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TECHNOLOGY DEEP DIVE:
Rapid biosolids drying | 28

HOW WE DO IT:
Covering up to stop chlorine losses | 40

Brandon Huston
Wastewater Treatment Plant Superintendent
Albert Lea, Minn.

Doing Good by Doing Well

TO BRANDON HUSTON, THE CAREER IS ABOUT PROTECTING AND CREATING A BETTER WORLD
18

IN MY WORDS:
Cybersecurity is everyone's job | 34

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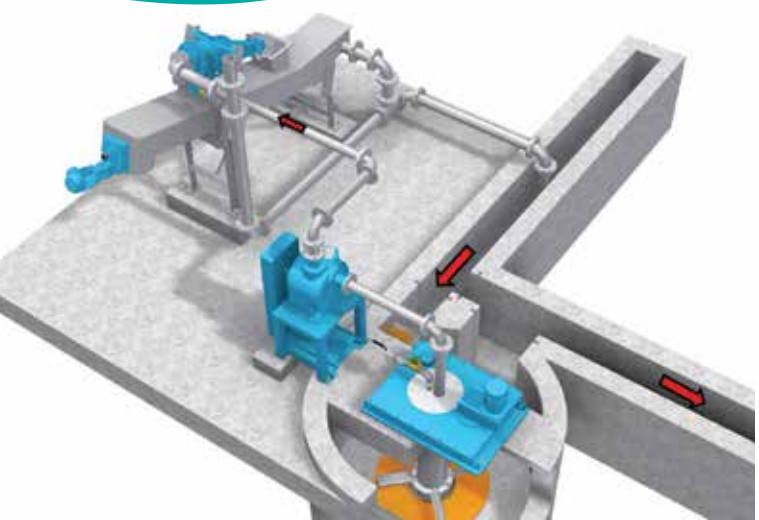

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contents

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» Let's Be Clear: Strategies for success on licensing exams » TOP PERFORMERS – Wastewater Plant: Hanover Park (Illinois) Sewage Treatment Plant #1 | Wastewater Operator: Dale Grudier II, Suffolk County, New York | Water Operator: Horacio Palacios, Las Cruces, New Mexico » How We Do It: Cutting chlorine losses in Bradenton, Florida » In My Words: Innovation in plant energy systems » Sustainable Operations: Exploring heating with effluent in Duluth, Minnesota » Hearts and Minds: West Basin Municipal Water District Water Detectives » Technology Deep Dive: Auger Monster ALT from JWC Environmental

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Published monthly by COLE Publishing, Inc.
P.O. Box 220, Three Lakes, WI 54562

In U.S. or Canada call toll free 800-257-7222
Mon.-Fri., 7:30 a.m.-5 p.m. CST

Website: www.tpomag.com / Email: info@tpomag.com / Fax: 715-350-8456

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EDITORIAL CORRESPONDENCE: Address to Editor, TPO, P.O. Box 220, Three Lakes, WI 54562 or email editor@tpomag.com.

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let's be clear

The Three-Foot Rule

EXHIBITIONS AND CONFERENCES DISPLAY LOTS OF TECHNOLOGY AND OFFER MANY COURSES. BUT THE GREATEST LEARNING OPPORTUNITIES MIGHT BE IN THE SEATS BESIDE YOU.

By Ted J. Rulseh, Editor

I'm not the world's most outgoing person, so when among strangers I'm not naturally inclined to say hello and strike up conversations.

In professional life, though, I soon discovered that my reticence was depriving me of opportunities — to learn, to build a network, to win clients, to find friends.

I began making it a rule, when traveling or at events in my industry, to always say hello and introduce myself to the person next to me, be that on an airplane, in the audience at a seminar or at a table during lunch.

It was a low-risk way to forge a connection, to learn from another person, or to share some of my knowledge with someone on the off chance they could use it. At the very least it was an entry to what could be an enjoyable conversation about almost anything: family, fishing, sports, travel.

REACHING OUT

An embodiment of this practice was someone I met at an environmental services trade show I used to attend regularly. Ed Fitzgerald, for many years a safety trainer with an equipment dealer, and now self-employed as a consultant, called it the Three-Foot Rule, as in, "If you come within three feet of me, I'm shaking your hand."

Ed attended trade shows in a sales mode, so it was in his and his company's interest for him to reach out to people. I would argue also that Ed was born with the gregarious gene. He was always smiling, upbeat, interested in others, especially in how he could help them. I can't begin to estimate the clients his company won and the sales they earned thanks to Ed's personality.

I was never as natural as Ed in opening up in busy environments where, let's face it, some people would rather be left alone. But I had my moments. Once on a plane trip for a marketing agency, I struck up a conversation with the fellow in the next seat, who turned out to be an executive for a food company that was looking for help with advertising.

Sometimes, encounters simply led to small-world moments. Once at a conference the guy next to me at lunch said he had lived for a time in my old home town, on the east side, where my first high school girlfriend lived. I mentioned her father's name and asked if he'd known him. He replied, "I bought his house."

ARE YOU MISSING OUT?

What about you? Are you making the most of your profession's events? First of all, are you making a point to attend your associations' trade shows, conferences, training events and short schools, whether your employer pays your way or not?

And if so, are you taking full advantage of the opportunities presented? I know your reason for attending industry events is not the same as Ed Fitzgerald's, or mine for that matter. But it's still to your benefit to observe the Three-Foot Rule, or something similar.

The more people you connect with, the more people you can welcome into your network. And the more people in your network, the more sources you have to help you solve some nettlesome problem with your process, to provide the pros and cons of a new technology you might be considering, to give you a referral to an excellent new operator to add to your team.

If you're at an event with members of your plant team, then at lunch time make an agreement to split up — each sit at a table with at least people you don't already know.

A COROLLARY

In that spirit, here's a variation on the Three-Foot Rule that you might consider trying. If you're at an event with members of your plant team, then at lunch time make an agreement to split up — each sit at a table with at least some people you don't already know.

If you all sit together, or with long-time acquaintances in the industry, it'll be easy just to talk among yourselves, and you won't learn much that way. Some of the most worthwhile conversations I've had at shows and conferences are with people I never would have met except that I walked up to a table and asked, "Mind if I join you?"

This is something to try even — especially — if you're less like Ed Fitzgerald and more like me. Give it a shot. You'll have nothing to lose and a great deal to gain. tpo

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FIGHT BRAIN DRAIN

Preserve Institutional Knowledge

Many utilities have a handful of long-time employees who form a kind of collective brain trust, filled with useful insights from decades of work. Facing an ongoing wave of retiring boomers, it's essential for utilities to preserve this invaluable institutional knowledge.
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MEETING WATER CHALLENGES

University Unveils New Institute

Rice University recently unveiled its new WaTER Institute, which seeks to address the widespread lack of access to clean municipal drinking water in America, along with other complex water-related challenges. The initiative aims to improve public health, energy efficiency and infrastructure resilience.
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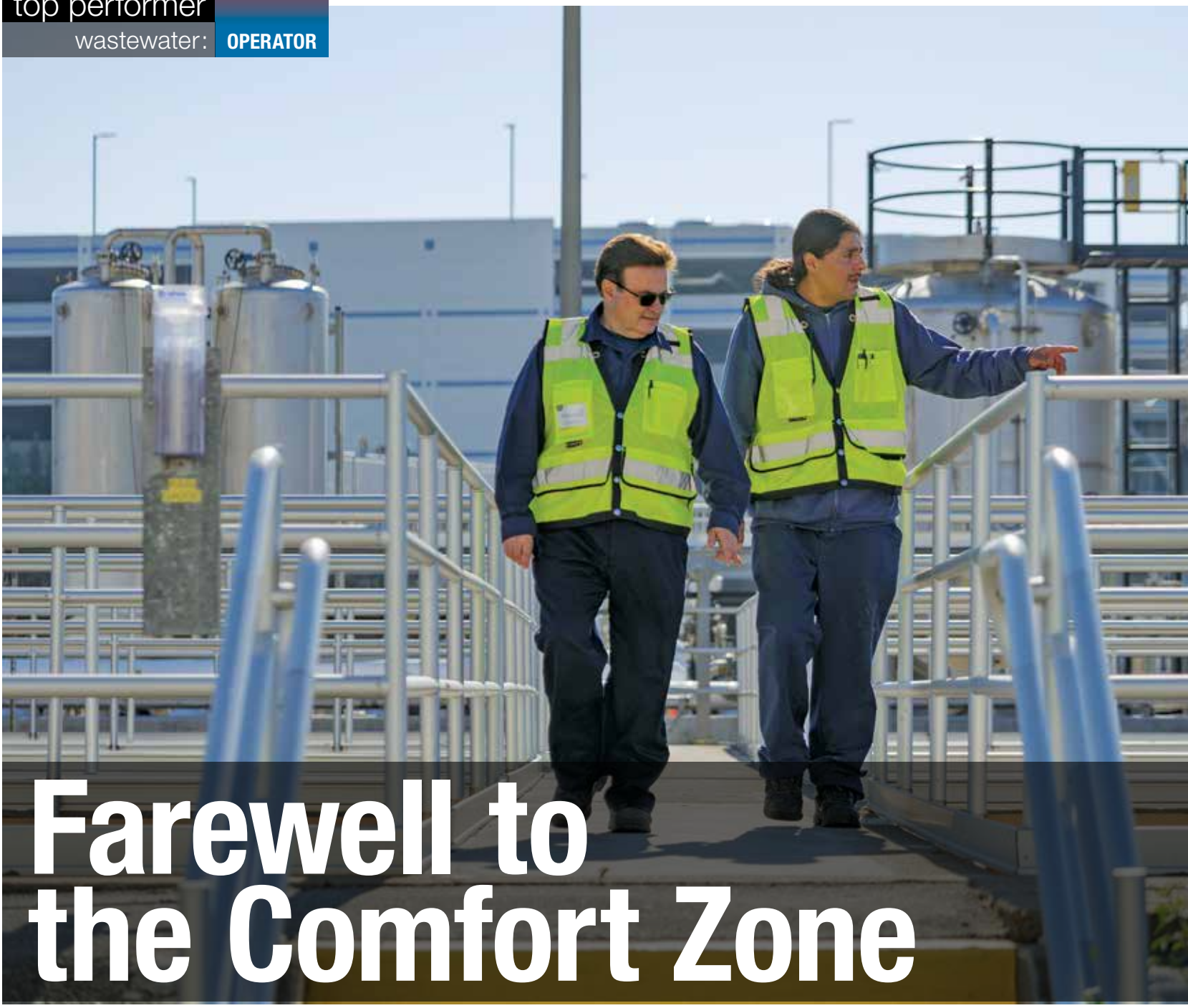

Farewell to the Comfort Zone

MANUEL DOS SANTOS OVERCAME A LEARNING DISABILITY TO BECOME HIS CLEAN-WATER PLANT'S GO-TO GUY AND AN AWARD-WINNING LEAD OPERATOR

STORY: **Stormy Shafer** | PHOTOGRAPHY: **David Elkins**

When Manuel Dos Santos entered the Air Force, he wasn't sure what he wanted to do with his life.

He only knew it couldn't require a lot of reading (he's dyslexic) or speaking to people — his condition was accompanied by a stutter. He did know that he wanted to help people, help his community and help make the world a better place. It took some time, but he found his place in and a platform from which to achieve his dream.

Now Dos Santos is nearing the end of a 35-year water career, currently as lead plant operator at the South San Francisco-San Bruno Water Quality Control Plant. He was recognized for his work as 2022 Operator of the Year by the California Water Environment Association.

EYE-OPENER

Dos Santos was serving in the Air Force in 1988 when his brother Angelino, then an instrument technician at the Millbrae (California) Wastewater Treatment Plant, took him along on a visit to a city lift station. "I thought everything was kind of cool, this huge lift station with a lot of electronics," he remembers.

Manuel Dos Santos, left, lead plant operator at the South San Francisco-San Bruno Water Quality Control Plant, takes pride in his contributions to treatment efficiency and team members' productivity. He's shown with Rayes Collins, plant operator II.

> "When it comes to understanding how things work, I'm very good at that. I remember things really well, and I'm very detail-oriented."
> **MANUEL DOS SANTOS**

Angelino told him about wastewater work, the generous benefits and the job security. Intrigued, Manuel switched his on-base training to wastewater management. He struggled. Air Force personnel tested him to discover the root of his learning difficulties, but failed.

But he persevered and eventually made staff sergeant, environmental compliance specialist. In 1991 he was finally confirmed dyslexic. From that point he received the tools and knowledge he needed to manage his condition, and applied himself to his career.

After military service in 1994, he wanted to remain in wastewater management and took a few college courses, but didn't do well. "When it comes to understanding how things work, I'm very good at that," he says. "I remember things really well, and I'm very detail-oriented. That's part of being dyslexic."

In 1995, he signed on with his current facility as a temporary worker, proving his worth, and stayed on permanently. He worked his way up to Grade III Operator certification, which is the level he holds today.

DEEP KNOWLEDGE

Nicholas Talbot, assistant plant superintendent and Dos Santos' boss, observes that "Manny is the go-to guy here in terms of institutional knowledge, with the staff and all the contractors and engineers coming onsite perform major capital improvement projects. He is like the god of the plant and all the underground utilities here. You dig a hole and won't even have to look at a map, because Manny will know: 'Oh, that's this pipe from 1952.'"

It began with Dos Santos learning about the plant in detail in his early days there. In the Air Force a new officer came on board to run the plant. "The first thing he did was get a big piece of construction backboard and drawing out all the piping in the plant," Dos Santos recalls. I thought that was a great way to learn the plant really quick.

"So, when I got here, I started making a similar drawing of this plant. Within the first year I really knew it pretty well. Soon he was re-creating all the plant logs and electrical schematics, with help from operator Robert Keen. By retaining vast knowledge of the plant through the years, Dos Santos became something of a walking encyclopedia for his colleagues. In 2011 he was named the city's first lead plant operator.

Manuel Dos Santos

South San Francisco, California

POSITION:
Lead plant operator, South San Francisco-San Bruno Water Quality Control Plant

DUTIES:
Manage plant operations; technical, SCADA and infrastructure specification support, capital improvement construction liaison

CERTIFICATIONS:
Plant Operator III

EDUCATION:
Military treatment plant training

GOALS:
Serve the community; help colleagues reach personal and professional goals

HELPFUL MENTORS

Dos Santos acknowledges ample help from colleagues who wanted him to succeed. It started with a mentor in the military: "I don't remember his name, but he was a civilian contract operator. He was one I learned a lot from." At South San Francisco, his first assistant superintendent, Ken Navarre, encouraged him in many areas, as did Brian Schumacker, who started as an operator and is now plant superintendent.

Other key team members include Eunejune Kim, public works director; Dave Bockhaus, deputy director; and Nicholas Talbot, assistant plant superintendent. The laboratory, environmental compliance, maintenance, and operations teams comprise 40 certified professionals.

The plant (13 mgd design, 8 mgd average) serves about 112,000 residents. There are 12 lift stations and two stormwater station in the system's 150 miles of collection lines. Plant personnel are responsible for lines and flows after they leave the lift stations.

Influent passes through Parshall flumes and the plant's original bar screens. A Jones + Attwood ram compactor piston (Ovivo) pushes rags from the bar screens into a dump bin. The liquid flows through a PISTA vortex grit chamber (Smith & Loveless).

From there, a WEMCO Torque-Flow grit pump (Trillium Flow Technologies) pushes solids to a dump container while the wastewater flows to an influent pump station with six 125 hp submersible channel impeller pumps (Flygt, a Xylem brand).

A flow splitter divides the influent among four primary clarifiers, two online during dry weather and the others activated during significant rain events. Then the flow is split between two secondary treatment trains with aeration basins that include anaerobic selectors with Flygt mixers. Two APG-Neuros high-speed turbo blowers deliver air through Sanitaire fine-bubble diffusers.

Dos Santos is enthusiastic about the blowers: "We save 10,000 to $12,000 a month in electricity. Our total bill gets reduced by about another $40,000 using a 580 hp INNIO Waukesha VHP engine for co-generation."

After the final clarifiers, the flow is disinfected with sodium hypochlorite and dosed with sodium bisulfite for dechlorination before discharge a mile out into San Francisco Bay.

The team at the South San Francisco-San Bruno plant includes, from left, Janice Chapman, senior chemist; Quinn Miller, lead plant operator; Eunejune Kim, public works director; Brian Schumacker, plant superintendent; Manuel Dos Santos, lead plant operator; Andrew Wemmer, environmental compliance supervisor; and Arran Gordon, maintenance supervisor.

> "I feel like everybody here is supposed to be family. We're supposed to all work together."
>
> **MANUEL DOS SANTOS**

On the solids side the plant has four anaerobic digesters; a new high-solids digester with Omnivore technology (Anaergia) takes the place of two digesters. Biosolids are dewatered to 18% solids on two Komline-Sanderson Kompress Series III belt filter presses. The material is land-applied through Lystek International as LysteGro agricultural fertilizer.

BEST PRACTICES

Dos Santos has had an influence on plant upgrades, even serving as construction liaison based on knowledge acquired =over his career. He believes his input has improved treatment efficiency and workforce productivity.

A SCADA system was introduced in the year 2000. "I loved programming and doing things on computers," Dos Santos says. "Most dyslexics like that kind of stuff, logic type things. I was watching the guy program our SCADA system, and talked to him a lot.

"So I started playing with it. I would read, program a few things, add things. I kept numerous system backups. We didn't hire anyone from outside to do the SCADA work. Our assistant superintendent said, 'You could do it.'"

In 2012, the plant needed a new generator building, and Dos Santos volunteered to be the construction liaison. "That was rough," he recalls. "Taking power down at the plant while keeping things running was very difficult. I had to do a lot of writeups for shutdowns and put generators on certain pieces of equipment while things were down." That was a two-year project involving a 2 MW Caterpillar diesel emergency generator.

Dos Santos was also construction liaison for the most recent four-year, $60 million plant upgrade. All told, the projects he oversaw amounted to more than $200 million of capital improvements, says assistant superintendent Talbot.

(continued)

Manuel Dos Santos (right), had a significant role in developing the plant SCADA system, which was largely an in-house project.

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He observes, "Most plants hire outside people to do this, but Manny was doing the work along with his normal duties as lead plant operator; all the standard procedures for regular shutdowns, night shutdowns, all the operational automation."

HIDDEN BENEFITS

Dos Santos, who years ago didn't want to interact with people because of his stutter, evolved his skills enough to run tours, lead city-run events and teach big classes at Skyline College. In doing so, he discovered a huge benefit.

> "When there's a problem and the lights are going off, what do you do? You run to Manny."
> **NICHOLAS TALBOT**

"I was horrible with stuttering, couldn't get through one sentence without doing it most of the time," he says. "In giving tours, initially I was just like a machine gun. But Brian [Schumacker] encouraged me a lot, and he went with me at first. We got through a few of them, and I got better and better. Now, after more than 500 tours, I hardly stutter at all."

Talbot says, "You can just tell, he loves what he does. The biggest thing is, he actually cares about this place, the people. He wants to see the organization do really well."

Dos Santos says he developed his attitude toward life and work in the military: "I got orders to South Korea for a one-year short tour. You can't take dependents, so your coworkers become your family. We all kind of stuck together, and I brought that back with me.

"I feel like everybody here is supposed to be family. We're supposed to all work together. That's why I raised my hand to do the liaison work. I knew the plant better than anyone here. I felt like it was my duty to help, to make sure things were done correctly."

He recalls something he heard that had a huge influence on his work ethic. "Back in the late '70s, I was watching football. They were praising this groundskeeper for taking care of the field, because he always did a phenomenal job. And he said he put in 110% every day. So that kind of stuck with me.

"Then, after doing that SCADA system, I was out of my comfort zone, but I learned a lot. I think we need to push ourselves. That way, we can excel. I got out of mine by giving tours.

"In the military, I was in supply. When somebody needed to get a hold of me and couldn't remember my name, they would refer to 'the guy that stutters.' That's how they knew me."

Talbot concludes, "Manny just cares about this place and the people here, and it's infectious. They're all stepping up their game because Manny is so involved and knows this stuff so well. When there's a problem and the lights are going off, what do you do? You run to Manny."

EDITOR'S NOTE: *Manuel Dos Santos retired from the South San Francisco-San Bruno Water Quality Control Plant in early 2024 after 25 years of service.* tpo

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Quinn Miller and Dos Santos check on the Komline-Sanderson belt press.

FIGHTING FILAMENTS

The South San Francisco-San Bruno plant recently had a $60 million upgrade covering the aeration basins, secondary clarifiers, anaerobic digesters, disinfection and electrical system improvement.

Previously, plant operators had battled for decades against filamentous bacteria, which hindered solids settling in the secondary clarifiers. In desperation, crews deployed makeshift anaerobic selectors in the aeration basins using small electric propeller mixers.

"It worked a little bit," says Manuel Dos Santos, lead operator. "I found that if we partially nitrified, it helped kill the filamentous bacteria." But it was a labor-intensive process:

"I would grab an effluent sample every morning, measure the nitrite and ammonia, then decide whether we should waste more solids to balance out our mixed liquor, or take an aeration based on our service, so we wouldn't go totally out of whack.

"Every day was that morning balancing act, and then of course I would assign operator duties, go with maintenance to service equipment, shut down equipment, take equipment offline, run generators for testing, and order chemicals. It was a very full day."

After the upgrade, the plant has true anaerobic selectors and is hospitable to phosphate accumulating organisms. Their presence prevents the growth of the filamentous bacteria.

"It's night and day," says Dos Santos. "Before, we had to put hypochlorite into our mixed liquor to kill the filamentous, which also killed some of our good bacteria. We would run hypo for three or four days, so we doubled our hypo usage every week.

"Our sludge volume index would go up to 600. We'd start hypo and bring it down to 250. Now we're at 120 to 130 SVI, nowhere near what we used to be. No more grabbing samples in the morning. No figuring out if we had to waste a little more to tweak everything every day. It's so much easier."

Muzit Kiflai poses with the Public Information and Education award Metro Water Recovery received in the e-media category from the National Association of Clean Water Agencies for the interactive website.

ABOVE: The How We Transform Wastewater website features an interactive graphic of Metro Water Recovery's treatment process. Visitors can click on any part of the process to learn about it.

BELOW: Colleen Miller, public information specialist, shares the How We Transform Wastewater website as a resource for teachers to learn more about the treatment process.

Online Education

A WEBSITE FIRST ENVISIONED AS A VENUE FOR EXPLAINING WASTEWATER TREATMENT TO BOARD MEMBERS BECAME A POWERFUL MEDIUM FOR MORE COMPREHENSIVE PUBLIC OUTREACH

By Sandra Buettner

The Metro Water Recovery board of directors asked for a presentation to help them better understand the wastewater treatment processes. They didn't realize how useful it would be for larger public education efforts.

The utility provides wastewater treatment services to 61 local governments, from which its board members are appointed. Its 805-square-mile territory includes 2.2 million people in Denver and parts of five Colorado counties. It treats 135 mgd of wastewater from most of metro Denver, operating the Robert W. Hite Treatment Facility and the Northern Treatment Plant.

INTERACTIVE WEBSITE

The board sought a way to understand how water quality improves through the treatment process. Muzit Kiflai, senior continuous improvement manager, observes, "Instead of a one-time presentation, we created the website. It became an educational resource that we update every six months to keep the information current."

The website took six weeks to complete, and the content was created internally. Kiflai relied on wastewater operators for process descriptions and tapped the Environmental Services, Engineering, and Technology and Innovation departments. The site was promoted on Facebook and by word of mouth. As of fall 2023, it had logged more than 7,000 visitors.

> "Teachers love the website because they learn along with the students and then use it afterwards to continue teaching about the wastewater treatment process."
> **COLLEEN MILLER**

A virtual classroom experience was first explored in 2020 while the COVID-19 pandemic was still relevant. Some schools were still not back to in-person classes, and educators wanted a virtual tour of the treatment facilities. The live tours are limited to 28 attendees, not enough capacity for larger classes; that made the virtual classroom experience ideal.

Employees took the idea to their children's teachers and reached out to educators in their families to let them know about the resource. From there, word spread.

TREATMENT MAP

Visitors to the website can click on all the treatment process stages and get a detailed explanation. Colleen Miller, public information specialist, presents the virtual classroom to students and educators through Zoom. She includes the website as part of her program; the virtual experience takes about 30 minutes.

"Teachers love the website because they learn along with the students and then use it afterwards to continue teaching about the wastewater treatment process," Miller says. "Home-schoolers have called us, and so have private schools. Parents who have special-needs children have asked for one-on-one presentations. It is useful for all class sizes." As of fall 2023, more than 7,000 visitors to the website have clicked on the tool.

The website has also been helpful for educating utility contractors, consultants and vendors and for onboarding new employees. Miller has tweaked the virtual classroom presentation for groups of different ages, such as retirees, civic clubs, scout troops and community educators.

"A rural school in Wyoming asked for a presentation," Miller says. "They are out of our service area, but we were happy to help. Those students only attend school two days a week because their school is an hour from their homes."

Kiflai notes that the website and virtual classroom have exceeded expectations. The website (treatment.metrowaterrecovery.com/) won a 2023 Public Information and Education award in the e-media category from the National Association of Clean Water Agencies. tpo

Doing Good by Doing Well

TO BRANDON HUSTON, WASTEWATER TREATMENT IS ABOUT NOT JUST PROTECTING THE ENVIRONMENT, BUT CREATING A BETTER LIFE FOR HUMANKIND

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Brad Stauffer**

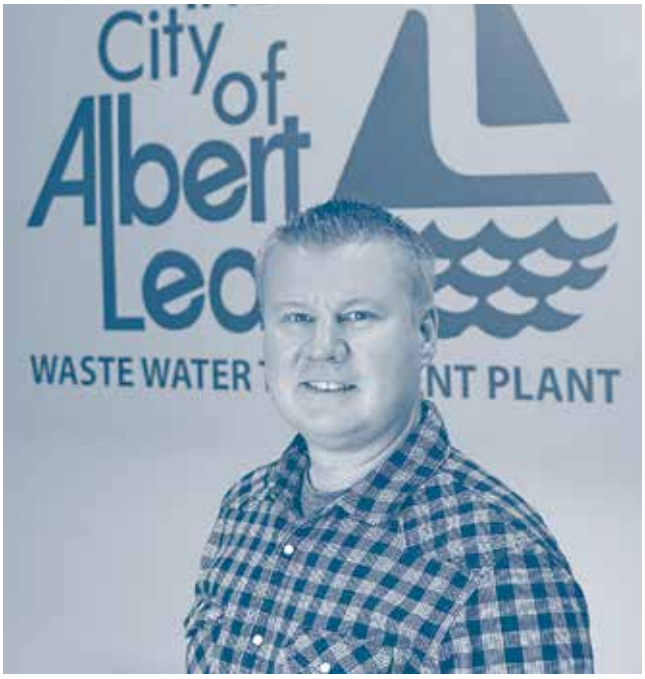
Brandon Huston looks at wastewater treatment as more than a career. It's fair to say he considers it a calling.

"I always had a desire to help the environment," says Huston, wastewater treatment plant superintendent in Albert Lea in Southern Minnesota. "I feel like we're actually doing something good for humankind. We're solving diseases. We're removing pollutants from the rivers. We're working with industries and benefiting them as well."

Huston has been with Albert Lea (population 18,000) since he started as an intern 25 years ago. After four years in his current position he was named the 2023 Outstanding Class A Operator of the Year by the Minnesota Wastewater Operator Association.

Huston is proud of steps he and his nine-member team have taken to improve the treatment plant; he looks forward to a major upgrade expected to unfold over the next several years. He reports to Steven Jahnke, director of public works and city engineer.

The wastewater treatment plant team includes Dustin White, foreman; Matthew Larson, lab technician; and operators Matthew Jensen, Doug Yotter, Travis Rauenhorst (also backup lab technician), Cavit Wobschall, Parker Hanna and Nick Finholdt.



Brandon Huston, wastewater treatment plant superintendent in Albert Lea, Minnesota, received the 2023 Class A Wastewater Operator of the Year award from the Minnesota Wastewater Operator Association.

FARM CONNECTIONS

Huston grew up on a farm half an hour west of the Albert Lea plant, where he took advantage of an internship program after high school. "I always wanted to work in testing water or work for the DNR testing rivers," he says. "The internship opened up. I fell in love with the industry and have been with it ever since."

He was hired as a part-time operator the day he graduated from Riverland Community College with an associate degree in environmental technology. He then worked eight years as a full-time operator and 10 years as a lab technician (the last two also as foreman) before being promoted to plant superintendent. He holds a Class A (highest) Wastewater Operator license.

Huston's farm background gave him insights toward finding qualified people for his team, which over the years lost experienced operators to retirement: "We look for people who have

“I want our plant to look like a park. ... I want to show the public and the city management that we’re caring for their investment.”
BRANDON HUSTON

Huston, shown with Dustin White, wastewater foreman, makes team members’ safety a top priority.

Brandon Huston
Albert Lea, Minnesota

TITLE:
Wastewater Treatment Plant Superintendent

EXPERIENCE:
25 years in the industry

AWARDS:
2023 Outstanding Class A Operator of the Year, Minnesota Wastewater Operator Association

CERTIFICATIONS:
Class A Wastewater Operator, Class D Drinking Water Treatment, Type 4 Biosolids Application

EDUCATION:
Associate degree, environmental technology, Riverland Community College

GOAL:
Continue improving treatment performance, keep the plant and grounds looking sharp

> "When I took over we only had four licensed operators. My goal is to have everybody licensed."
>
> **BRANDON HUSTON**

mechanical aptitude and some type of mechanical experience, and we train them from within.

"Maybe they're a farm kid, or they're in some type of maintenance program within their facility. Basically we're looking at, 'What have they built?' 'What have they taken apart?'" Job openings are posted on Indeed, on the city website, in the local newspaper and with wastewater professional associations.

New hires are first trained in safety. "I want them to understand how the plant all works," says Huston. "I send them out with one of our seasoned operators or our foreman. They need to know where the lockout/tagout equipment is, where all the PPE is stored."

For basic wastewater training, Albert Lea provides online courses through Suncoast Learning and Sacramento State University. New operators can study during the year they spend gaining the hands-on experience required for a Class D license. Before sitting for the exam, they take a preparatory course offered by the Minnesota Pollution Control Agency at various locations.

The team at the Albert Lea Wastewater Treatment Plant includes, from left, Parker Hanna, wastewater operator; Dustin White, wastewater foreman; Nick Finholdt, wastewater maintenance/operator; Brandon Huston, superintendent; Cavit Wobschall, wastewater operator; Matt Larson, lab technician; and Matt Jensen and Travis Rauenhorst, wastewater operators.

EMPHASIS ON LICENSING

Huston insists that all plant team members become licensed. "We used to have separate maintenance and operator positions," he says. "When I took over we only had four licensed operators. My goal is to have everybody licensed so they can be put on for weekends and take the workload off of just four individuals.

"It also takes away issues with, 'That's not my job.' Everybody does maintenance. There's no complaining. I want our guys to feel good about their jobs and know they have accreditation for what they're doing." Team members receive a pay boost for each license level they attain.

As a result, says Huston, "We have a wonderful crew. A lot of my success is based off what they've done for us. They're awesome at what they do. They have a good work ethic. When they do well, I do well.

"We have morning meetings every day for 10-15 minutes, and I make sure everybody communicates. We go over a weekly synopsis of all the things we're likely to see happen, and then each individual operator is assigned tasks. And I get updates on things happening in the plant that they say need to be fixed.

"My goal is first and foremost to fix anything that's a safety issue. If we find issues with gas, or electrical, or pinch points, or you name it, we try to resolve those right away." A company called SafeAssure provides a variety of safety training and each year performs a simulated OSHA inspection that ends with a list of recommendations.

Huston, right, named Outstanding Rookie Operator of the Year by the Minnesota Wastewater Operator Association, works with Cavit Wobschall to calibrate dissolved probes using a Hach SC200 controller.

CONSISTENT COMPLIANCE

The Albert Lea plant (9.85 mgd design, 3.3 mgd average) in most years receives one of the Facility Operational Awards presented annually by the MPCA for permit compliance. Influent is screened before it enters the force main that delivers it to the plant. The flow first passes through a Hycor Waterlink grit classifier (Parkson Corporation) and then primary clarifiers using Eimco drives (Ovivo).

The activated sludge process (Hoffman blowers) includes nitrification and clarification (Ovivo drives) followed by sand polishing filters (also Ovivo). After UV disinfection (Fischer-Porter), the final effluent discharges to the Shell Rock River.

Waste activated sludge is thickened by dissolved air flotation (Ovivo) before being sent to the anaerobic digesters (Ovivo). The digested material passes through rotary drum thickeners (Vulcan) before storage for application to cropland close to the plant. The city has 1,186 acres permitted, 81% of it owned by one farmer. A contractor pumps the liquid biosolids from a storage lagoon by way of a 6-inch hose directly to the fields for injection into the soil.

UPGRADES ON THE WAY

Huston looks forward to a series of upgrades to cost about $80 million spread over several years. The improvements will include a new pretreatment building a vortex grit removal system and grit classifier, biological and chemical phosphorus removal to meet an expected effluent phosphorus limit, and a biosolids dryer to replace anaerobic digestion.

"We are one of very few cities in the state that don't have a phosphorus limit," says Huston. "We've been monitor-only for decades, partly because the Shell Rock River is not technically a Minnesota watershed. All that water flows into Iowa."

Anaerobic digestion will be eliminated because with a substantial reduction in BOD from food processors, biogas production has declined. The two existing 35 kW microturbines used for cogeneration are aging, and the electricity they feed to the plant covers only about 10% of the total power demand.

> "We're trying to future-proof ourselves."
>
> **BRANDON HUSTON**

"Our engineers determined that it's much cheaper to abandon anaerobic digestion because of code issues, electrical issues and worn-out equipment," Huston says. "On paper, anaerobic digestion looks wonderful. But this plant was designed for 22,000 pounds of BOD per day coming in, and we've been averaging 9,000 to 10,000 pounds. That's just not enough."

Plans call for the biosolids to be dewatered to about 20% solids on a screw press and then fed to a natural-gas-fueled thermal dryer producing material at 90-96% solids. "We're trying to future-proof ourselves," Huston says. "We're trying to set it up so we could go to a new process after a dryer, like pyrolysis." That or some other high-temperature process would destroy PFAS, for which Albert Lea biosolids so far have not been tested.

The upgrades will also include an additional secondary clarifier for settling of phosphorus after alum addition, new disc filters and UV disinfection, a septage receiving station, new offices and new electrical switchgear.

DILIGENT MAINTENANCE

The existing plant is built for reliability and ease of maintenance. All major equipment has redundancy so that a pump or valve can be taken out of service for repair without interrupting treatment. Team members can track equipment operating hours on the Wonderware SCADA system (AVEVA) and perform planned maintenance on schedule. Housekeeping is a priority. Operators mow some 30 acres of grass, prune trees and trim weeds. The grass is allowed to go natural with clover, dandelions and other flowering plants to provide pollinator habitat.

Inside the facility, operators regularly hose or brush the clarifiers weirs; they pressure wash the concrete on the clarifiers and aeration basins. A city

Huston is proud to work in an industry that is growing in sophistication as its professionals deal with increasingly complex and important issues. (Blower control panels from Hoffman.)

street sweeper cleans the roads within the complex. The building windows are kept clean, the interiors walls washed and painted. Old exterior lights are being replaced with LEDs.

SOURCES OF PRIDE

"I want our plant to look like a park," says Huston. "It's one of the most expensive properties the city owns. I want to show the public and the city management that we're caring for their investment."

Huston takes pride in improvements made on his watch. Leachate accepted from an Iowa landfill generates some $500,000 a year in revenue and does not upset the process. Training for team members has helped elevate plant performance: "Some people say, 'What if you train all your guys and they leave?' My mentality is, 'What if I don't train them and they stay?' My goal is to make sure our team members can run the plant in my absence if they need to."

A certified lab has been a valuable asset: "We've been able to maintain certification not only for MPCA but also for the Department of Health in testing for coliform in the city's drinking water. With an accredited lab we can have the data extremely fast instead of waiting for a third-party lab to get back to us. It makes plant control so much easier."

Huston is also proud to be part of an industry that is advancing in sophistication. "They've solved a lot of the world's problems with pollution, and now they're fine tuning it and dialing in," he says. "In past decades we were looking at PCBs and heavy metals. Now we're looking at future concerns with PFAS."

Albert Lea is among about 30 cities working with the University of Minnesota on wastewater surveillance for COVID-19. "You can actually determine when COVID is going to hit a community before the cases start appearing," Huston says. "Our bodies excrete RNA from the SARS-CoV-2 virus days before the symptoms show up."

Huston's brand of leadership is sure to help keep Albert Lea's clean-water facilities on the cutting edge. tpo

NEW TO THE TEAM

Cavit Wobschall joined the team at Albert Lea just two years ago and made an immediate impact. In 2023, he was recognized as the Outstanding Rookie Operator of the Year from the Minnesota Wastewater Operator Association.

He came with an associate degree in information systems from South Central Community College in Mankato, Minnesota, and nine years in wastewater spray irrigation in the food processing industry. He holds Class D Wastewater Operator and Type 5 Spray Irrigation certifications, along with a Specialty Boilers license and a commercial driver's license.

"While I was in college I started working at a food processing plant and driving a combine for peas and sweet corn during summer just to gain some money," Wobschall says. "After I finished school I realized that I hated computers. I like to work with my hands."

He started doing maintenance at the food plant and soon was offered a position on the wastewater side. Water from the plant's cleaning operations and overflow from vegetable processing was sent to a pond to be sprayed onto permitted land. He became the wastewater mechanic, then the wastewater lead and finally environmental supervisor.

From there he took his current position with Albert Lea. "I was done with the food processing side," he says. "The hours were insane. I was working 80 to 100 hours a week for seven months out of the year, I had a couple of kids, and you can't be away from them that much."

He quickly came to love the municipal clean-water sector: "It's fascinating. Anybody who gets into wastewater never said 'My dream is to be a wastewater operator.' I don't think you'll ever find someone who says that. But once you get into the field, it's interesting to see how it all works — the chemistry, the biology, everything.

"There's always something going on. Everything is always changing. It keeps you on your toes. I like working for this plant and with these people. It's good for mentorship. They teach you how to do things here. Before, I had to figure it out on my own. Now I have a lot of people I can lean on, and that elevates everything I do.

"Our foreman, Dustin White, is one of the quietest and nicest guys around. He's very knowledgeable. He's been here 15 years, so he knows the entire process. He's patient and he helps me figure things out. And everyone else around here is really nice and really helpful."

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Upper Tuscarawas Wastewater Treatment Plant, Akron, Ohio

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Two buildings that provide access to the underground Sustainable Water Infrastructure Project in Santa Monica are the only visible signs of the reverse osmosis facility at ground level.

An Underground Success

THE CALIFORNIA CITY OF SANTA MONICA CAPTURES STORMWATER, MIXES IT WITH WASTEWATER AND TREATS IT FOR AQUIFER RECHARGE AND POTABLE REUSE

By Steve Lund

Santa Monica built a facility that can produce 10% of the city's water demand by treating wastewater and stormwater for indirect potable reuse. And it's practically invisible.

"The bad joke my staff gives me a hard time about is that we spent $96 million on a parking lot," says Sunny Wang, water resources manager. "Because essentially that's all we have to show for it on the surface."

The facility, known as the Sustainable Water Infrastructure Project received a 2023 Helen Putnam Award for Excellence from the California League of Cities. The treatment system came online in November 2022.

The project consists of a 1 mgd advanced water treatment system, a 1.5 million-gallon stormwater collection tank, and upgrades to the city's urban runoff treatment facility. The advanced treatment plant can process a mix of 30% stormwater and 70% wastewater, 100% wastewater during dry weather.

The treated water is piped to injection wells that recharge an aquifer, from which water then can be drawn out and be treated for drinking water. On the way to the injection well, some of the treated water is used for irrigation or for toilet flushing in dual-plumbed buildings.

The recycled water is suitable for nonpotable and potable reuse. "The water that comes out of that facility actually meets or exceeds all drinking water standards," Wang says.

NO ROOM ON THE SURFACE

The treatment plant and the stormwater storage tank were built under a parking lot next to the Santa Monica Courthouse. Wang observes, "Santa Monica is a highly urbanized community. We're completely built out. There's just no space on the surface for this type of facility.

"We put everything underground to be a good neighbor and to be supportive of the facilities around us. We have very efficient odor-control systems. Even within the facility, you don't have a strong sense of wastewater, and definitely aboveground you don't smell any hint of it at all."

The only visible indications that the water treatment plant is there are two small buildings that provide access to the underground facilities.

MULTI-STEP PROCESS

Treatment starts with a rotary drum screen (CleanTek Water Solutions). The stormwater-wastewater mixture then goes to a ZeeWeed membrane bioreactor (Veolia Water Technologies) that consists of an anoxic zone, an aerobic zone and filtration.

"Anything larger than 1 millimeter will get screened out," Wang says. "After that, it goes to biological treatment. That's actually the most effective treatment process we have in removing both organic and inorganic industrial contaminants. And then we have ultrafiltration. So the biological process and the ultra-filter membranes work together."

After the membrane bioreactor, the flow goes to cartridge filtration (Harmsco), reverse osmosis with Toray membranes (H_2O Innovation), UV advanced oxidation (Trojan Technologies) and finally disinfection with free chlorine. The cartridge filters protect the RO membrane from fouling. The UV advanced oxidation process destroys chemicals such as pharmaceuticals and personal-care products.

> "We use wastewater to dilute the stormwater. Stormwater is actually harder to treat than wastewater."
>
> **SUNNY WANG**

"People take painkillers, for example, and that is in our wastewater," says Wang. "We've got to make sure we destroy those before we can use the water to recharge our aquifer. The UV and chlorine zap out industrial contaminants. After that we carry a chlorine residual to provide traditional chlorine disinfection. The quality of the water coming out of the facility is above and beyond typical surface water or groundwater treatment."

PROTECTING THE BAY

Under California regulations, water injected into an aquifer must remain there for two to six months before being pumped to a water treatment plant. "We have to conduct a tracer test," Wang says. "We have monitoring wells.

We monitor and confirm through tracer testing that we provide the required retention time."

The raw wastewater being treated at the SWIP is a small portion of the city's flow. The rest is treated at the Hyperion Water Reclamation Plant, a regional facility operated by the city of Los Angeles. The stormwater now treated at the SWIP previously ran untreated into the Pacific Ocean at the Santa Monica Bay.

"The original motivation for this project was to divert the urban runoff and stormwater water away from the Santa Monica Bay to improve water quality there," Wang says. "Then it became, OK, if we divert all that water, what do we do with it? So then we decided to recover it for beneficial use."

The reverse osmosis equipment at Santa Monica's Sustainable Water Infrastructure Project is all underground (H_2O Innovation).

Cartridge filtration is part of the advanced water treatment process at the Sustainable Water Infrastructure Project (Harmsco).

STORMWATER: THE HARD PART

During the heavy rains that hit Southern California in the winter of 2022-23, the stormwater collection system diverted 20 million gallons that would have flowed into the ocean. That stormwater was mixed with wastewater, treated and reused.

"We use wastewater to dilute the stormwater," Wang says. "Stormwater is actually harder to treat than wastewater. Wastewater is organic and easy to biodegrade, versus the heavy metals and oil and grease that stormwater picks up in the streets. That's why we only treat up to 30% stormwater. Otherwise, it would affect our biological treatment basins."

In its first year of operation, the SWIP did not run at full capacity, because the injection well couldn't absorb as much water as expected. The city is developing two more injection wells to enable use of the plant's full capacity, which is about 10% of the Santa Monica's water demand.

That's a big step toward the city's goal of reducing reliance on water imported from Northern California or the Colorado River. The city hopes to become water self-sufficient, meaning 99% of its water would be locally sourced.

Keeping stormwater out of the bay is also a goal, and the amount collected and treated at the SWIP is a small percentage of what is available. Another underground collection tank is under consideration. "It's doing great," Wang says. "But there's definitely more to be done."

Wang thinks what Santa Monica has accomplished with the SWIP can be a model for other communities: "We spent quite a bit of time and money to investigate and negotiate with the regulators about how to treat this water to the highest beneficial use, so we hope that this is an example that other communities could follow.

"They don't have to go through the same exercise we did. We established what those treatment requirements and regulations look like, and others could just follow our lead. We're really hoping for more utilities to pick up on these ideas and implement this type of project." tpo

The Turbo Dryer contains a stack of circular trays that rotate. Wet material enters at the top and is exposed to hot air. After one revolution a wiper directs the material through slots down to the tray below.

Rapid Biosolids Drying

A TURBO DRYER PROVEN FOR DECADES IN MANY INDUSTRIAL APPLICATIONS IN THE U.S. AND WORLDWIDE IS BEING INTRODUCED TO THE WASTEWATER SECTOR

By Ted J. Rulseh

Biosolids drying can yield Class A products suitable for a wide range of beneficial uses with few restrictions.

But cost-effective drying requires high efficiency and a reliable process that can operate continuously and keep the product pipeline full.

Komline-Wyssmont is now offering its Turbo-Dryer to the municipal wastewater treatment sector. Dryer manufacturer Komline acquired Wyssmont and the Turbo-Dryer in 2022. The technology has been proven for several decades in industrial application for drying hundreds of materials, according to Nathanael Komline, marketing manager with Komline-Sanderson Corp.

The dryer uses direct heat and a stepwise process to deliver uniformly dried biosolids. The material is exposed to heated areas and is intermittently redistributed to speed the drying. Dryer sizes range up to 35 feet in diameter by 60 feet high with an evaporative capacity of 25,000 pounds of water per hour. The units provide continuous automatic operation with precisely controlled temperature and residence time.

The manufacturer says the process creates minimal dust and fines and provides a free-flowing end product that does not cake. The dryers can use a variety of fuels and other heat sources. Komline and Joe Bevacqua, vice president of Komline-Wyssmont, talked about the technology in an interview with *Treatment Plant Operator.*

tpo: What is the reason for bringing this technology to the wastewater treatment market?

Komline: We have significant experience in biosolids drying. Now we are adding this direct-drying technology to our experience with our existing indirect dryer. Some treatment facilities prefer a direct dryer for their applications. Some dryers that we supplied in the 1950s are still operating in production every day.

tpo: What differentiates this dryer from other biosolids drying technologies?

Bevacqua: We have a very heat-efficient system. We take some of the exhaust gas from the dryer and recirculate it back over the burner or through a heat exchanger to increase the temperature of the incoming ambient air. So for example, in winter we're taking in fresh air that is very cold, but we preheat that ambient air and therefore use less fuel. The amount of hot air recirculated depends on the amount of water we need to evaporate in the dryer. The units are also relatively compact. Whereas a conveyor dryer or a rotary dryer could be up to 100 feet long, our units are vertical structures. There is a big range of sizes depending on the capacity the customer is looking for.

tpo: What fuels can this dryer use?

Bevacqua: We can use any heat source our customer has available. We can use waste heat, steam, natural gas, oil and biogas. We can handle the material at up to 85% moisture without having to condition the feed.

tpo: How would you quantify the heating efficiency of this technology?

Bevacqua: We can operate with heat requirements as low as 1,650 to 1,800 Btu per pound of water evaporated. For a belt dryer, which is not a sealed unit, the heat requirement is often much higher. In the industrial field, we have seen heat usage as high as 3,300 Btu per pound of water, and that's for materials with the same water content as municipal biosolids.

> "From a test using about two pounds of material, we can scale up to any capacity and guarantee performance."
>
> **JOE BEVACQUA**

tpo: In basic terms, how does the technology work?

Bevacqua: Inside the dryer we have a stack of circular rotating trays, like flat donuts. Down the center of the trays is a shaft with fan wheels mounted on it. Hot air enter the unit is mixed by the action of those fans to control the temperature. Generally for municipal biosolids we are in the range of 250 to 350 degrees F. The hot air circulates over the material on the trays. Wet material enters at the dryer onto the top tray. After one revolution a stationary wiper directs the material through slots down to the tray below, and so on to the bottom of the unit. Every time the material transfers to the next lowest tray, the pile is turned over. That helps dry the material faster.

tpo: How many trays are there?

Bevacqua: That depends on the capacity the customer requires. It can be anywhere from 10 to 48 trays. The dryer can be built with a variety of materials. The trays where the material is flowing would typically be stainless steel. But other pieces such as the walls, the roof and the support structure can be stainless, or plain steel, in which case there is probably a 25% reduction in price.

tpo: Is each dryer custom designed for the site?

Komline: As with most of our equipment, they are engineered to order. That's partly where the experience of Komline comes in.

Bevacqua: We size the equipment based on test data. On each project, we calculate the amount of heat necessary and size all the auxiliary equipment like fans, burner, dust collector and scrubber if necessary. Then we run tests on a sample of the customer's material. We have a bench-scale unit that duplicates all the actions of a full-scale production unit. From a test using about two pounds of material, we can scale up to any capacity and guarantee performance.

tpo: What is the capacity range of the dryers?

Bevacqua: If you have a product that's 80% wet and 20% solids, our biggest units can evaporate about 12,000 pounds of water per hour. That yields about 3,000 pounds of solids. Units from 4 to 12 feet diameter and about 17 feet tall are shipped shop-assembled. Units larger than that are field-assembled from subassemblies.

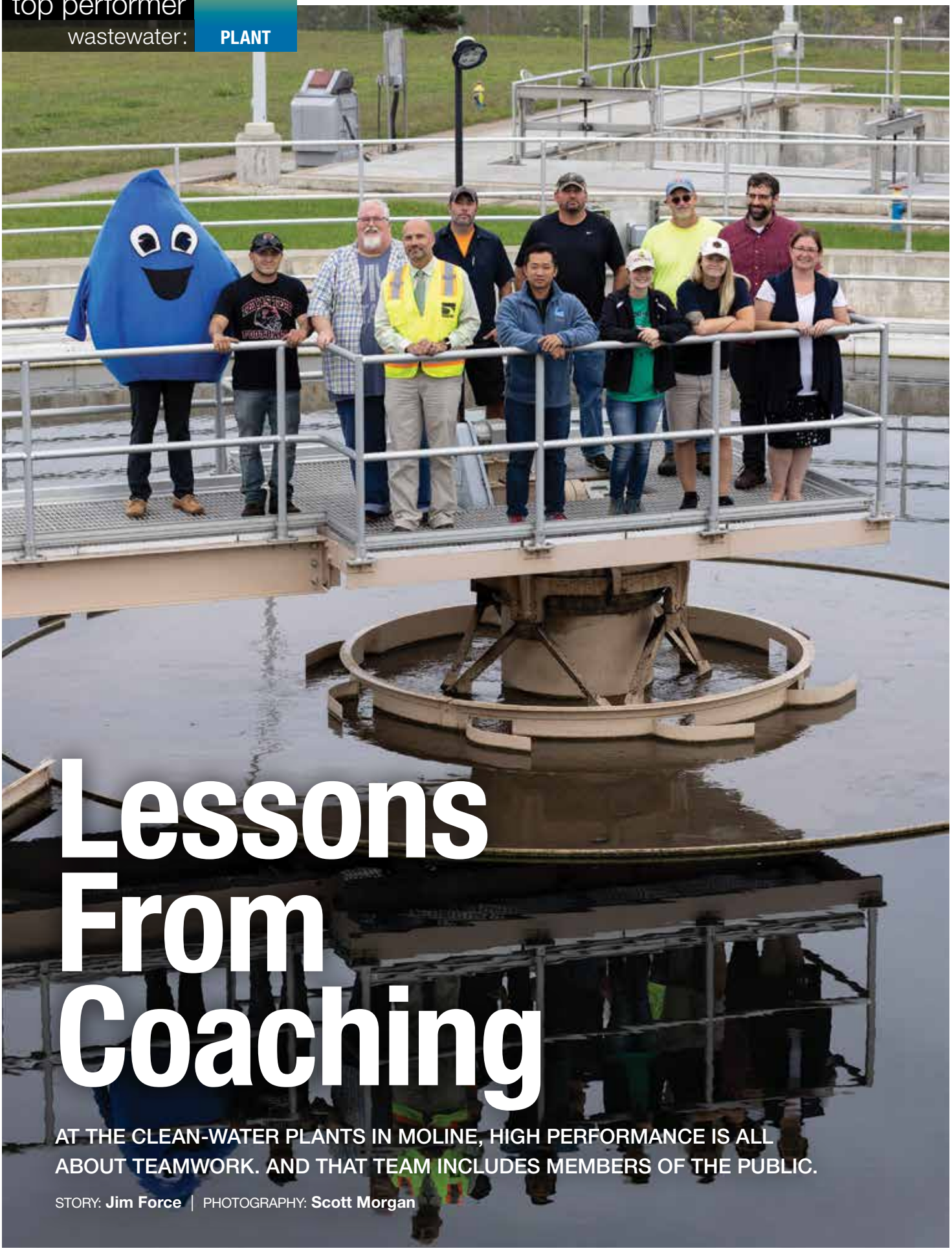
tpo: How easy is it to operate the technology?

Bevacqua: It operates automatically with essentially no operator attention. Customers have told us they turn it on Monday morning and nobody watches it. It runs continuously. No plant assigns an operator to watch the Turbo-Dryer.

tpo: What does regular maintenance consist of?

Bevacqua: Generally, maintenance is less than 1% of the cost per year. The bearings are designed for a 20-year life because the rotational speeds in the dryer are quite low. The only wear items are the wiper blades, which are made from tempered 316 stainless steel. Because the material being dried is continuously wiped from the trays, the system requires minimal cleaning.

tpo



Lessons From Coaching

AT THE CLEAN-WATER PLANTS IN MOLINE, HIGH PERFORMANCE IS ALL ABOUT TEAMWORK. AND THAT TEAM INCLUDES MEMBERS OF THE PUBLIC.

STORY: **Jim Force** | PHOTOGRAPHY: **Scott Morgan**

FACING PAGE: The staff at the North Slope Wastewater Treatment Plant includes, from left, Brandon Foutch, laborer; Misty (water mascot); Greg Pyles, treatment operations manager; Tony Loete, director of utilities; Chris Hancock, operator; Quoc Chu, lab technician; Justin Pratt, crew leader; Alex Branham, operator; Mike Butler, plant mechanic; Emily DeGraff, operator; Charly Brown, environmental compliance manager; and Melissa Kodatt, executive coordinator.

In the movie *Hoosiers,* coach Norman Dale preached a team approach. Every player contributed to the effort that led to the Indiana state basketball championship.

Next door in Moline, Illinois, Greg Pyles takes the same approach. The focus on teamwork has resulted in a 2023 Class B Plant Award for the city's North Slope Wastewater Treatment Plant from the Illinois Association of Water Pollution Control Operators.

"I think of my role in terms of being a general manager of a sports team," says Pyles. "I draft the best people I can and find a role for them on our team. There isn't always a No. 1 draft choice, but everyone has some meaningful way they can contribute. If someone from our team retires, quits or gets hit by a bus, we still have people who can operate our facilities."

That team approach enables the Moline staff to operate two other plants: the 9 mgd (design) South Slope plant in the city and a 1 mgd facility in the nearby community of Colona. Pyles recalls that when Colona lost its operator, leaders there approached Moline to help find a replacement. Moline had a different idea.

"We were able to add staff to our team, and we now operate the Colona facility," Pyles says. The move was helpful since the smaller community might not have been able to hire and keep a licensed operator on staff, Pyles says. "Additionally, we have a depth and breadth of experience that a single person couldn't possibly match."

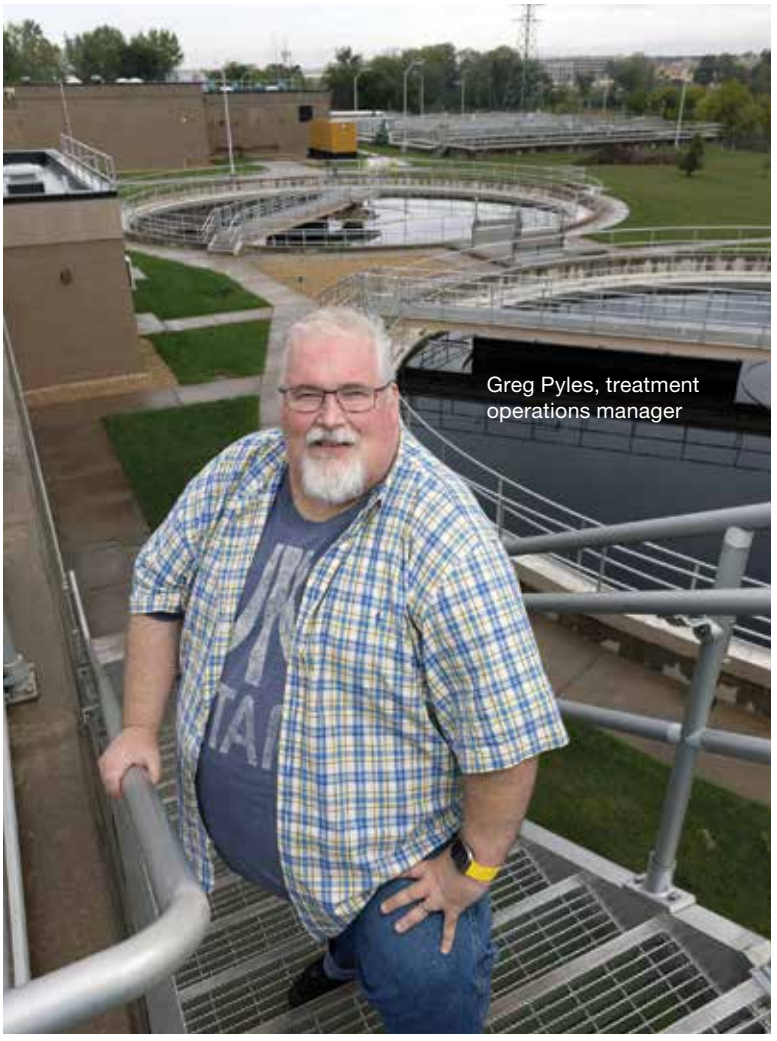
> "We want to empower operators to achieve their full potential."
> **GREG PYLES**

NEWLY UPGRADED

The North Slope facility (5.5 mgd design) dates to the 1970s. In the past few years, it has undergone a $40 million upgrade and modernization. Today it treats an average flow of 4 mgd, serving about 22,000 customers in the north and east sectors of Moline. Wet weather capacity is 34 mgd. Storm flow was a central factor in the expansion, since the city opted for partial treatment and release of stormwater instead of building storage reservoirs around the system.

Flow enters the plant through a mechanical screen and wash press (Headworks International). Walker Process clarifiers settle out primary solids, and the flow passes to aeration basins equipped with fine-bubble diffusers (Sanitaire, a Xylem brand) and APG-Neuros blowers. The plant's two aeration trains operate in the conventional activated sludge mode.

Treated effluent settles in circular secondary clarifiers (Walker Process) and is then disinfected with liquid sodium hypochlorite on a seasonal basis (May 1 to Oct. 31) before discharge to the Sylvan Slough of the Mississippi River. Monthly effluent averages 3-4 mg/L BOD and TSS, which is well within permit limits.


Greg Pyles, treatment operations manager

Pyles and plant staff anticipate a phosphorus requirement sometime in the next five to seven years.

All submersible pumps in the plant and lift stations are Flygt, a Xylem brand. Sludge pumps are the Double Disc Pump by Penn Valley Pump. AVEVA Wonderware supplied the SCADA system, and the preventive maintenance management system uses Antero software (AllMax).

Solids handling at the North Slope plant is unique; the facility has no digesters. Instead, solids are stabilized with lime sludge from the water treatment plant, which is co-settled in the primaries with the primary sludge. Then the waste solids are dewatered to 40-50% solids on new FKC screw presses and hauled to landfill.

The utilities administration building at the North Slope Wastewater Treatment Plant in Moline, Illinois.

UPGRADING PERFORMANCE

Today, the operation looks quite different than 10 years ago. The upgrade project, funded through the Illinois State Revolving Loan Fund, included a new administration building, laboratory and server and operations control center.

New screens were installed in the headworks, and new influent

> "I think of my role in terms of being a general manager of a sports team. I draft the best people I can and find a role for them on our team."
>
> **GREG PYLES**

Alex Branham, water treatment operator, runs a test using a pH probe.

pumping was added. The old primaries were redesigned and repurposed to add storage capacity for excess flows. Wet weather can be a problem, and incidents are increasing, according to Pyles.

"We had a very wet spring in 2019 with 30-plus days of flooding," he says. "We're along the river. We have separated sewers, but we still have some infiltration and inflow." In the new configuration, storm flow receives partial treatment at North Slope before discharge.

In addition to increased flows, the North Slope project addressed rising energy costs. Working with the Smart Energy Design Assistance Center at the University of Illinois, the plant staff has implemented several energy-saving measures and is contemplating more.

The center commended the North Slope staff for efforts to reduce energy consumption by having variable-frequency drives on pumps, fine-bubble aeration and a separate stormwater settling and treatment stream. Occupancy sensors, LED lighting and an energy saving HVAC system also help reduce the annual energy bill by several thousands of dollars.

"By also participating in a SEDAC energy assessment, the facility is exhibiting a sharpened focus as an organization dedicated to energy management practices" the center reported. "It sends a very strong message to one's community."

Pyles adds, "I believe we may be among the most energy-efficient treatment plants in the state. I know we ranked second among activated sludge plants in the audit of state facilities."

North Slope Wastewater Treatment Plant, Moline, Illinois

moline.il.us

BUILT:
1970s, expanded 2014-2018

SERVICE AREA:
Northern and eastern sections of Moline

POPULATION SERVED:
22,000

FLOWS:
5.5 mgd design, 4 mgd average

TREATMENT LEVEL:
Secondary

TREATMENT PROCESS:
Activated sludge

SOLIDS:
Lime addition, dewatered, landfilled

RECEIVING STREAM:
Mississippi River

AWARDS:
2023 Best Operated Plant, Illinois Association of Water Pollution Control Operators

ANNUAL OPERATIONS BUDGET:
$10.4 million (North Slope and South Slope plants)

North Slope Wastewater Treatment Plant
PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
BOD	120 mg/L	3 mg/L	20 mg/L
TSS	462 mg/L	4 mg/L	25 mg/L

PUBLIC INTERACTION

In winning the award as the state's best-operated plant, the North Slope team facility received a pat on the back for public outreach. Pyles says tours and communications are key: "We conduct numerous tours of the plant. We host the local plumbers and pipe fitters classes to show them the type of work that they will encounter in their jobs."

The plant also maintains strong communications with environmental organizations focused on protecting and preserving the Mississippi River and its tributaries. "We're very involved with them," says Pyles. "We have hosted Riverine Walk tours with the River Action group a couple of times a year. We give numerous presentations about the plant. We are partners in protecting our waterways."

Pyles exemplifies the experience he appreciates on his staff. This is his 32nd year in the clean-water profession. He studied microbiology at the University of Illinois at Champaign-Urbana, while working as an operator in Decatur. He served there for 28 years, becoming the safety and training coordinator and then operations manager.

After that, Veolia hired him to manage the wastewater operation at Lincoln. In 2019 Pyles came to Moline. He has a capable team in place, with a mix of veterans and newcomers. Tony Loete leads the team as utilities director, and Pyles reports to him.

Reporting to Pyles are Justine Pratt and Carl Hensley, water pollution control crew leaders; Mike Butler and Bob Nees, water pollution control mechanics; Andy Laxton, Chuck Saunders, Emily DeGraff, Nick Poseteri, Chris Hancock and Alex Branham, operators; Josh Mader, Madison Jewell, Brandon Foutch, laborers; and Charles Brown, environmental compliance manager.

The team is supported by laboratory technicians Robin Markle, Susan Grau, Quoc Chu and Echo Claus, who is also the pretreatment coordinator.

STARTING THEM YOUNG

Cities everywhere are struggling to find new people to fill important positions. Instead of just hanging out the Help Wanted sign, officials in Moline have launched a creative internship program to interest high school students in municipal jobs, including those at the water and wastewater treatment plants.

Following the leadership of Mayor Sangeetha Rayapati, herself a professional educator, the city offers paid internships in various departments to students after their junior year in high school, with the option of a full-time summer job after their senior year.

Leah Miller, human resource director, says students are introduced to job opportunities by first signing up for a tour of various city departments. In summer after their junior year they can choose to spend a six-week paid internship, rotating through several areas: administration, streets and parks, engineering, fleet maintenance and utilities.

After their senior year they can return for a six-week summer job in one area they select.

Theresa Todd of Blackhawk College in Moline specializes in work-based learning and says that while the city's program is in its initial phases, it already shows promise.

"Three students chose to take part in the program in its first year, and six in the second year," she says. "It's a phenomenal framework, and it's developing really well."

So far no students have chosen water/wastewater internships, but Greg Pyles, water pollution control treatment operations manager, likes the program. "Not everyone has the aptitude for working here," he says. "But many didn't realize what we do, and now they appreciate our efforts."

APG-Neuros NX100 turbo blowers at the The North Slope Wastewater Treatment Plant.

FLEXIBLE STAFFING

Pyles is proud that in the past 24 months, Loete, Brown, Butler, DeGraff and Claus all have become Class 1 (highest) operators, passing the exam on their first attempt. In the same timeframe, Chu earned his Class 4 license.

Quoc Chu, lab technician, runs a phosphorus test using a Hach DR2700 spectrophotometer and a Drummond Pipet-Aid portable pipette controller (Cole-Parmer).

> "I believe we may be among the most energy-efficient treatment plants in the state."
>
> **GREG PYLES**

"We've made a push to get operators certified and trained, even when it means we may lose them to another community," Pyles says. "We want to empower operators to achieve their full potential." He credits the Wastewater Short School at the Environmental Resource Training Center at Southern Illinois University Edwardsville for helping the staff reach these goals.

The staff rotates among the three treatment plants Moline is responsible for. For example, when the utilities laboratory is short-staffed, an operator can fill in and run solids or BOD tests. If there's a vacancy at one plant, an operator can be sent from another plants or a crew leader or mechanic can step in when an operator is on vacation or calls in sick.

And while Moline struggles to find new hires, Pyles is happy with his team: "We've got some with years of experience who are very skilled. We have a lot of resources. By recognizing what an employee brings to the team, playing to their strengths and avoiding their weaknesses we have built a solid team of wastewater professionals."

Sounds a lot like coach Dale. **tpo**

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Cyber Threats: Are You Prepared?

THE WATER AND WASTEWATER SECTORS ARE TARGETS FOR A VARIETY OF CYBERATTACKS. SOME SIMPLE MEASURES CAN GO A LONG WAY TO PROTECTING CRITICAL OPERATIONS.

By Ted J. Rulseh

Cyberattacks on water and wastewater utilities might not be quite as inevitable as death and taxes.

Still, they pose significant risks that operators in treatment facilities can play a critical role in mitigating. Attacks can come from various sources: agents for foreign governments, purveyors of malware and ransomware, disgruntled former employees and others, according to Kevin Morley, Ph.D., manager of federal relations with the AWWA.

Morley emphasizes that small utilities lacking security expertise are especially at risk. He cautions that cybersecurity is not just the province of IT professionals — it is everyone's job. Measures as simple as managing passwords effectively and warning team members against clicking on links in suspect emails can help greatly in warding off attacks.

Morley works closely with U.S. government agencies and others to enhance the security of critical infrastructure. His work includes developing standards and guidance on cybersecurity, preparedness, and risk and resilience management for water and wastewater systems. He talked about cybersecurity threats and remedies in an interview with *Treatment Plant Operator.*

tpo: In the big picture, how would you assess the scope and nature of cybersecurity threats for water utilities?

Morley: Water utility operations face a number of threats, from natural disasters to typical water main breaks. Cybersecurity is a threat factor that has as close to 100% probability as anything else. Water systems are being targeted. Even very unsophisticated attacks have potential to seriously compromise utility services. Just because you're small doesn't mean you're not a target. It may make you more of a target because bad actors know that smaller entities don't necessarily have in-house cybersecurity expertise. They are easier targets than big cities.

> "Cybersecurity is a threat factor that has as close to 100% probability as anything else. Water systems are being targeted."
> **KEVIN MORLEY**

tpo: Can you give an example of an attack on a smaller utility?

Morley: A few years ago in Kansas, an employee was released from a small utility, and nobody took away his sign-on credentials. Two months later he was out having beers with his buddies and said, "Watch what I can do." He shut down the water plant from his phone. He was prosecuted by the Department of Justice. The point is, a really simple HR failure compromised the public health and safety of a community.

More recently, utilities have been targeted by Iranian nationals in relation to the war between Israel and Hamas. In Aliquippa, Pennsylvania, they defaced the HMI on the PLC in a booster pump station with a message that essentially said, "We're attacking you because this is an Israeli-based technology — free Palestine." They didn't go through with turning anything off, but they could have. They had total control of the system.

tpo: How might the operators in that utility have prevented that incident?

Morley: The intruders took advantage of the utility being on the internet and not having changed the default password. Those are two super simple things that operators could have changed in terms of how access to that PLC was managed. These examples illustrate some simple, low-hanging-fruit actions that can be taken by operators to help manage the risks associated with cyber threats.

Kevin Morley

tpo: What are some of the kinds of vulnerabilities that utilities tend to have?

Morley: Sadly, it's some really simple things, like not changing default passwords. Elements of their network are public-facing. People can go in and see it, and there's no password control, and there's no use of multifactor authentication or VPN to control access. I am not saying they shouldn't do remote access, but if they're doing that they need to put in some speed bumps to control who can get in and who can't. It's like at a physical plant: If you don't have a fence, anybody can walk in. If you put up a fence, you keep most people out. And if somebody does jump the fence, you're in a better position to say, "Hey, you're not supposed to be here."

tpo: How severe can the consequences be from cyberattacks?

Morley: It depends on the motivation of the bad actor and where they get into the system. They could literally turn the water system off, and that's

Cybersecurity: A Collaborative Approach?

The AWWA and the National Rural Water Association are advocating a collaborative approach to cybersecurity measures in the water sector.

David LaFrance, AWWA CEO, noted that cyber threats in the water sector are real and growing and cannot be ignored, and that strong oversight of cybersecurity is critical. He advocated "a co-regulatory model that would engage utilities in developing cybersecurity requirements with oversight from EPA."

Together, AWWA and NRWA represent community water systems of all sizes and have advocated solutions to address cybersecurity while keeping members' perspectives in mind.

The proposed governance framework for cybersecurity would be built on a process similar to the one followed in the electric utility sector. It would maintain EPA oversight, engage water sector experts, and protect sensitive information.

a real problem for fire safety, dialysis centers and hospitals. They could also compromise water quality. There are a lot of redundancies in water systems to help mitigate that, but depending on how the system is segmented and set up, those things can be overcome. On the wastewater side, they could shut the plant down, and now the utility is straight-piping waste out into the watershed, upstream of drinking water systems. A lot of environmental harm and downstream consequences could occur.

tpo: What specifically are intruders targeting?

Morley: They are targeting the things that actually run the pumps and the motors — operational technology. But the most common threat is ransomware because it's about money. A Texas municipal district that serves 2 million people got hammered with ransomware. It didn't impact operations, but it really messed up the business side. Customer and employee data was released. That costs real money.

tpo: How do ransomware and other malicious programs get into a system?

Morley: People click on things. Somebody sends an email containing malware. An employee clicks on it and now the malware is deployed. That's how ransomware gets delivered 99% of the time. Or it could be an operator charging up a phone in the USB port on the computer in the control room. That operator just blew the firewall, so any garbage on that phone can get moved onto the control system.

tpo: How important is it to manage passwords?

Morley: It's critical. If five people are working in a plant and there's a single username and password, management has no operational understanding of who is in the system and when. You need unique usernames and passwords for personal staff, and if you have multifactor authentication, that's one more safeguard to ensure only authorized users can access the system.

tpo: What kinds of resources are available to help utilities deal with cyber threats?

Morley: There is a free service from the Cybersecurity and Infrastructure Security Agency within the Department of Homeland Security. It's a vulnerability scanning program. Think about window-shopping at Christmas time. You're not in the stores, you're not buying anything, but you can look in and I can see what they have. What this tool is doing is scanning the utility's IP addresses from the outside, which is exactly what the bad guys do. If a utility implements this service, they would get a report that tells them, "You've got an open port to the internet at XYZ location, and you should close that."

tpo: How effective has this scanning program been?

Morley: It's really empowering, especially for small utilities that don't have in-house security staff, but have a couple of operators in charge. They're likely not cybersecurity experts, which is fine — I'm not knocking operators. But this is one tool that can help them understand what vulnerabilities may exist. CISA has observed that utilities enrolled in the program have reduced their vulnerability exposure by upwards of 40% within three months.

tpo: Is the scanning done on a one-time basis or over time?

Morley: They get a report from CISA on a periodic basis that essentially says: Here are the things about your network that, from the outside looking in, we see as vulnerabilities. Then, depending on what it the issue is, they can deal with it themselves or bring in a service provider. It allows them to make important decisions to manage cybersecurity risks.

tpo: What cybersecurity resources does AWWA offer?

Morley: At awww.org/cybersecurity, we have practical, step-by-step guidance for protecting process control systems from cyberattacks. We also have an assessment tool to help utilities tailor their review of the controls that are the most applicable to the technology used by the system. It includes a series of questions that basically say, "Do you do this or don't you?" Based on the answers, we give prioritized recommendations for controls that should be implemented. There is also a getting-started guide to help small and rural utilities improve cybersecurity practices.

> "Doing nothing is unacceptable. Cybersecurity is not an extra thing. It is a mission critical thing."
> **KEVIN MORLEY**

tpo: In summary, how important is it for utilities to make cybersecurity a priority?

Morley: Doing nothing is unacceptable. Cybersecurity is not an extra thing. It is a mission critical thing. It needs to be managed just as much as the distribution system. Water is a national critical infrastructure. It's a national security risk. State actors including China, Iran and Russia are targeting it, along with more routine actors who are monetarily motivated, like purveyors of ransomware. We need to think in terms of the multibarrier approach we apply to water quality and expand it to cybersecurity for the assets that are critical to running the water system. Assume you're going to be attacked. And then ask: Are we prepared to respond? And if the system is compromised, do we have a plan to bring things back online in a timely fashion? tpo

Process Control, Instrumentation and Laboratory Equipment

By Craig Mandli

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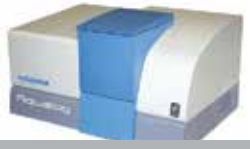

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HORIBA SCIENTIFIC AQUALOG

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SmartSights Bundle software

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EC-2000 Digital Controller from DSI Dynamatic

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4-in-1 Controller from Orenco Systems

ORENCO SYSTEMS 4-IN-1 CONTROLLER

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PRIMEX PC-3000XC

PC-3000XC controller from PRIMEX

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Data Logger

AUTOMATION24 NOVUS FIELDLOGGER 8812191900

NOVUS FieldLogger 8812191900 from Automation24

The NOVUS FieldLogger 8812191900 from Automation24 is a versatile data logger designed for industrial and laboratory applications. This compact device can monitor and record a wide range of physical and electrical parameters, including temperature, humidity, pressure, voltage, current and resistance. With eight universal analog inputs, two relay outputs and up to eight digital inputs and outputs, it can be customized to suit different measurement needs. It has a large color display that provides an intuitive interface for configuration, data visualization and alarm management. The device can store up to 512k of data on its internal memory, which can be expanded with an SD card. The data can be transferred to a computer or a cloud service through Ethernet, USB or RS485 connections. It also features advanced functions such as math and logic operations. **800-250-6772; www.automation24.com**

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AQUATIC INFORMATICS RIO

Rio data management solution from Aquatic Informatics

Rio from Aquatic Informatics is a compliance and operations data management solution for water and wastewater professionals. It helps manage operations, compliance, data and reporting to stay ahead of risk and protect a community's water supply. It can be used to centralize and organize compliance and operations data in a secure, online platform for a holistic view of the water system — integrated with electronic lab transfers and field data captured through mobile devices. It can also be used to unlock insights with data visualization and dashboards for optimized analysis and empowered decision-making. Its use can help ensure data accuracy with the calculation validation engine to produce reliable, accurate reports for regulatory requirements or internal operations. It also collects data remotely — while connected or offline — for improved visibility without any duplication of effort. It lets utilities achieve efficient, proactive operations by reviewing and analyzing data faster, supporting compliance and more informed decision-making. **877-870-2782; www.aquaticinformatics.com**

Alyza IQ analyzer platform from YSI, a Xylem brand

YSI, A XYLEM BRAND ALYZA IQ

Alyza IQ from YSI, a Xylem brand is an online wet chemistry analyzer platform developed to help ensure regulatory compliance, improve operational efficiency, and reduce costs. It is designed to minimize analyzer maintenance while maximizing accuracy and reliability. It features automatic cleanings and calibrations, no-spill reagent containers, and uses only 5 to 15 microliters of reagent per measurement, resulting in fewer reagent changes over time. The analyzer platform has a fully automated temperature control system with a double-insulated cabinet to maximize performance regardless of where it's deployed. The Alyza NH4 continuously measures ammonium and can be used to help control ammonia-based aeration and ensure regulatory compliance. The Alyza PO4 continuously measures orthophosphate to monitor and control chemical-P removal, verify bio-P removal and help ensure regulatory compliance. **937-767-7241; www.ysi.com**

XIO WATER SYSTEMS ACUITY HUB

Acuity Hub from XiO Water Systems

XiO Water Systems' data services and analytics solution enables water utilities to gain valuable insights from their data and optimize operations. Real-time data can be extracted from existing SCADA systems, stored in the cloud, and made available through the Acuity Hub cloud-based portal. It provides a suite of solutions designed to provide system-wide visibility, automate regulatory reporting and track equipment performance. Acuity Analytics will help limit leaks and equipment failures by detecting abnormalities in behavior and immediately notifying operators. Additionally, the portal provides a way to monitor and control multiple systems from a single dashboard and establish digital twins to improve efficiency through asset management and predictive modeling. **415-462-1300; www.xiowatersystems.com**

(continued)

Gas/Odor/Leak Detection Equipment

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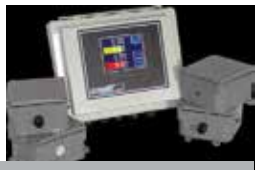

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RKI INSTRUMENTS GX-3R PRO CONNECTED WORKER SOLUTION

Connected Worker Solution for the GX-3R Pro from RKI Instruments

RKI Instruments offers the Connected Worker Solution for the GX-3R Pro powered by Guardhat. It is a subscription service that provides a single view into a gas detector fleet and worker condition via the Safety Control Center, accessible from any computer or tablet. The subscription provides features like live monitoring with gas readings and GPS location, visual, haptic and audible notifications including to notify near-by users, geofencing for hot or safe zones, heatmapping, push-to-talk communication, audio and video capture and management, as well as predictive gas detection analytics and instrument history. The GX-3R Pro connects via Bluetooth to the SCC through the Guardhat app for Android or iOS or the Scout wearable device. **800-754-5165; www.rkiinstruments.com**

Meter Boxes

IN-SITU CHEMSCAN MINI OUTDOOR ENCLOSURE

ChemScan mini Outdoor Enclosure from In-Situ

The ChemScan mini Outdoor Enclosure from In-Situ makes it possible to mount a ChemScan mini Analyzer on virtually any outdoor railing for enhanced process control near the site of sample collection, without the expense, complexity and downtime of updating infrastructure. The enclosure includes a forced-air, open-loop heating and cooling system with an ambient range of -20 to 105 degrees F, to ensure reliable performance of the system in any environment. And optional freeze-protected sample lines and drains are available for plants with harsh winter conditions. This flexible, low-maintenance solution is available with 120-volt or 230-volt supply. It enables installation of additional analyzers to fine-tune ammonia-based aeration control, keep a close watch on activated sludge, and monitor influent and effluent residuals without the disruption and expense of infrastructure modifications. **800-446-7488; www.in-situ.com**

SMITH & LOVELESS SHADE AIDE

SHADE AIDE screen protector from Smith & Loveless

The SHADE AIDE from Smith & Loveless is a human-machine interface screen protector that easily installs onto a variety of control panels so that operators can see their HMI no matter how sunny of a day. It collapses when not in use and is fully lockable. It also protects the display from the harmful effects of constant UV ray exposure, saving the maintenance budget from replacement HMI costs due to excessive sun exposure. The product is compatible and customizable to fit every HMI screen sold today, with custom sizes available. **800-922-9048; www.smithandloveless.com**

Process Control Equipment

ELECTROSWITCH TIME DELAY CONTROL SWITCH RELAY (TD-CSR)

Time Delay Control Switch Relay (TD-CSR) from Electroswitch

The Time Delay Control Switch Relay (TD-CSR) from Electroswitch provides a safe, effective means of mitigating arc flash danger in local circuit breaker operation by allowing for a manually initiated time-delayed trip or close. A flashing LED notifies the operator of the pending trip or close operation and serves as a warning to evacuate the arc flash area. By allowing time to leave the room during the operation, it provides an unmatched measure of safety against arc flash danger. To avoid inadvertent operation, the control push-buttons must be depressed for 4 seconds to activate the 10-second delay. The intuitive push-button design simplifies personnel training. No special wiring is required for installation. It is available with a standard mechanical target ("flag") to show the last operating position and an optional lighted nameplate with local LED indication, a remote SCADA contact alarm, and a single or dual trip-coil monitoring option. **781-335-5200; www.electroswitch.com**

FORCE FLOW WIZARD 4000

Wizard 4000 chemical inventory system from Force Flow

The Wizard 4000 from Force Flow is a powerful chemical inventory system for monitoring chlorine gas, sodium hypochlorite, hydrofluosilicic acid and all other chemicals used in water treatment. It can help ensure a safe process and a safe plant by providing essential information such as current chemical feed rate, how much chemical has been fed and how much chemical remains. With four separate channels, it can be used to simultaneously monitor levels in up to four separate tanks. Each tank can be monitored independently while monitoring combined totals for all the tanks. The daily usage function allows for easy recordkeeping, and a days-until-empty function makes it simple to anticipate tank refilling and chemical reorder points. A feed-rate function allows early warning of dangerously low or high feed-rate conditions, preventing hazardous underdosing or overdosing of chemicals to the water supply. **925-686-6700; www.forceflowscales.com**

FRANKLIN ELECTRIC CERUS X-DRIVE

Cerus X-Drive drive solution from Franklin Electric

Designed for variable torque applications up to 600 hp, the Cerus X-Drive is Franklin Electric's all-inclusive drive solution for a variety of markets. Available as a standalone drive and in multiple enclosed configurations, these panels are built to last, according to the maker, with

every detail and component centered around the application's specific requirements. It can be paired with a choice of motors and pumps to maximize the performance of the application. **866-271-2859; www.franklinengineered.com**

PULSAFEEDER PULSATRON MP SERIES

Pulsatron MP Series from Pulsafeeder

Pulsafeeder's Pulsatron MP Series now features an optional 4-20mA output signal that provides a remote indication of pump speed to remotely confirm the pump's speed is adjusting to process parameters, and more accurately estimate chemical usage over time. The pump transmits a 4-20mA signal proportional to the actual speed of the unit and is factory calibrated for easy installation in the field. It is a true microprocessor-controlled instrument delivering precise and accurate metering control. Packed with standard features, it includes automatic control via 4-20mA or 20-4 mA inputs, an external pace function with a stop feature, and a graphical LCD display with support for English, French, German and Spanish languages. Models are capable of flows ranging between 3 and 504 gpd and pressure ranges from 20 to 300 psig with a turndown ratio of 1000-1. **800-333-6677; www.pulsafeeder.com**

SENSUS, A XYLEM BRAND CORDONEL

Cordonel water meter from Sensus, a Xylem brand

The Cordonel is an ultrasonic commercial and industrial water meter from Sensus, a Xylem brand, that measures low-to-high-volume flow with proven accuracy. The unique flow tube has three measurement channels to capture every drop and seamlessly integrates with the FlexNet communication network to provide accurate readings in real time. Cordonel is also a sensor that enables the digitalization of water distribution systems by incorporating temperature and pressure data that helps utilities meet customer expectations. Transferred securely, this actionable information helps utilities maintain water quality, balance pressure levels and gain visibility into its operations. **800-638-3748; www.sensus.com**

Sensors

KELLER AMERICA ECONOLINE

Econoline pressure transmitter from Keller America

The Econoline pressure transmitter from Keller America is built for consistent performance. The Lean Production cell provides maximum versatility for customer-specific applications with short lead times, thus negating the need for the user to maintain extra inventory on-site. It combines a media-isolated piezoresistive silicon sensor with signal conditioning electronics to provide a compact pressure transmitter with < ±1% total error band accuracy over 0-50 degrees C. The industry standard 4-20mA analog output is compatible with most existing monitoring infrastructure and SCADA systems and provides meaningful output in ranges from 30 to 10,000 psi. The design makes it suitable for use under harsh environmental conditions, including those with high levels of electromagnetic radiation, both conducted and radiated. As a result, it provides trouble-free service and sufficient accuracy for almost any application, including those involving aggressive media and/or high levels of electromagnetic interference and where small size, low weight and reasonable cost are required. **877-253-5537; www.kelleramerica.com**

SENSOREX S8000 SERIES

S8000 Series sensor platform from Sensorex

The Sensorex S8000 Series modular pH/ORP sensor platform delivers accurate pH and ORP measurement in water and wastewater treatment. The modular platform is a custom configured system that can grow and change with process needs, saving users time and money. Users first choose the pH or ORP (Redox) electrode suited to their process. Mounting interface choices enable retrofit, submersion and inline installations. Optional electronic modules include unity gain pre-amplifiers for longer installation distances, 4 – 20mA outputs or Modbus for direct interface to plant control systems. If monitoring needs change, users simply update the applicable module without the need to replace the entire system. **714-895-4344; www.sensorex.com** tpo

Chlorine-Saving Cover-Up

A FLORIDA CLEAN-WATER PLANT SIGNIFICANTLY CUTS LOSSES FROM ITS CHLORINE CONTACT CHAMBER BY SHADING IT WITH A LOW-PROFILE FABRIC SCREEN THAT LIMITS HEAT AND UV EXPOSURE

By Ted J. Rulseh

The cover is made from a light yet strong 90% UV protective and chlorine resistant polyolefin/polypropylene fabric and includes end curtain panels that keep sun and wind from undercutting the fabric.

Chuck Baxter (left) and Billy Waitt stand before a panorama of the cover that helps prevent chlorine loss from the contact chamber at the Bradenton Wastewater Treatment Plant.

> "It creates about a 30% reduction in my chlorine use, which saves a lot of money. It also helps with algae control."
>
> **BILLY WAITT**

Florida's hot temperatures and high UV ratings almost year-round cause significant chlorine losses from wastewater treatment plants' chlorine contact chambers. The impact of chlorine loss is rising as chlorine costs increase.

Shading of chlorine chambers helps keep the UV rays out while also keeping the temperature down. Lower temperature also helps to limit trihalomethanes and control algae.

Billy Waitt, superintendent at the Bradenton (Florida) Wastewater Treatment Plant, was concerned about these issues and looked for a cost-effective solution. He sought help from Chuck Baxter, owner of J Mosher Enterprises in Sarasota, to create a UV protection system for his 7,500-square-foot chlorine contact chamber.

After investigating available shade systems, Baxter found the choices less than ideal. Therefore, he created a system of his own design, using a special UV-protective sunscreen fabric mounted on a low-profile support framework.

CHECKING ALTERNATIVES

Before embarking on his design project, Baxter examined three types of traditional shading systems. Pool cage screen enclosures were not designed for UV protection material, and Baxter believed the material and supporting frame were not durable enough.

Shade balls, considered suitable for very large uncontained areas, also were not designed for chlorine contact chamber applications. Tarp-type covers, Baxter observed, could hold water and become wind sails. In addition, the nonporous material would not allow heat to escape and would require heavy, permanent structural steel frames for support.

Unwilling to compromise, Baxter applied his own ingenuity. "Everything has to be the best of the best in order to survive the harsh environmental conditions at treatment plants," he says. For shading material, he turned to Dewitt Fabric, a manufacturer of industrial fabrics and screen materials. The company offered a light yet strong 90% UV-protective and chlorine-resistant sunscreen fabric, made from uncoated polyolefin/polypropylene.

Being a knit fabric, it does not fray or unravel if damaged. It has a 132 psi burst strength. The screen allows some air and water to flow through, creating a cooler temperature beneath it. Baxter used an Actron laser temperature gauge to measure the concrete tank temperature, both in the sun and under the screen. Despite only about eight inches separating the two test points, there was a difference of 13 degrees F between them.

To test UV effectiveness, Baxter used a Solarmeter electronic UV measuring instrument. "The UV in the sun was 9.1, and under the screen it was 0.1," he reports.

INSTALLING THE SCREEN

The screen is tailored to fit the chlorine contact tank. To achieve maximum shading, end curtain panels were deployed to help keep sun and wind from coming in under the fabric. This also makes the screen more aerodynamic, forcing most of the wind to blow over the top. That means the screen does not become inflated and blow around in heavy winds.


All cables, rigging and hardware are marine-grade 316 stainless steel.

The system also includes covers to go over adjoining screen sections with 2-inch-wide fabric fastener attachments. This creates a strong rigging system that also allows easy access to the inside. All cables, rigging and hardware are marine-grade 316 stainless steel that will not rust or corrode and will not have a severe reaction to chlorine.

The mounting parts are the same type of anodized aluminum as the hand railings commonly used in industrial facilities.

Waitt calls the end result a strong, maintenance-free, low-profile and removable sunscreen system. "It creates about a 30% reduction in my chlorine use, which saves a lot of money," he says. "It also helps with algae control. It works great, and I'm very happy with it."

Baxter estimates a screen life expectancy of eight years or more, depending on weather conditions. In that time he expects the Bradenton plant to recover its investment several times over. "Since the 316 stainless steel hardware is just about indestructible, it can be reused," Baxter says. "When the screens become old or severely damaged, replacing only the screens will amount to a fraction of the original installation cost."

Baxter says similar covers can be deployed on decant tanks, plastic chemical storage tanks and other areas that require UV protection, algae control or both. tpo

case studies

PROCESS CONTROL, INSTRUMENTATION AND LABORATORY EQUIPMENT

By Craig Mandli

Creating efficiencies with water sampler system

Problem

A water recovery facility in Michigan monitors the quality of the entire plant from seven sample points. The samplers were more than 20 years old and discontinued by the manufacturer, so parts and services were no longer available. The samplers constantly clogged and overflowed, and keeping them clean was difficult. Mechanical and electronic parts had to be switched between units, and the process became unsustainable.

Solution

A fully automatic **water sampler** from **Endress+Hauser** provided a retrofit solution. Liquistation CSF34 samplers automatically take water samples for analysis. They include menu-guided sample programming and tool-free maintenance.

RESULT:

Since the samplers were installed, the plant has seen improved air quality in the sampling room, and the samplers enable the team to accurately monitor all permit-monitored and nonpermit points. **888-363-7377; www.us.endress.com**

Liquid-only, low horsepower pump systems replace grinders

Problem

Trash was clogging pumps daily in the sewer system in Palestine, Texas. Items including wipes, plastics, clothing, rags and trash bags caused the clogs and led to catastrophic downtime. The items clustered to form rag balls. The system included three return activated sludge pumps that required manual clean-out 21 times a week, costing $3,000 weekly. The process was time-consuming and dangerous, as team members had to shut down the pumps, pull them up and manually dislodge blockages from the sharp impellers.

Solution

The city installed three **DERAGGER systems** from **Industrial Flow Solutions** to monitor the pumps' amperage, voltage and hertz outputs and sense potential overloads. If a clog is detected the pump impellers reverse direction, eliminating the clog or rag. The technology is available in four models, providing intelligent data monitoring and analytics to meet specific application needs.

RESULT:

Eight months post-installation, there were no shutdowns, and the city saved over $100,000. **860-631-3618; www.flowsolutions.com** tpo

OZ Lifting Products Tele-Pro davit crane

OZ Lifting Products' patented Tele-Pro davit crane features a telescoping boom adjustment that can be moved in and out while under load. A ratchet screw jack allows the user to adjust the boom from horizontal to 45 degrees while under load and the 360-degree rotation of the crane allows for a full range of motion. Smart latch technology at the boom/mast means no tools are required for assembly. A zinc-plated finish provides added corrosion protection. The Tele-Pro is available in 500-, 1,200- and 2,500-pound capacities. Volt AC and DC electric winches are optional on the 500- and 1,200-pound models, or a manual winch with a drill drive adapter is available for all three models. The cranes are made in the USA and each one is individually tested and certified at 125%.

800-749-1064; www.ozliftingproducts.com

Watson-Marlow Qdos chemical metering pumps

Watson-Marlow's range of Qdos chemical metering pumps is designed to reduce operating costs without compromising on safety or accuracy. They offer accurate linear flow rates of up to 31.7 gallons per hour at variable fluid viscosity levels. The pumps come with multiple mounting options, skid and POD systems for additional protection and reliability even at high pressure.

800-282-8823; www.wmfts.com

product spotlight

water

Radar level sensor streamlines management processes

By Craig Mandli

Level sensors play a critical role in water and wastewater management for ensuring efficient operation, optimizing treatment and ensuring compliance. In municipal water treatment applications in particular, they are often used to monitor levels in open channels, lagoons, canals, lift stations, sediment tanks, clarifiers and chemical feeding tanks. In addition, in elevated storage tanks, level monitoring is important to be sure that water pressure and supply is adequate during peak demand periods. The sensors are also utilized for measurement in tanks storing chemicals used in the water treatment process.

The **NCR-86 radar level sensor** from **BinMaster Level Controls** is designed to streamline management. When paired with the company's BinCloud software, according to the maker, it becomes the singular solution for measuring any solid or liquid commodity across vessels and sites, and is all accessible through a single login. In addition, it adapts to any level measurement application, providing 1 mm accuracy for solids, powders, or liquids of varying bulk density or specific gravity.

Despite challenging conditions such as dust, foam, steam, or condensation, the NCR-86 ensures rapid data updates, enhancing efficiency in inventory management. The sensor offers a simple Bluetooth setup using a BinDisc or the BinMaster Sensor App, optionally connected to the operator's phone or PC, facilitating easy installation. It utilizes wireless and solar gateways, long-range transceivers, and HART consolidator modules to reduce system costs and complexity.

Utilizing the sensor is easy. Once installed, simply connect the NCR-86 to the BinCloud system, which then enables users to log in, monitor inventory, receive alerts and generate reports for any commodity, at any site, during any defined time.

NCR-86 from BinMaster Level Controls

Encapsulated electronics make the NCR-86 dependable and safe to operate in extreme environments, withstanding high temperatures and pressures. It is certified to various hazardous approval standards. Customers can choose from plastic, aluminum or stainless steel housings, along with various seal materials that suit specific process requirements.

The NCR-86 employs advanced technology to combat cyber-attacks, adhering to the highest IT security standards set by the process industry. Designed to standard IEC 61511, the NCR-86 ensures functionally safe operation in any process industry. They are also suitable for use in wastewater applications such as providing overflow protection for sewage treatment plants during flooding or stormwater during heavy rainfall, or in receiving stations to measure the level of sewage pumped from trucks into receiving tanks to control the input of sludge at the plant.

800-278-4241; www.binmaster.com

Emerson Fisher 63EGLP-16 pilot operated relief valve

Emerson's Fisher 63EGLP-16 pilot operated relief valve installs on pressurized bullet tanks used to store liquid propane and anhydrous ammonia. The new valve is certified under UL132 and American Society of Mechanical Engineers Section VIII. With a pre-installed national pipe tapered thread standard 2-inch male hex nipple, the valve serves as a solution with a 2-inch connection that provides the same benefit as traditional multi-ported valves, but with simplified installation and maintenance. For this application, the PRV must be connected directly to the tank, with no isolation valve between the tank and the PRV. Operation is implemented with a dual pilot array, providing redundancy, and allowing for removal of one pilot for testing while the other is operational.

800-972-2726; www.emerson.com

Pulsafeeder PulsaPro7440 chemical pump

When chemical injection processes demand dependable and accurate delivery where space is limited and reliability and convenience are required, Pulsafeeder's PulsaPro 7440 has the compact size and features to make operation and maintenance easier and faster. The large,

product spotlight
wastewater

Knife gate valve a fit for wastewater applications

By Craig Mandli

Knife gate valves have long proven to be a fantastic option for wastewater treatment applications. They are designed to cut through the solid media that travels through the lines, while ensuring pipe turbulence and erosion are kept to a minimum. Mueller recently announced a new addition to its knife gate valve inventory — the **Henry Pratt P77 Perimeter-Seated Bi-Directional Knife Gate Valve.**

Engineered to specifically handle tough slurries and abrasive materials, the P77 meets rigorous MSS SP-81 standards and offers a range of features and benefits that make it an excellent valve for both municipal and industrial applications.

"The Pratt P77 Perimeter Seated Bi-Directional Knife Gate Valve is an industry game-changer," says Dale Speggen, vice president of specialty valves for Mueller. "With its sealing capabilities and its ability to reduce stress on the packing chamber, the P77 ensures reliable and efficient operation."

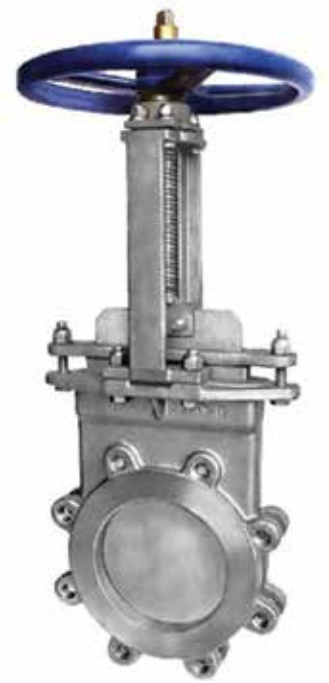
The P77 has ideal sealing capabilities, ensuring a drip-tight shutoff, and preventing the buildup of solids, regardless of line pressure. The valve is designed to eliminate any confusion regarding the direction of isolation, providing clarity and ease of use in demanding wastewater environments. It is designed with multiple rows of packing to reduce stress on the packing chamber, enhancing the longevity and reliability of the valve. The integrated PTFE gate guide reduces wear on the packing, preventing blockages and flow disruptions with its nonstick properties. Its rubber-seated gate delivers a secure bi-directional drip-tight seal, which enables it to withstand pressures of up to 150 psi effectively.

Featuring an EPDM perimeter cartridge seat, the P77 Knife Gate Valve resists chemicals and high temperatures while preventing leakage and protecting downstream equipment. By reducing leak paths and extending the life of the packing, this valve minimizes maintenance requirements and ensures smooth operation. Its handwheel can be easily converted to various types of operators, including hydraulic or pneumatic cylinders, bevel gears, chain wheels, electric motors or fail-safe spring cylinder operators by utilizing an existing cast yoke.

The heavy-duty cast stainless steel body is resistant to deflection from line loads and internal pressure, further enhancing the valve's performance and longevity. In addition to municipal water and wastewater, it has applications across various industries, including pulp and paper, mining and food and beverage.

"We are proud to offer this valve, which sets a new standard for performance and reliability," says Speggen.

877-436-7977; www.henrypratt.com



Henry Pratt P77 Perimeter-Seated Bi-Directional Knife Gate Valve

easy-to-view hydraulic diagnostic window provides observation of oil condition and proper pump operation saving time troubleshooting. Externally adjustable bypass valves protect the pump from system overpressurization and quickly adapt to changing process conditions. The push-to-purge button allows for on-demand removal of air from pump hydraulics to avoid wasting energy from inefficient pump operation. When precise and accurate chemical delivery matters the PulsaPro 7440 provides dosing accuracy of plus/minus 0.5% across its operating range, whether the stroke length is set at full capacity or 10% of maximum. It is available with flows up to 1,098 gph and pressures up to 3,200 psig.

585-292-8000;
www.pulsafeeder.com

Smith & Loveless EVERLAST Series 4000 pump station

Smith & Loveless EVERLAST Series 4000 pump station is an above-ground wastewater pump station that offers high efficiency, long service life, operator ease and safety and low operation and maintenance costs. The EV Series 4000 pump station comes as a complete, factory-built and -tested system that is fast and simple to install in both new installations and replacements of submersible pumps. It incorporates premium efficiency motors designed for wastewater, resulting in reduced energy consumption costs and a smaller carbon footprint. The pump station features a two-piece split, rolling UV-coated fiberglass enclosure that provides easy 360-degree access to all components. QUICKSMART PLC controls provide an intuitive touchscreen for simplified training and operation, and system monitoring, troubleshooting and predictive maintenance capabilities.

800-898-9122;
www.smithandloveless.com tpo

exam STUDY GUIDE

Licensing exams can be challenging. Our **Exam Study Guide** helps you prepare by presenting questions similar to those on an actual exam. You can find many more sample questions on the *TPO* website at www.tpomag.com/study.

WASTEWATER

By Rick Lallish

How is wasting accomplished when operating a sequencing batch reactor?

A. Immediately after the react stage
B. During the react stage (about halfway through the stage)
C. During the decant stage
D. During the idle stage

ANSWER: D. Typical sequencing batch reactors are single-tank wastewater treatment systems that operate in a five-stage process (fill-react-settle-decant-idle). When operating properly, the wasting is done during the idle stage before starting a new sequence. During this stage a small amount of the MLSS or activated sludge is pumped out as necessary. Most SBRs are computer-operated, using sensors and timers. More information may be found in the WEF textbook: *Wastewater Treatment Fundamentals III: Advanced Treatment,* Chapter 4.

DRINKING WATER

By Drew Hoelscher

What is the maximum chlorine gas withdraw rate from a 150-pound cylinder?

A. 150 pounds per day
B. 75 pounds per day
C. 40 pounds per day
D. 25 pounds per day

ANSWER: C. Maximum chlorine gas withdraw rates vary based on temperature. It is not recommended to feed more than 40 pounds of chlorine gas per day from a single 150-pound cylinder. Excessive gas withdraw rates may cause issues due to the gas being withdrawn faster than the liquid is being converted to a gas.

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

industry news

Membrion appoints Mitchell as COO

Thomas Mitchell

Membrion has appointed Thomas Mitchell as chief operating officer. As COO, he will take primary responsibility for accelerating performance and scaling manufacturing as Membrion expands following its recently completed Series B funding round. He will also oversee customer delivery and quality. Mitchell spent 18 years with Danaher Corporation's Water Quality Platform (now Veralto), including 11 years at Sea-Bird Scientific where he rose to vice president of operations, having previously served as vice president of commercial and research and development.

Badger Meter acquires assets from Trimble

Badger Meter has acquired select remote water monitoring hardware and software from Trimble, inclusive of the Telog brand of remote telemetry units and Trimble Unity Remote Monitoring software. The acquisition provides real-time monitoring hardware and software targeted at distributed data collection for applications in water, wastewater, stormwater and environmental water monitoring.

ResinTech expands New Jersey headquarters

ResinTech announced a significant expansion to its Camden, New Jersey headquarters. The company has awarded the expansion contract to Penntex Construction, a move aimed at bolstering production capacity for its premium quality U.S. resin and filter manufacturing, as well as the burgeoning lab services business. This expansion will add 30,000 square feet to the existing 186,000-square-foot factory. tpo

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people/awards

The **Sweeney Water Treatment Plant** in New Hanover County received Gold Star recognition from the North Carolina Department of Environmental Quality Water Resources Division.

The town of **Friday Harbor** received the Washington Department of Health Silver Award for consistently outperforming water quality standards every month for more than five years. This is the second such award the town has received.

The new water treatment plant in **Robbinsdale** received a 2023 American Public Works Association Minnesota Chapter award for Environmental Project of the Year.

David Inchaurregui Jr., a student in Chula Vista, California, received a $1,000 Work for Water Scholarship from the Sweetwater Authority governing board. He attends the Center for Water Studies at Cuyamaca College, pursuing a career as a water plant operator or laboratory technician.

Richard "Dick" Johnson of Devils Lake was commissioned by Governor Doug Burgum as Commodore in the North Dakota Mythical Navy during the 60th annual Joint North Dakota Water Convention and Irrigation Workshop. The award is for outstanding leadership, dedication and commitment to the development and management of the state's water resources.

Culver City, California, received the American Public Works Association BEST Award for the Mesmer Low-Flow Diversion Project, which improves water quality by capturing dry-weather runoff from Centinela Creek and redirects it to Hyperion Water Reclamation Plant for recycling.

Reggie Williams, utilities maintenance supervisor in Palm Beach, Florida, and an 18-year veteran of the public works department, was named Employee of the Year by the Palm Beach Chamber of Commerce.

The Triunfo (California) Water & Sanitation District elected **Janna Orkney** as board chair. Orkney is serving her fourth term and will lead the five-member board through 2024.

Marlene Kennedy retired after nearly three decades at the front desk for the Big Sky County (Montana) Water and Sewer District.

Jan Keiser, public works director in Homer, Alaska, retired and was succeeded by **Paul Dyal.**

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events

April 7-10
2024 Alabama-Mississippi Water Joint Annual Conference, The Battle House Renaissance Mobile. Visit almswater.com.

April 8-11
Indiana AWWA Section Annual Conference, Indianapolis Marriott Downtown. Visit inawwa.org.

April 9
2024 Central States Water Environment Association Education Seminar, Monona Terrace, Madison, Wisconsin. Visit cswea.org.

April 9-11
New York Section AWWA New York's Water Event, Saratoga Ballroom, Saratoga Springs. Visit nysawwa.org.

April 9-12
California Water Environment Association AC24 Conference and Expo, SAFE Credit Union Convention Center, Sacramento. Visit cwea.org.

April 9-12
Texas AWWA Texas Water 2024, Fort Worth Convention Center. Visit tawwa.org.

April 10
AWWA Microplastics 2024: Practical State-of-the-Science in Drinking Water webinar. Visit awwa.org.

April 10-12
Oklahoma Rural Water Association Annual Conference, Embassy Suites Hotel, Norman. Visit orwa.org.

April 15-17
Design-Build for Water/Wastewater Conference, Duke Energy Convention Center, Cincinnati. Visit dbwater.com.

April 15-17
Illinois Section AWWA WATERCON 2024, Peoria Civic Center. Visit isawwa.org.

April 15-May 17
AWWA Spring 2024 Water Treatment Operator Level 3 webinar. Visit awwa.org.

April 16-17
Quebec Environmental Technologies Show, Levis Convention Center. Visit reseau-environnement.com.

April 17
AWWA Optimizing Water Resources: Tools for Water Optimization and Energy Efficiency webinar. Visit awwa.org.

April 23-25
AZ Water Conference & Exhibition, Phoenix Convention Center, South Building. Visit azwater.org.

April 23-25
Montana Section AWWA/Montana WEA 2024 Joint Conference, Hilton Garden Inn, Missoula. Visit montanawater.org.

April 23-26
Water Environment Association of Utah Annual Conference, Dixie Convention Center, St. George. Visit weau.org.

April 28-30
British Columbia AWWA Annual Conference and Trade Show, Whistler Conference Center. Visit bcawwaconference.org.

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kelleramerica.com