater treatment and water reuse.

Emory University in Georgia received a 2018 Campus Sustainability Achievement Award from the Association for the Advancement of Sustainability in Higher Education for its teaching and student docent programs related to the WaterHub, which uses engineered processes that emulate nat-

ural ecological systems to reclaim wastewater for heating and cooling buildings and flushing toilets.

The **pureALTA water treatment project** in Altamonte Springs, Florida, ranked in the top three at the International Water Association Project Innovation Awards in Tokyo. The project was recognized for forward-thinking solutions to advance clean and safe water goals. It took a top award in the Market-Changing Water Technology and Infrastructure category.

The **California Water Service** received the Water Project of the Year award from the American Society of Civil Engineers San Joaquin Branch for its 1,2,3-trichloropropane treatment and compliance project. The utility also received the Water Project of the Year award from the ASCE Los Angeles Section.

Sherri Mason received the 23rd Heinz Award from the Heinz Family Foundation in the Public Policy category. She was recognized for her research identifying the presence of microbeads and microfibers in freshwater and for raising awareness of the potential impact of microplastics and associated contaminants on the food chain and human health, resulting in state, federal and international policy change. She is a professor of chemistry and chair of the department of geology and environmental science at the State University of New York at Fredonia.

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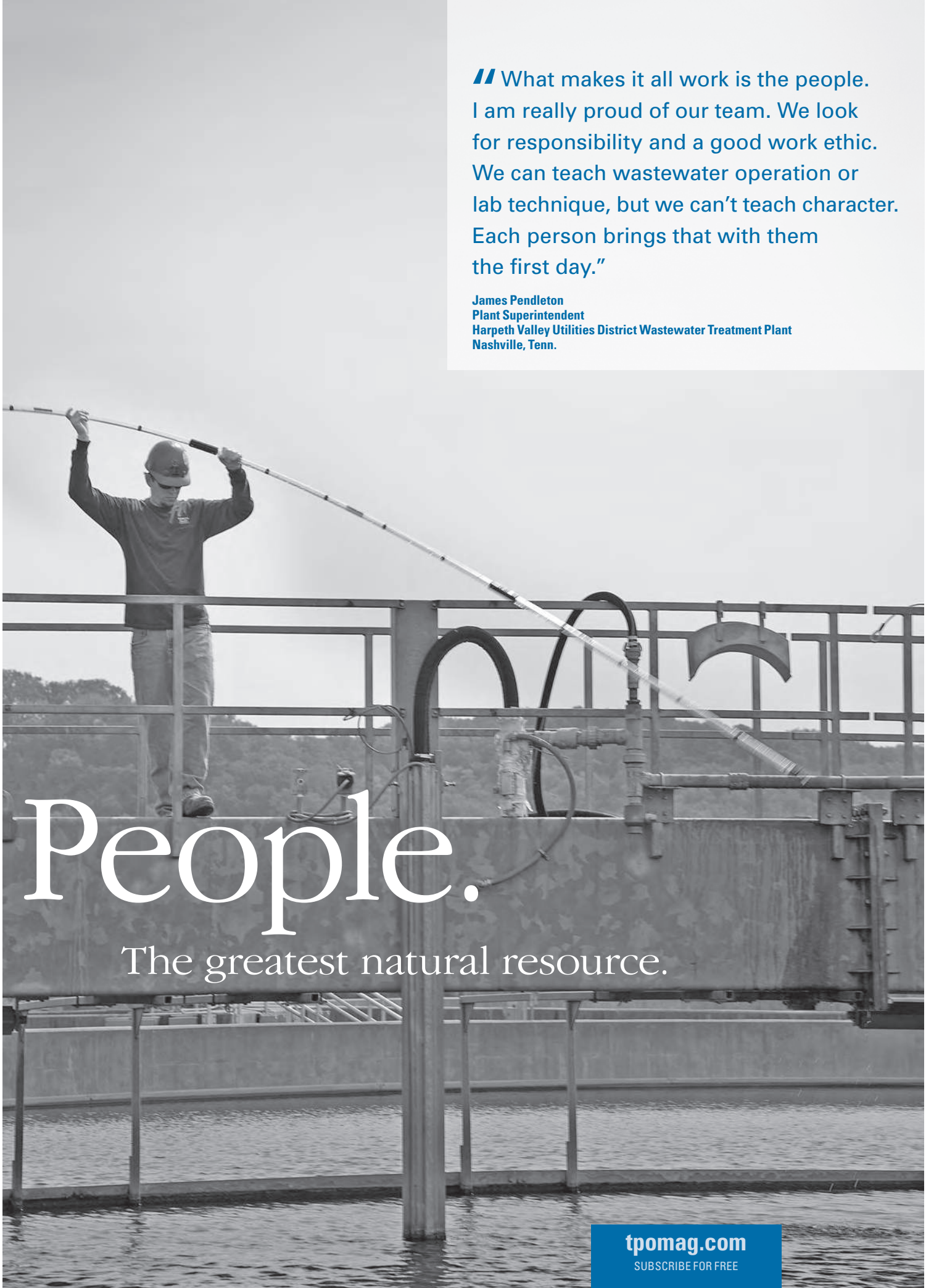

"What makes it all work is the people. I am really proud of our team. We look for responsibility and a good work ethic. We can teach wastewater operation or lab technique, but we can't teach character. Each person brings that with them the first day."

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

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AquaNereda® Demonstration Facility
Rock River Water Reclamation District, Rockford, IL

AquaNereda®

AEROBIC GRANULAR SLUDGE TECHNOLOGY

Following its introduction to North America in 2016, AquaNereda® Aerobic Granular Sludge Technology is quickly becoming the most sought-after wastewater treatment system in the U.S. and Canada.

In less than two years, consultants and end-users have realized the process and cost saving benefits associated with AquaNereda technology through on-site pilot testing, installation visits and technical seminars. The result is complete confidence in a progressive technology that ensures full plant compliance and peace of mind.

- Exceptional effluent without chemical addition
- Designed to meet or exceed nutrient removal demands
- Small footprint that easily retrofits into existing basins
- Reduced cost due to minimal civil site construction
- Low total cost of ownership

Aqua-Aerobic Systems, Inc. is the exclusive U.S. and Canada provider of Nereda® technology developed by Royal HaskoningDHV.

50th Anniversary
AQUA-AEROBIC SYSTEMS, INC.
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