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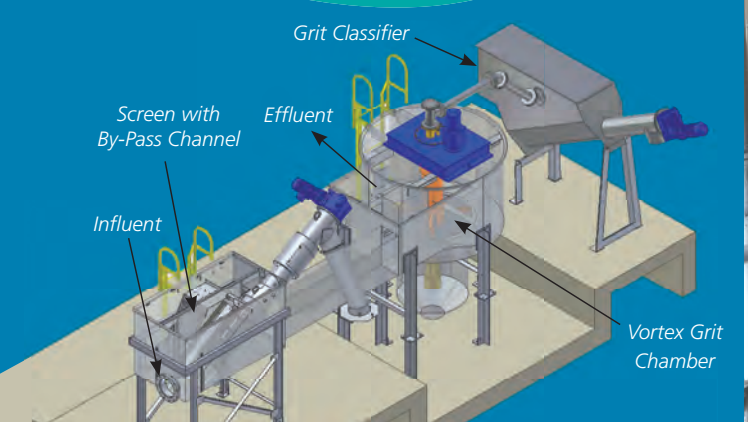

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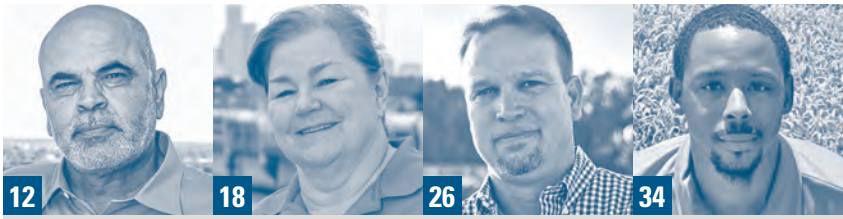
top performers



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tpo TREATMENT PLANT OPERATOR

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Published monthly by COLE Publishing, Inc.
1720 Maple Lake Dam Rd., P.O. Box 220, Three Lakes, WI 54562

Call toll free 800-257-7222 / Outside of U.S. or Canada call 715-546-3346
Mon.-Fri., 7:30 a.m.-5 p.m. CST

Website: www.tpomag.com / Email: info@tpomag.com / Fax: 715-546-3786

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

REPRINTS AND BACK ISSUES: Visit www.tpomag.com for options and pricing. To order reprints, call Jeff Lane at 800-257-7222 (715-546-3346) or email jeff.lane@colepublishing.com. To order back issues, call Nicole at 800-257-7222 (715-546-3346) or email nicole.maney@colepublishing.com.

CIRCULATION: 68,563 copies per month.

Reuse Rising

ENTITIES OF ALL KINDS ARE RECOGNIZING WATER AS A RESOURCE TO BE CONSERVED, NURTURED AND RECYCLED, NOT JUST USED AND DISCHARGED DOWNSTREAM

By Ted J. Rulseh, Editor

Water has always been a vital resource. Only recently are businesses and government entities treating it as such.

The latest evidence of this evolution is the draft National Water Reuse Action Plan released last fall by the U.S. EPA. The plan proposes a wide range of actions covering government policy, technology, public outreach and communication, and workforce development.

"Addressing future water resource challenges will require more holistic thinking that embraces the 'convergence of water' through more integrated action," the plan document states in one of its less bureaucratese-sounding passages.

EARLY ADOPTION

One could argue that the EPA is a little late to the party in creating a federal recycling and reuse initiative. Be that as it may, it's a welcome project that aligns with efforts underway in major sectors of government and business.

Industries were early adopters of water reuse for the simple reason that most often they have to pay for the water they use in their processes. It makes a great deal more sense to recycle and reuse that water on site than to send it to the wastewater treatment plant, pay for it again and then buy some more. Owners of industrial facilities pride themselves on achieving zero liquid discharge through intensive recycling.

Municipal utilities, meanwhile, jumped on the recycling train as water demand started to outstrip supply, especially in the dry climates of the West and Southwestern U.S. First came water reuse for landscaping and some industrial processes. Now attention is turning to indirect potable reuse of wastewater — sending highly treated effluent into a reservoir or other drinking water source.

A number of utilities are looking deeper, at direct potable reuse — sending even more highly treated wastewater effluent straight into the drinking water supply. The communication challenge can be daunting, but the rewards justify the effort.

BIGGER PICTURE

The EPA plan envisions a broad approach to water reuse, representing "a major opportunity" to ensure the quality of the water supply and supplement existing supplies through recycling of water from agriculture, munic-

> "Recovering water, energy, nutrients and other precious materials embedded in wastewater is an opportunity for cities to transition to the circular economy and contribute to improved water security."
>
> **REPORT:** ***WASTEWATER: THE REUSE OPPORTUNITY***

ipalities, industrial processes, stormwater, and produced water from oil and gas operations. Among many potential components of the plan are:

- Supporting and encouraging water reuse on a watershed scale
- Preparing case studies on successful water reuse projects
- Enhancing collaboration on water reuse among states
- Incorporating water reuse considerations in civil works projects
- Enhancing combined and sanitary sewer overflow abatement
- Promoting technology development, deployment and validation
- Facilitating financial support for water reuse
- Integrating and coordinating reuse research
- Supporting development of a talented and dynamic workforce for reuse applications

The public comment period on the EPA reuse plan closed last December. The EPA intends to issue a final plan with clear commitments for actions that will advance water reuse and help ensure the sustainability, security and resiliency of the nation's water resources. For details about the plan and to review the draft, visit www.epa.gov/waterreuse/draft-national-water-reuse-action-plan.

ANOTHER VOICE

Meanwhile, Wharton University of Pennsylvania has issued a paper called *The End of Wasted Water: A Revolution in Reuse is Underway*. Sponsored by SUEZ Water Technologies & Solutions and the Initiative for Global Environmental Leadership, the paper advocates water reuse on a global scale. It states:

"The technology needed for water reuse is at hand and the costs of deploying it are dropping. Yet 80% of the world's wastewater is still being discharged into rivers and oceans without being treated. Financial, bureaucratic and cultural challenges are significant, and while progress is being made globally and nationally, much more remains to be done."

The paper cites a 2017 report, *Wastewater: The Reuse Opportunity,* published by the International Water Association and the OPEC Fund for International Development. "Recovering water, energy, nutrients and other precious materials embedded in wastewater is an opportunity for cities to transition to the circular economy and contribute to improved water security." You can read the report at d1c25a6gwz7q5e.cloudfront.net/reports/2019-09-04-igel-report.pdf.

Clearly there's a movement afoot here. Progressive communities and clean-water and drinking water utilities have every reason to explore the full potential for reuse in their operations. **tpo**

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STUDENT COMPETITORS

Operations Challenge

Three students from Milwaukee Area Technical College recently made waves at the Wisconsin Wastewater Operators Association's annual conference in Green Bay as the only student team that competed in the 2019 Operator Competition event. Read about their experience in this online exclusive article.

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THIS IS FOREVER

Understanding PFAS Impact

University of Wisconsin aquatic chemist Dr. Christy Remucal recently described her new research project looking at per- and polyfluoroalkyl substances (PFAS) in the environment. The project had only been underway for one day, yet more than 100 people showed up to hear about it when she spoke in front of a packed house at Madison's Winnebago Arts Café.

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Engaging Today's Youth

The environmental compliance and water quality team at Illinois American Water visits schools throughout the year to educate students about the water cycle, water service and wise water use. But Randy Pankiewicz, department director, envisioned expanding the program by bringing a new kind of classroom to the kids. That's exactly what the team is doing now with its 18- by 8.5-foot-wide mobile education center.

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Lessons From Scarcity

RAED ARMOUTI'S WATER CAREER WAS INSPIRED IN PART BY GROWING UP IN A COMMUNITY WHERE A DAILY SUPPLY OF WATER WAS NOT A CERTAINTY

STORY: **David Steinkraus**
PHOTOGRAPHY: **Denny Medley**

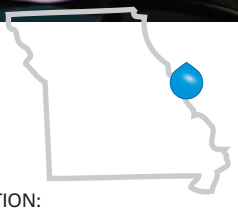
Raed Armouti, vice president and Water Resources Business Unit director for Crawford, Murphy & Tilly in St. Louis.

Armouti, shown with colleagues Heather Gipp (right) and Bailey Adams, brings first-hand experience with water scarcity to his role as a designer and company leader.

Raed Armouti grew up understanding water in a way few people do.

Although he didn't know it as a boy, water would form the theme for his life, leading to his current job as vice president and Water Resources Business Unit director for Crawford, Murphy & Tilly (CMT) in St. Louis.

His group deals with a variety of water projects, and his division comprises about 20% of the company's revenue. His work drew the attention of the American Water Works Association, which in 2019 gave him the George Warren Fuller Award for wide-ranging contributions to the water industry.



Raed Armouti, CMT,
St. Louis

POSITION:
Vice president and Water Resources Business Unit director

EXPERIENCE:
33 years

DUTIES:
Supervise the 72 people who design and build water resources projects

EDUCATION:
Bachelor's degree, civil engineering, Southern Illinois University Edwardsville

CERTIFICATION:
Professional Engineer

LIVING WITH SHORTAGE

Armouti knows water so well because he grew up in Amman, Jordan. The earliest remains of the city date to about 4000 B.C. It sits on a plateau about 2,800 feet above sea level and 4,238 feet higher than the Dead Sea, about 20 miles away.

In Amman, Armouti says, "Probably from the end of April through mid-October they don't see a drop of rain. Water is pretty scarce in Jordan. In Amman there is not enough water to supply every house every day. So different neighborhoods get water on different days of the week. The neighborhood we lived in would get water on Monday, Wednesday and Friday. Each house, each business, had its own storage tank.

"On Monday, when the water came, we filled the storage tank, and we used it on Tuesday when there was no water. It definitely played a role in my growing up to see how precious water was, and how scarce. I also think that instilled water conservation in my blood. When I'm brushing my teeth now, the water's off."

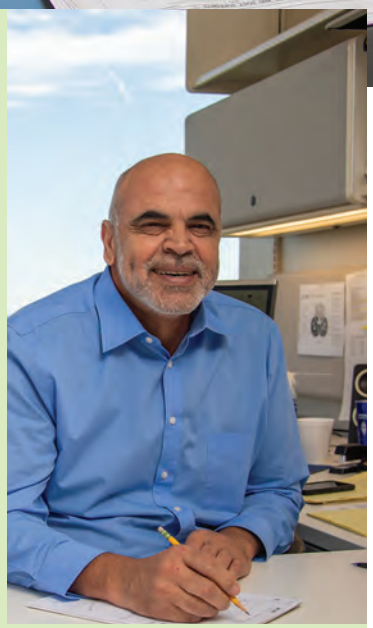
Amman still has a shortage of water: It is still pumped several hundred miles to the city, neighborhoods don't get water every day, and every roof still holds a pair of 500-gallon tanks.

The other part of his childhood that influenced Armouti was working in his father's construction company. It was one of the top five in the country, and he worked within a 50-mile radius of Amman. Water projects were the biggest source of revenue.

"The country at that time didn't have a lot of infrastructure," Armouti says. "You could drive around Amman and see his equipment in many neighborhoods." He started with his father's company at age 13 during the summer school break. He shoveled dirt, dug trenches and pushed plate compactors and roller compactors. His father had excavators, loaders and dump trucks,

Raed Armouti, with team members (from left) Bailey Adams, Heather Gipp, and Jason Shurtz, takes pride in his company's intern program, which sends young people into the field to acquire hands-on experience.

GROWING INTO THE AMERICAN WATER WORKS ASSOCIATION



Raed Armouti was chair of the Missouri Section AWWA in 2016 and 2017, was past chair for 2017 and 2018, and headed several committees. His involvement in and passion about the organization started from a clear motive.

"Part of the engineering business is to develop clients," says Armouti, now vice president and Water Resources Business Unit director for Crawford, Murphy & Tilly (CMT) in St. Louis. "As a company policy, we want our young engineers to get involved with the industry organizations: AWWA and the Water Environment Federation.

"When we get involved with these organizations, we get exposed to utilities, companies, other engineering firms, water districts and sewer districts. And when we volunteer on committees, we can showcase our professionalism. And so we use that to develop relationships with these potential clients."

But over the years, those relationships become friendships, and a desire grows to help others and make sure the industry and the public are well served, he says. "The more you get involved, the more you want to do and the more they ask you to do. And then by that time, they're your friends and you don't want to turn them down."

He has backed off his involvement because expanded responsibilities for CMT made it more difficult to attend all the necessary meetings. "They basically gave me permission to cut back a little bit," he says with a laugh.

He still helps with nominations for offices. "At some point I plan to go back and volunteer for whatever committee the section needs help with."

but there was a need for laborers in the trenches. At 16 he made foreman of a water main installation crew, scheduling materials and running the jobs.

Then he was selected as an exchange student and spent his junior year of high school in Los Osos, California. After a year back in Jordan to finish high school, he returned to the U.S. to study general civil engineering. "But all along, based on my experience with my father's company, I wanted to do something with water."

VALUE FROM THE TRENCHES

When he graduated from Southern Illinois University Edwardsville in 1986, he went back to Jordan to do two years of compulsory military service, in the Civil Defense Directorate. In that role, he also had time to work for his father's company as an engineer instead of a laborer.

> "Water is pretty scarce in Jordan. In Amman there is not enough water to supply every house every day."
> **RAED ARMOUTI**

When he returned to the U.S., he worked for a construction company in Alton, Illinois, for six months and then for nine months in an engineering firm. In fall of 1990, he was hired by CMT, starting as resident engineer on a water treatment plant the company was building for the western Chicago suburb of Aurora. His construction experience was an asset.

His experience digging ditches continues to lend value. Most of the time he sees students coming straight out of college into engineering positions without field experience. In the last five years, CMT has hosted interns, and part of that process is sending them into the field because early, hands-on experience is so beneficial.

"Drawing things on paper is easy," Armouti says. "You can show all kinds of line work and pipes and walls, but unless you've seen it actually get installed, you may not appreciate the spaces you have to work with."

BUILDING FACILITIES

Of all the projects Armouti has worked on, his favorite was the $91 million Spring Creek Wastewater Treatment Plant for the Sangamon County Water Reclamation District in Springfield, Illinois, a 32 mgd facility that opened 2012.

> “Drawing things on paper is easy. You can show all kinds of line work and pipes and walls, but unless you’ve seen it actually get installed, you may not appreciate the spaces you have to work with.”
>
> **RAED ARMOUTI**

The job involved the design and construction of 12 buildings enclosing more than 100,000 square feet for administration offices, a lab, dewatering, disinfection, pumping and other functions. These replaced buildings from the 1920s, and the job won 2013 Project of the Year in the environment category from the American Public Works Association Illinois Chapter.

It was also the largest project Armouti managed at CMT. He was assistant manager during the design phase, overseeing the people handling the electrical and mechanical and site planning. During construction, he was the manager on site. He and a team of six engineers worked for 24 months to build the plant, train the operators and start it up. For him, the project lasted from 2007 to 2012.

“I started with cost-estimating with the client, then went through design and construction,” he says. “It was very rewarding to see that our estimates came right on. The client got a new plant within budget and on schedule. I’m not a wastewater treatment process engineer, but I managed it, so it was fun to see all the wastewater pieces mesh to help the client meet the permit requirements and help the community treat its wastewater.”

DAILY BUSINESS

He doesn’t do much design work now. He may help on a large project and he mentors younger engineers, but his job is management.

“The bulk of my day is spent with the business unit management, the operations of the unit, responding to questions, looking at financials for the unit,” he says. “I think the job is what I expected it to be. It’s a big responsibility, but I feel like I’m transitioning into it well.”

Armouti’s predecessor held the position for a long time, and as a result, the unit developed habits for how things were done. He didn’t want to make a lot of changes in a short time, instead waiting to make sure people were comfortable.

He has been in his current position since 2016: “I still consider myself settling in, but after this year, I think I will have that transition completed.” Armouti manages 72 people in seven offices spread around the country. It’s a challenge having his staff so spread out, but he has six group managers. He tries to visit each office at least once every quarter, although it doesn’t always work out that way. There are regular phone calls and constant emails, and he and his staff have video chats through Skype. But face-to-face meetings are still best, he says.

Longevity makes management easier, too. Armouti has been with CMT for almost 28 years, and many of the people he now manages were previously his peers: “I know them well. I know their capabilities. I know their expertise. I consider them colleagues and a lot of them friends.”

As a young man, Armouti managed a construction crew for his father. Now he manages more people in a more complex structure, but he’s still the person making the call. “At some point you have to make decisions, and ultimately you’re responsible for the performance of the unit,” he says. “So at the end, I’m very comfortable making the decision after listening to all sides and points of view.” tpo

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A Wall as a Window

INSTEAD OF BEING A BARRIER, A WALL AT AN OREGON CITY'S WATER PLANT PROVIDES SCENIC VALUE AND LETS VISITORS VIEW THE TREATMENT PROCESS

By Jeff Smith

The Willamette River Water Treatment Plant was built as a long series of buildings in a row, each joined by sections of a wall with creative stone-faced or concrete surfaces.

Despite its nearly 800-foot length and secure appearance, the facility in Wilsonville, Oregon, is widely open to the public's view and draws people in to its operation. Varying in height to accommodate the different buildings as it slopes to the river below, the attractive wall separates the treatment facility from a public park and provides an educational portal into the plant's operation and functions.

Strategically placed windows and openings along the wall let park users look in and see the gallery of pumps, pipes, valves and other equipment related to processes such as disinfection, clarification, sedimentation and filtration.

A LOOK INSIDE

An 8-foot-tall, 6-foot-wide, four-panel, tempered glass window under an overhang provides a clear and protected view into the filtration gallery. Next to it, a window-height marble inlay depicts the function of a carbon and sand filter. Similar multipanel windows reveal the finished water pumps area; others wrap around the raw water pump station.

Interpretive displays mounted with brackets behind laminated glass panels with spotlighting describe the role each component plays in water treatment. "They are like big picture windows so the public can see what's going on in the plant," says Kim Reid, operations manager for Veolia North America, which runs the plant under a contract.

PHOTO ABOVE: Looking upstream at the cascading ponds of the water feature and a portion of the 800-foot long wall that separates the park from the Willamette River Water Treatment Plant. The covered observation area of the filter gallery and the open-side meeting room can be seen along the concrete walkway that allows the public to view the information signs mounted in the observation portals.

A flowing water feature, highlighted by a cascading pond and waterfall, complements the cast-in-place concrete wall and runs parallel to it. A 6-foot-wide concrete walkway between the wall and the water feature provides access to the wall and its portals. The walkway loops all the way around the park.

The flow begins with a waterfall at a high point just outside the administration building and moves by gravity through a series of five landscaped ponds cascading toward the Willamette River, the plant's water source 200 feet below. A Flygt Model 3120 submersible pump recirculates the river water from a recovery well below back to the overflow pond.

"The water feature mimics the Willamette River with its cascades, channel and quiet ponds," Reid says. "To many, it's really the focal point of the park."

DIVERSE MATERIALS

A variety of facades and materials add to the wall's attractiveness. Structural brick masonry, clear anodized aluminum, cedar horizontal lap siding

and the controlled growth of clinging ivy add an artistic element to the wall. Potential rain-staining of the wall is prevented by galvanized caps on the top.

The landscape of boulders, architectural stone, a variety of crushed stone and gravel, native grasses and shrubs visually blend the wall and ponds into the park. A paved trail connects a neighboring residential area with the plant and the park.

The 10-acre Willamette River Water Treatment Plant Park and the 15 mgd treatment plant were built together in 2002. The decision to build the new plant to polish river water, rather than drill more wells to meet demand, involved collaboration and community input.

> "The water feature mimics the Willamette River with its cascades, channel and quiet ponds. To many, it's really the focal point of the park."
> **KIM REID**

The original plan was to use the entire site for the treatment plant, which is co-owned by Wilsonville's partner in the plant — the Tualatin Valley Water District. The inclusion of the park meant reducing the plant's footprint by using innovative and space-saving processes, such as Actiflo high-rate clarification and sedimentation (Veolia). Building the plant along the wall reduced the space required.

Part of the administration building is an open-sided meeting room used by city staff and neighborhood groups that overlooks the first waterfall on the park side of the wall. Two covered picnic areas enable park users to sit and overlook the meadows in the park and the river below.

"The wall could have been built strictly for security," Reid says. "But rather than isolate the public from the plant, the wall draws them into its operation." **tpo**

Trainer Extraordinaire

THROUGH HER TRAINING PROGRAMS, RHONDA HARRIS HAS HELPED NUMEROUS WATER PROFESSIONALS ADVANCE IN THEIR CAREERS AND CERTIFICATION LEVELS

STORY: **Steve Frank**
PHOTOGRAPHY: **Olivia Ogren-Hrejsa**

Rhonda Harris

When Rhonda Harris was 6 years old, she knew what she wanted to do: "I was going to be a civil engineer. I'm one of the few people who knew what they were going to do upon going to college."

Little did she know that her career path would lead to becoming a trainer of wastewater, drinking water and stormwater professionals around the world. In recognition of her contributions, in 2019 she received the Kay Kutchins Education Leader Award, presented by the Texas Section American Water Works Association. Today she plies her engineering and training skills with the Brown and Caldwell environmental engineering and consulting firm.

LEARNING HOW IT WORKS

From the start of her career, Harris was intent on understanding water facilities. "I learned how to do everything surrounding design: surveying, drafting and running a treatment plant," she says. "I always thought it made sense to learn how to do all the things that were entailed in the work. I thought I needed to know how to run the facilities I was going to design."

Her mother was the first employee in the Federal Emergency Management Agency's Region VI office in the Dallas area. Harris completed her college basics at Christian Brothers College (now Christian Brothers University) in Memphis, Tennessee, and then moved home to establish Texas residency. "Tuition in Texas was only $4 a credit hour, but everything else, like books and lab fees, was expensive. I had to work to pay for it," she recalls.

Harris (center) with Sally Wright, assistant director of water production, and Ron Patel, senior engineer, both from the Dallas Central Wastewater Treatment Plant.

> "I always thought it made sense to learn how to do all the things that were entailed in the work. I thought I needed to know how to run the facilities I was going to design."
> **RHONDA HARRIS**

Harris began her engineering studies at the University of Texas at Arlington in 1977 as one of only two women in the program. When she graduated in 1984, there were about a dozen women enrolled, and she graduated with five of them. She was older than all of them because she had worked her way through school.

AN EXCELLENT MENTOR

Her experience and her degree earned her a job with Camp Dresser & McKee (now CDM Smith). She was assigned to a wastewater project at Dallas' Central Wastewater Treatment Plant, where she worked with and learned from the chief operator, the late Richard Chapman.

"They wanted me to design a new headworks, and I needed to know more about it," Harris recalls. "They put me with Richard, and he taught me how to operate a plant. I shadowed Richard for two or three years. He was great, one of the most amazing people I've ever met. He was patient with me. There were no other women out there in the plant, and there was one woman in the lab.

"So there I was in my mid-20s, chasing all over the plant, trying to learn how to operate it. They were very receptive and accommodating." In 1994, she earned her Texas B water and wastewater operator licenses (second highest). "I'd been on the operations side of things for about 10 years then, doing pilot plant work and operating different systems for the engineering firm. Because of my experience, I was allowed to sit for the B exam." She earned her A water operator's license in 2003 and her A wastewater operator license in 2004.

Her career path took a turn in 1991 when the U.S. EPA Region 6 hired her to manage its new stormwater program. Her construction experience and the MBA she had earned at Southern Methodist University made her attractive: "By then I had designed and built several million dollars' worth of drainage and infrastructure projects."

MAKING THE RULES

EPA Region 6 was managing 90% of the stormwater permits then and developed the national rule-making. "I became the public face of Region 6 for the stormwater program," she recalls. "I learned public speaking in a trial-by-fire setting. It's how I learned to talk in front of crowds. Once you get comfortable with it, you can talk to anybody about anything."

Those affected by the stormwater program called it the "rain tax," and it was very unpopular. Industries that had flown under the radar for years became noticed and were regulated: "They came under EPA oversight and were required to follow EPA regulations, something they'd never had to do

Rhonda Harris talks with Ron Patel about the history and changes at the Dallas plant where she began her career.

Sally Wright and Harris discuss upcoming projects while visiting the Dallas Central Wastewater Treatment Plant.

before. Farmers, ranchers, auto salvage yards, the petrochemical industry and others were all suddenly visible. The CAFO (concentrated animal feeding operations) rules came out of the NPDES system and stormwater regulation."

After the program was up and running, Harris recognized a gap in her knowledge and left the EPA to work for KPMG, a multinational professional services network and one of the Big Four accounting firms. There she learned the financial side of utilities.

After a couple of years at KPMG, Harris made her biggest career move yet: going out on her own. She and a friend, Curtis Smalley, who worked at Brazos River Authority, formed a partnership to train water and wastewater operators all over Texas. They formed a company called Professional Operations (ProOps) and were preparing to make the leap when the Brazos River Authority gave Smalley a promotion and a large salary increase to keep him on board.

THE PROOPS YEARS

Harris bought Smalley's share of ProOps, launched the training venture in 1995 and operated the company full time for 16 years. She was an approved trainer for Texas Commission on Environmental Quality, the Texas licensing authority.

"I did a lot of certification training all over the state for various utilities, and I worked at a lot of Texas Water Utility Association Regional Schools," Harris says. "TCEQ had approved me to teach about 20 courses, things like basic water and wastewater, water lab, wastewater lab, collection, distribution, groundwater production, safety, utility calculations — everything operators needed for a good foundation for their utilities."

She trained operators all over Texas while working as a consultant in areas such as system optimization, troubleshooting, startups and commissioning. After 9/11, she received approval through AWWA for Risk Assessment Methodologies for Water Systems training and through the Water Environment Federation for training in the Vulnerability Self-Assessment Tool.

A LONG FRIENDSHIP

In 1989, Harris met Kay Kutchins, and the two became close. "She was 17 years my senior," Harris says. "She was a communicator, not an engineer. She started her own firm, and we did a lot of work together."

Later, Kutchins went to work for the Black & Veatch consulting firm, and Harris frequently worked for her as a subcontractor. "She was the godmother of Texas water," Harris says. "She developed a TCEQ-approved course called Utilities Management. If you wanted an A license in Texas, you had to have Kay's class."

In the mid-2000s, the EPA provided a large block grant to the states to develop training programs for small water systems serving fewer than 3,300 people. Texas got $9 million to provide training for about 5,500 systems, and Harris worked as a contractor to TCEQ to deliver the training. She built the curriculum for the first two classes.

"They were specific, hands-on classes, starting with sampling," she says. "The state had found that about 90% of false positives in biological sampling were because of sampling errors. They had me develop a 10-hour curriculum to teach operators how to take samples properly, starting with developing a siting plan that met the rules.

"The class included how to handle the sample jars and take a sample without contaminating it. Most problems with false positives occur when the samples get contaminated. Proper sampling procedure means fewer false

(continued)

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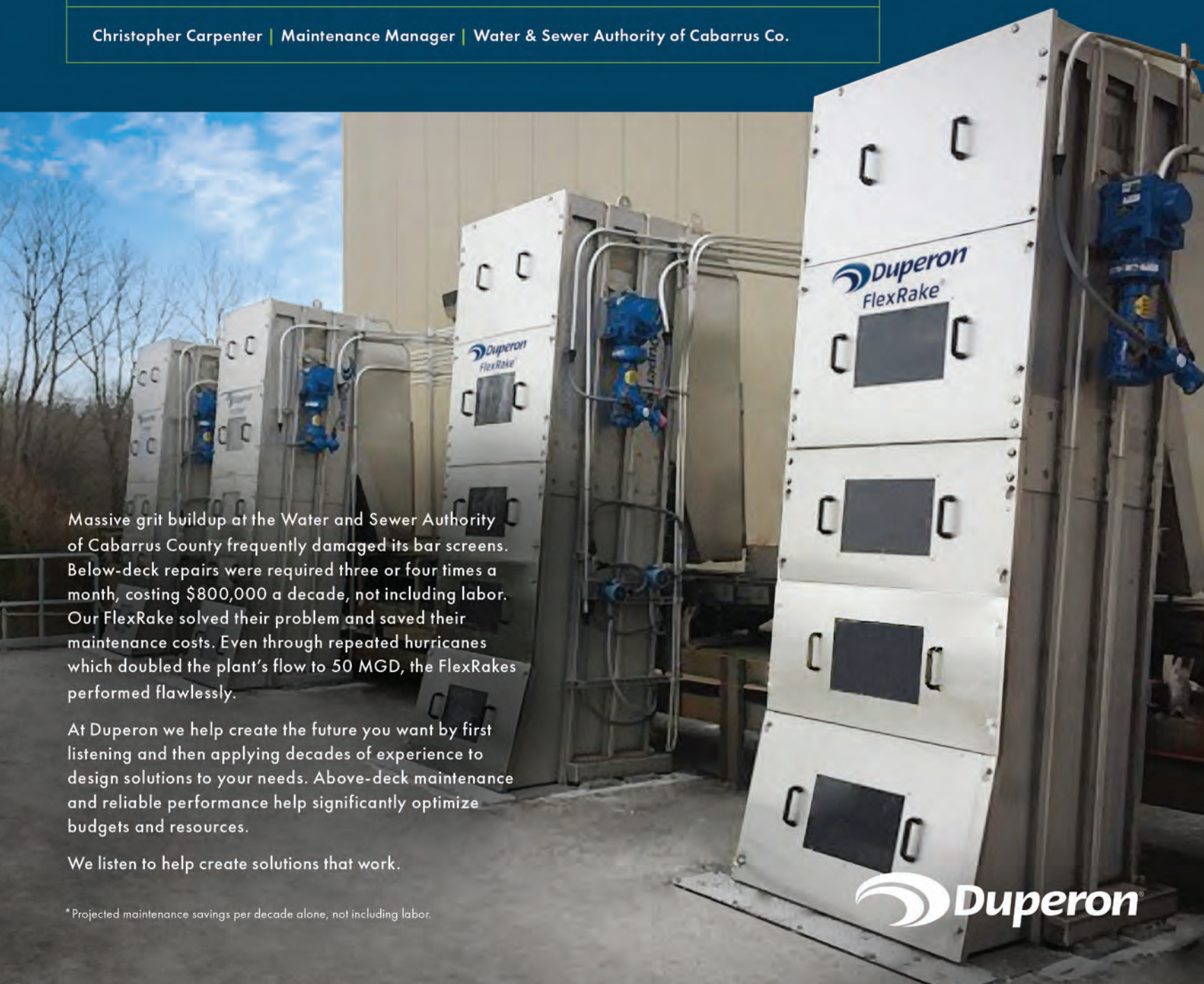
Christopher Carpenter | Maintenance Manager | Water & Sewer Authority of Cabarrus Co.



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positives and less wasted time and money proving that the sample was bad and not the system's water. It also included a Mock Compliance Assessment, using the same checklists that TCEQ uses, to assist these small utilities in preparing for their assessments."

SERVICE TO THE INDUSTRY

ProOps taught nearly 200 classes with five to 10 operators in each class. The program trained more than 5,000 operators in five years, providing cluster training for operators from multiple systems within 50 miles of the training site. The classes encompassed an afternoon and the next morning so that operators were away for only one night.

She also found time to serve as president of the Water Environment Association of Texas in 1995-96 and Water Environment Federation in 1998-99. "There I was at age 41 as president of WEF," she says. "I was not the first woman president but the second. Many folks didn't know what to do with me, especially the small states and small member associations. They'd never seen a woman engineer or WEF officer, and it was hard for some of them to accept that. I traveled all over the world for WEF, and it was a great opportunity."

> "I learned public speaking in a trial-by-fire setting. It's how I learned to talk in front of crowds. Once you get comfortable with it, you can talk to anybody about anything."
> **RHONDA HARRIS**

ANOTHER TURN IN THE TRAIL

When the EPA small-system funds ran out in 2010, Harris had no follow-on business because she'd been busy teaching classes, but she had developed relationships. In 2011, CH2M Hill (now JACOBS) offered her a position with its Operations and Management Business Group.

There she implemented training programs all over the world. As a volunteer in the late '90s, she had managed a grant from EPA Region 6 and developed an operator certification program in Piedras Negras, Mexico, in response to a cholera outbreak. The program was adopted by Mexico as the countrywide voluntary operator training certification program.

In this program, she worked with Texas AWWA and Water Environment Association of Texas to develop B and C level operator training programs and translate them into Spanish. In addition, she developed a training curriculum for the Republic of Maldives, off the southern tip of India in the Arabian Sea.

Her Operations and Laboratory Training Program is now curated by the Maldives National University throughout the country. It is specifically designed for desalination and laboratory operators and was adopted as the national Operator Certification Program for the Maldives.

Harris continues to provide training, with Brown and Caldwell, a firm focused on municipal infrastructure including water and wastewater facilities and systems. "I love training, and I continue to learn as much as I can myself every day to make any training that I provide more useful and relevant to my participants," she says. "I will continue training as long as I can because it is the most fulfilling thing I have done in my whole career."

It's been quite a journey of a woman who always knew what she wanted to do. **tpo**

Rhonda Harris received the Kay Kutchins Education Leader Award, an honor with extra significance because Kay Kutchins was her mentor and friend.

CAREER BUILDER

The Texas Section American Water Works Association developed the Kay Kutchins Education Leader Award to honor selfless contributions to the water industry.

Rhonda Harris, the first recipient of the award, was a longtime friend of Kay Kutchins, a recognized leader in the water industry. "I've received a lot of awards over the years, but this one means more to me than most," Harris says. "Kay was such a mentor to me, especially in my training life. Getting the award was a huge surprise."

Kutchins and Harris met in 1989. They worked together to develop and teach classes in initiatives like the North American Development Bank training program for utilities in the U.S. and Mexico.

Kutchins passed away in December 2018. She had been president of the Texas Section AWWA and was the first woman vice president of AWWA at the national level. The Texas AWWA website observes, "There are a number of water professionals around the country who credit Kay as their lifelong mentor. They'll say: 'I owe my career to what Kay Kutchins taught me.'"

Among many achievements, Kutchins developed the Texas Section's Utility Management Program, which remains the only such program approved by AWWA.

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-Jeff Pippenger, Utilities Administrator.
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A tour of the Jones Island Water Reclamation Facility is a major part of the visiting teachers' day.

Teaching the Teachers

THE MILWAUKEE METROPOLITAN SEWERAGE DISTRICT'S WATER JOURNEY FOR EDUCATORS HELPS TEACHERS BRING EFFECTIVE WATER EDUCATION TO THE CLASSROOMS

By Sandra Buettner

School teachers are important carriers of messages about clean water, and it's important that they be equipped to deliver those messages effectively.

To that end, the Milwaukee Metropolitan Sewerage District holds an annual Water Journey for Educators that covers activities and resources available to K-12 teachers and students on water-related issues.

The third annual daylong event last August included 23 teachers from public and private schools representing all grades in the district's service area. The day started at 8 a.m. with breakfast. The rest of the morning consisted of a choice of a tour of the Jones Island Water Reclamation Facility and grounds, or the University of Wisconsin-Milwaukee School of Freshwater Sciences labs and research boat. The School of Freshwater Sciences is the first graduate school in the nation dedicated solely to freshwater studies.

The Jones Island facility tour started with a classroom meeting where teachers saw a large diagram of the buildings they would visit and the functions of the equipment in and around them. The district's Jones Island and South Shore facilities clean some 600 mgd of wastewater for 28 municipalities with a combined 1.1 million residents.

UPPER RIGHT: Working with water sampling and analysis instruments is part of the Water Journey for Educators annual training day. RIGHT: Teachers observe the various treatment processes during their tour of the Jones Island Water Reclamation Facility.

> "It was really wonderful to see how excited all the teachers were, especially when they came back from the tours."
>
> **CHRISTINA TADDY**

What's Your Story?

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

TOURING THE GROUNDS

At the Jones Island facility, attendees viewed the influent screw pumps, primary and secondary clarifiers, and aeration systems, learning the roles they play in the treatment process. They also toured the Milorganite fertilizer plant, which produces an organic fertilizer from heat-dried biosolids. The fertilizer is sold in bags through retail outlets and has been marketed since 1926.

After the tour, the teachers returned to the classroom, where tour guides explained how promoting wastewater careers to students is a high priority for the district. They encouraged teachers to bring students age 10 and older to the Jones Island facility for a tour during the school year.

After the tours, the teachers enjoyed lunch at the district's headquarters. Christina Taddy, outreach program coordinator, then presented water education resources for activities outside the classroom.

The district offers tours of its research monitoring vessels to students and has other environmental education initiatives for teachers and students. The utility also partners with nature centers to give students hands-on experiences to learn about water resources. Taddy also described the Adopt-A-River Program in which students take part in the cleanup of a stretch of local waterways twice a year as a class project.

LEARNING AT WORKSHOPS

The afternoon session included a choice of three workshops for elementary, middle and high school teachers:

Project Wet (elementary and lower middle school) – Here the educators learned how to make many aspects of water relatable to students' lives through artwork and other activities.

Digital Observation Technology Skills (middle school) – In this program, presented by the Upham Woods Outdoor Learning Center, teachers learned to use modern mobile technology tools to connect students to the outdoors.

Great Lakes in My World (high school) – Following the curriculum created by the nonprofit Alliance for the Great Lakes, teachers learned hands-on activities and resources they could replicate in the classroom.

POSITIVE FEEDBACK

After the workshops, attendees completed a survey on the day's activities. Overall feedback was positive. Educators said they would spread the word to their colleagues about the event and return to take a different tour or workshop next year. They also said they planned to add water activities and education to their curriculums.

"It was really wonderful to see how excited all the teachers were, especially when they came back from the tours," Taddy says. "Many said they were definitely going to bring their students back for a tour once school started. It was just so great to see all the enthusiasm and engagement throughout the day." tpo

One Step at a Time

A SERIES OF POSITIONS AT PLANTS WITH DIFFERENT PROCESSES GAVE GARON GOULARTE A SOLID FOUNDATION FOR STEADY ADVANCEMENT IS HIS CAREER

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Collin Chappelle**

For Garon Goularte, frequent job changes have been a good thing.

In moving from one California facility to the next and gradually stepping up the operator ranks, Goularte has been exposed to multiple processes, each with its own challenges and with duties that encompass lab work, plant operations, water distribution, maintenance and leadership.

Now, as a senior operator with Monterey One Water, he's excited to play a role in running a brand-new advanced water recycling plant that yields water for indirect potable reuse by introduction to the groundwater.

Goularte earned the 2019 Operator of the Year award from the California Water Environment Association while in his previous position as chief plant operator and operations supervisor with JACOBS at the South County Regional Wastewater Authority in Gilroy. He took his current position in January 2019.

He's grateful for his wide variety of challenges during just 14 years in the water profession. "It gives me this large toolbox I can draw from when I encounter something I'm not familiar with," he says. "I may not know all the fine details, but it's not going to be a complete surprise. I can draw from a larger repertoire than someone who has been at just one facility for a long time. It doesn't make me better than anyone else, but it makes me more comfortable and maybe a little bit more confident."

CHANGING DIRECTION

Goularte grew up in Hollister, about 45 minutes south of San Jose. He earned a bachelor's degree in psychology from San Diego State University and enrolled in graduate school. Not wanting to attend graduate school in that field, he started working toward a teacher credential at San Jose State University. Then fortune intervened.

Mixed liquor return pumps recirculate nitrate as part of the denitrification process at the South County Regional Wastewater Authority in Gilroy, California.

"A good old friend, Jose Rodriguez, was in the water industry, and one day I went to see him at the facility where he was working," Goularte recalls. "I was intrigued by it. The activated sludge process, the biology of it, was fascinating. The more I asked, the more he answered. He told me about the industry, how you could excel at your own rate if you were motivated and driven. It seemed like a good career path."

Rodriguez is now assistant plant manager with Veolia at the Hollister Water Reclamation Facility but then was working in operations for Bracewell Engineering. Goularte tried to land a job with the company and finally

> "You look at life and anything that's stagnant usually doesn't do well. That's a metaphor I like to use."
> **GARON GOULARTE**

TIP OF THE DAY

While serving as chief plant operator at the South County Regional Wastewater Authority in California, Garon Goularte was charged with grooming new members of his team. Along the way, he developed a teaching tool he called the Tip of the Day.

After the daily morning meeting of the maintenance and operation crews, he would pull the operators into the SCADA control room. Each day brought a different lesson. "I would go over process changes we were making and what results we expected to see," Goularte recalls.

"Since some of them were operators in training, I would go over basics such as nitrification and denitrification — what the process was, what the effects were. Sometimes I was on call after hours. If we had a problem overnight, that would be my teaching point the next morning. I might say, 'We had a chlorine pump go down, we saw this effect in the contact basin, and here's how we took care of it.'"

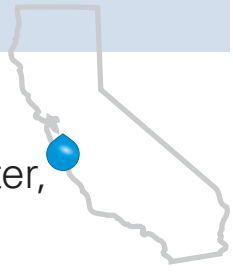
He also shared with his team issues involving customers of the authority's reclaimed water system. "Even though maybe I talked about some things that were a little over their heads for where they were in their careers, at least they could take a little bit away and feel somewhat familiar when they faced a similar situation.

"It made me grow and be sharper, too, because I had to make sure what I was telling them was correct. I'd research different processes and say, 'We're going to try this, here is why, and this is what the research says.' Then in our process meetings, we'd discuss how it worked or why it didn't work. Everybody would grow from that."

Garon Goularte at the South County Regional Wastewater Authority where he previously worked as operations supervisor and chief plant operator.

did so after earning a Grade I water distribution license on his own initiative: "They saw potential in me, took a chance and hired me."

He started by maintaining well sites and pump houses for small-community water systems. After earning a T2 water treatment license, he moved up to operating small water treatment plants. Eventually he became a wastewater treatment operator-in-training and gained Grade I wastewater operator certification: "So then I was operating water treatment, wastewater treatment and water distribution facilities for Bracewell Engineering."



Garon Goularte, Monterey One Water,
Monterey, California

POSITION:
Senior operator

EXPERIENCE:
14 years in water and wastewater industry

EDUCATION:
Bachelor's degree, psychology, San Diego State University

CERTIFICATIONS:
Grade 5 wastewater operator, Grade 3 advanced water treatment

GOALS:
Continue advancing skills and knowledge; attain a management position

Garon Goularte aspires to more growth in knowledge and responsibility as a member of the clean-water profession.

The South County authority reliably meets the steadily increasing demand for recycled water to irrigate parks, golf courses, sports complexes, landscape medians and more.

After about 2 1/2 years with that company, he moved to the Hollister facility, which had just replaced a lagoon system with a membrane bioreactor plant (4 mgd design, 2.5 mgd average) built by HydroScience Engineers under a design-build-operate contract. He worked there as an operator employed by HydroScience. Two years later, Veolia took over the operations contract; Goularte earned his Grade III wastewater operator license and stayed until 2013.

STEPPING UP

His next stop was with the operations arm of CH2M Hill (now JACOBS) at the South County authority, where he continued learning and growing. The treatment facility (8.5 mgd design, 6 mgd average) had an activated sludge extended aeration process in an oxidation ditch.

The facility treated wastewater to Title 22 reclaim standards and piped the water throughout the community for landscape and golf course irrigation, to some industries for wash water and to a small power plant for cooling. While there, Goularte served as site safety coordinator and as a stormwater committee member. He earned his Grade V wastewater operator license in 2018.

Then came the opportunity at Monterey One Water and its wastewater treatment and recycling facility (29.6 mgd design, 18 mgd average), with a variety of processes new to him. Wastewater from three interceptor sewers passes through two bar rakes (Duperon), two grit channels and two Gritt Mitt grit classifiers (WesTech Engineering).

After five primary clarifiers, the flow proceeds to six trickling filter towers (two BioDoc by WesTech Engineering and four Envirex by Evoqua Water Technologies) and then to a bioflocculation basin, similar to an activated sludge extended aeration basin, with fine-bubble aerators and APG-Neuros NX200 turbo blowers with diffused aeration sparging system for distribution.

The water then flows to six secondary clarifiers. A portion of the clarifier effluent (seasonally variable) is discharged to a Pacific Ocean outfall. The rest goes to flocculation basins where aluminum chlorhydrate polymer is added before treatment in anthracite/sand filters, chlorination and discharge

to a storage pond that supplies the water to the Salinas Valley Reclamation Project for farmland irrigation.

On the solids side, primary sludge is pumped to a gravity thickener and then to four anaerobic digesters; waste activated sludge is thickened in a dissolved air flotation thickener unit (drive and mechanicals from Evoqua Water Technologies; air and water dissolution system from World Water Works) and sent to the digesters. Biosolids are dewatered on two screw presses (FKC) to 16% to 17% solids and further dewatered to 50% to 70% solids in drying beds and sent to landfill.

Biogas from the digesters fuels a combined heat and power system with three engine-generators (Cooper Superior), each with 580-kW capacity, that supply the majority of the facility's power. Engine heat is captured from exhaust and jacket water and is used to heat the digesters. A solar energy installation (SolarCity) is designed to supply all power for the Salinas Valley Reclamation Project facility.

A NEW CHALLENGE

Recently, in pursuing California's new advanced water treatment certification, he has researched UV disinfection, advanced oxidation processes and membrane filtration technologies. In large part, that's in preparation for helping operate a new treatment facility for the Pure Water Monterey groundwater replenishment project.

That facility, commissioned in late 2019, uses membrane filtration, reverse osmosis, oxidation with hydrogen peroxide and UV disinfection to treat secondary effluent for percolation into the groundwater basin. Goularte and operator colleague David Bradley were responsible for startup and commissioning of the facility, which the Monterey One Water operations team will run and maintain.

With the addition of the new plant, there are now three product streams: secondary effluent discharged to the ocean outfall, Title 22 reclaim water for

> "I can draw from a larger repertoire than someone who has been at just one facility for a long time. It doesn't make me better than anyone else, but it makes me more comfortable and maybe a little bit more confident."
>
> **GARON GOULARTE**

TAKING THE CHALLENGE

Throughout his career, Goularte has been fascinated by the activated sludge process. "The bacteria are living organisms, and any small thing can throw off their biology," he says. "It could be a shock load from a septic hauler dumping something too acidic or alkaline. At higher temperatures, the bugs are more active and the oxygen transfer is a little less efficient, so you need to have more oxygen available in summer.

"You have to do microorganism examination and monitor your sludge age to make sure the filamentous don't become too abundant and cause foaming issues. Coming into this career, I thought it was all about pumps, motors and chemicals. But it's bacteria that do all the work, and the machinery provides the environment for the bacteria to treat the wastewater. To me, it's very exciting and amazing."

To help him master the process, Goularte took advantage of the Sacramento State University books; various training sessions, webinars and videos from the California Water Environment Association and the American Water Works Association; and studies to prepare for higher certifications. Naturally, he also learned by doing.

"You can read about it all you want," he says, "but when you get in there and do the sampling, the testing, and the microscopic exams, that's where you really learn about it. Since I started small and worked my way up, I've had sampling and lab experience."

Salinas Valley Reclamation Project or the Castroville Seawater Intrusion Project, and water for indirect potable reuse.

LEARNING AND LEADING

On his journey, Goularte has enjoyed a number of mentors, most notably Rodriguez: "He was instrumental to my growth in this industry. He was the first mentor I had, and I still consider him as such to this day. He helped mold and develop me in our first seven years working together. We had countless after-work conversations about process control management and systematic improvements that we could engineer and implement.

"We pushed each other to learn and climb in certification grade levels. We were our own little think tank at Bracewell Engineering, and then the Hollister facility, doing everything we could to make the plant and ourselves the best they could be.

Also influential was John Hernandez, maintenance supervisor with the South County authority: "He was a wealth of knowledge, an all-around great personality, very cerebral and a lead-by-example guy." Another was Chris Vasquez of CH2M Hill, who was operations supervisor at South County authority when Goularte was lead operator there: "I learned a lot of process from him — different techniques, different tests that I hadn't seen before."

Their influence helped Goularte develop his approach to leadership while at South County authority. Some of his team members were new to the wastewater industry; they had owned businesses such as carpet cleaning and pest control; one had worked in a cheese factory.

"All of them, they were hungry," Goularte says. "They wanted to learn and grow. When they started at the facility, they were operators in training. Now several are Grades 4 and 5; others are Grade 3. I got to see all of them excel. Part of that made me better because I got to work with them and teach them. That made me want to learn more and share my knowledge. I used to tell them, 'My job is to make you better than me, because then you make my job easier.'"

Now he's content to be back in the operator ranks. "Even as a leader, the guys would tease me because I'd still be out there shoveling sludge. They'd say, 'Aren't you supposed to be in the office?' I'd say, 'I've got to get some daylight. I've got to keep working with my hands.' I didn't want to be disconnected. I made sure I stayed on top of things in the facility. Now being back as an operator, I'm out in the sunshine again, getting my hands dirty. It's refreshing. I like it."

LOOKING FORWARD

Looking ahead, Goularte aspires to more growth in knowledge and responsibility. "You look at life and anything that's stagnant usually doesn't do well," he says. "That's a metaphor I like to use. If a pond sits stagnant, it goes bad. The same is true for people and careers.

"I would like to keep climbing. We have the new advanced water purification facility in Monterey. I'm excited to be working with that.

"This career is exciting. I enjoy it. I've loved everyone I worked with." tpo

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> **SCOTT DUHAIME**

An iFIX screen from the high-performance human-machine interface (HMI) is designed to help increase operator efficiency through effective design using fewer colors. The screen shown uses mostly gray-scale colors and has an alarm card with bright icons related to severity. The net objective is to help operators easily recognize and understand information.

A Simpler Picture

GE ISSUES NEW VERSIONS OF IFIX HMI/SCADA AND HISTORIAN AIMED AT ENHANCING PLANT PRODUCTIVITY AND SIMPLIFYING PLANT OPERATIONS AND OPERATIONS DATA ANALYSIS

By Ted J. Rulseh

It's hard to imagine operating a water or wastewater plant without a modern SCADA system. But what SCADA characteristics help operators keep their facilities operating at peak efficiency? What helps them understand when something happens that needs attention?

GE Digital has considered those and other questions in creating new versions of its iFIX human-machine interface/SCADA technology and Historian. The new iFIX 6.1 follows the latest design standards to create a user interface that helps operators easily prioritize critical alarms and substantially enhance plant productivity. It also incorporates the latest interoperability standards so that it runs across a variety of hardware platforms and operating systems.

Meanwhile, the new Proficy Historian 8.0 is designed to improve security and ease of use and enhance performance. It includes features that let operators access data about assets such as pumps and motors without knowing the technical intricacies of SCADA. Scott Duhaime, iFIX product manager, and Steve Pavlosky, Historian product manager, talked about the new versions in an interview with *Treatment Plant Operator.*

tpo: What would you consider the core strengths of your technologies in this realm?

Duhaime: iFIX and Historian are intertwined; we provide them as a package. We have a fairly broad base of customers in water and wastewater. Our HMI/SCADA system is noted for flexibility. It can go from very small deployments, such as on a single PC for a pump station, on up to large cities. We also support industrial users of water.

tpo: How do the different components of this technology fit together?

Duhaime: Think of SCADA as the engine. The SCADA scans the PLCs, and when parameters fall outside expected limits, it creates an alarm, which the operator reacts to. The HMI is the visualization side. Our HMI has a lot of flexibility. Our screens can go from a simple picture of a pump station or tank, to a dashboard overview, all the way down to nitty-gritty detail. Once the parameter values are captured, that's where Historian comes into play. The values can be played back on the HMI screen or used for purposes such as analytics and regulatory reporting.

tpo: What is significant about the new offerings?

Duhaime: On the HMI side, from an operator's perspective, what's new is a focus on standards, one of which is the ISA 101 high-performance HMI standard. That has nothing to do with how the computer performs; it's about making operators high-performing.

tpo: How is that accomplished?

Duhaime: It's done by using basic graphical packages and basic colors. Historically, HMIs are very colorful and detail oriented, so it's pretty complicated to get newer operators trained and running on them. They're good for people who have been looking at SCADA for 20 years, but newer operators need to be trained quickly to know exactly what they're looking at. One of our focuses is on providing high-performance graphics.

tpo: Can you describe what is meant by high-performance graphics?

Duhaime: In the HMI world, screen designers and controls engineers doing screen layouts have believed that putting as much information on a screen as possible was the right way to go. But research has shown that those cluttered screens can hide key elements that operators need to focus on. So on our HMI, operators see a more muted color palette. They see much less information on a given screen — only critical pieces of information that help them respond to and interact with the equipment.

tpo: Does your system use, for example, a green/yellow/red color pattern to create easy visualization?

Duhaime: We've moved away from that in part because many operators are men and a high percentage of men are color blind; they see red as brown. We use more of a gray-scale approach. There are only 16 colors on the high-performance graphics. And it's not just color that we present to the operators. We may present a shape, a color and maybe a number so they understand what's going on. The screen generally starts with a dashboard. Then there's a drill-down to the next layer.

tpo: What is the ultimate goal of this approach to design?

Duhaime: The overall goal is maximize machine uptime and eliminate operator errors. An operator can make mistakes for various reasons. One is they're looking at a display that's so busy that they can't interpret the situation quickly and they make a bad decision. The high-performance HMI standard is really about enabling operators to make the right decisions quickly.

tpo: What are the highlights of the new Historian offering?

Pavlosky: Part of the concept of the high-performance operator is the use of web-based technology. We've built a product called Operations Hub that overlays our HMI/SCADA and Historian offerings so mobile operators can interact with the system. Without knowing the inner workings of SCADA, they can look at the key performance indicators of a filtration unit, for example. And they can easily display trends or tabular data or build dashboards to represent that data. This information can display on a PC, tablet, smartphone or smartwatch.

> "Nobody gets value from storing data. They get value from analyzing or reporting on that data."
> **STEVE PAVLOSKY**

tpo: Why is this capability important?

Pavlosky: Our focus is on enabling customers to derive value from data that's being stored. Nobody gets value from storing data. They get value from analyzing or reporting on that data.

tpo: What else is new with this latest version of Historian?

Pavlosky: We've built in some powerful capabilities that allow users to interact with the data and share context around what is happening at a given time. For example, suppose an operator queries data associated with a pump and sees something odd with the revolutions per minute. That operator can make a comment or annotation that will be stored in Historian. Now when anybody else looks at that pump's data, that comment will be displayed.

Another capability we offer as a subscription-based service is cloud-based analytics. We have reliability analytics for many rotating assets, pumps being an important one in the water industry. That's a value we see a lot of municipalities taking advantage of in the future. **tpo**

Key Pine Creek facility personnel include, from left, Sam Russell, former plant manager; Napoleon Wilks, current plant manager; Greg Thompson, project engineer with Engineers of the South; and Ryan Bock, on-site Engineer with Engineers of the South.

Going the Distance

AN ALABAMA TEAM PULLED OUT ALL THE STOPS WITH A COMPLETE UPGRADE OF A CLEAN-WATER FACILITY THAT INCLUDES A LIME STABILIZATION PROCESS YIELDING CLASS A BIOSOLIDS

STORY AND PHOTOGRAPHY: **Larry Trojak**

> “Obviously, we wanted to tap into the strengths of today’s newer technology. However, we also wanted to try to use green infrastructure within the plant.”
>
> **DALE GANDY**

Pine Creek and Prattville’s Public Works Department see the new Learning Center playing a dual role: as a site for continuing education for water and wastewater operators, and as a vehicle for promoting water treatment as a viable career.

When the City of Prattville, Alabama, decided to upgrade its Pine Creek Clean Water Facility, it spared no effort.

While the city had made incremental modifications in the past, the latest upgrade, completed in 2019, was designed to take the facility from simply adequate to boldly forward-thinking, fulfilling the city’s needs for at least the next quarter century.

A key to the new facility plan was a rethinking of solids handling, which had been basic and costly. Today, the Pine Creek facility uses a new approach to aeration, dewaters biosolids on a pair of screw presses and generates Class A biosolids for land application. The facility now accepts biosolids from the city’s other treatment facility for processing into Class A material.

Pine Creek Clean Water Facility,

Prattville, Alabama

www.prattvilleal.gov/departments/wastewater.html

BUILT:
1979

POPULATION SERVED:
34,000

FLOWS:
5.7 mgd design, 2.4 mgd average

BIOSOLIDS PROCESS:
Lime stabilization

BIOSOLIDS QUALITY:
Class A

BIOSOLIDS VOLUME:
2,042 dry tons/year

BIOSOLIDS USE:
Land-applied

DEALING WITH GROWTH

Prattville, 10 minutes northwest of Montgomery, the capital of Alabama, is home to 34,000 residents and has seen impressive development. According to the Prattville Chamber of Commerce, more than 130 new businesses opened in the city and immediate surroundings between 2014 and 2018 — some $760 million in capital investment.

All that growth prompted city officials to look at existing infrastructure; it soon became clear that upgrades to the wastewater treatment systems were in order. “This was a wholesale overhaul of the entire treatment process to help deal with the growth in the area,” says Greg Thompson, project engineer with Engineers of the South, which had worked with the city for more than 15 years and helped design the upgrade.

“We were actively involved in the research and planning leading to the upgrade. The original facility, built in 1979 to comply with the Clean Water Act, had a 3 mgd design capacity. In addition to options for dealing with the increases in volume, we talked with city officials about rethinking the entire biosolids treatment and handling process.”

THINKING GREEN

Though a facilitywide change was in the cards, the evaluation criteria for upgrades were highly ordered and specific. The desire to use state-of-the-art technology headed the list of desirables, according to Dale Gandy, director of Public Works.

“Obviously, we wanted to tap into the strengths of today’s newer technology,” Gandy says. “However, we also wanted to try to use green infrastructure within the plant. We had our sights set on looking into Class A biosolids. We wanted to create effluent cleaner than the environment into which it was headed. We wanted the whole effort to be energy efficient and needed the facility to have 25 to 30 years of viability.

Napoleon Wilks periodically monitors the overall process in the biosolids control room. Changes can be easily made from there when needed.

"In addition, because we didn't have unlimited funds to throw at the project, we had to be relatively cost-conscious. It was a long list to try to meet, but we set out confident that it could get done." The facility envisioned by Thompson and his engineering team, working hand in hand with Gandy and the Prattville wastewater staff, would take the design flow from 3.0 to 5.7 mgd. That increase, they felt, would provide the needed life expectancy.

MAKING IT MODERN

To get to that point, no area of the Pine Creek facility was left untouched. Designed as a conventional activated sludge facility, the facility headworks used a coarse screen in a deep sump ahead of the raw sewage pump station, followed by aerated grit removal.

"Aeration in the original design consisted of three parallel basins with two fixed-mounted, low-speed surface aerators per basin," Thompson says. "Control of the aeration system consisted only of locally mounted low/high-speed selector switches.

"The process was energy inefficient, and the inability to aerate sufficiently or deal with varying flow rates and oxygen demands led to plant upsets and periodic effluent violations. The warm summer months, when effluent limits are lowest, made it particularly hard for operators to maintain compliance."

At that time, liquid Class B biosolids were hauled to a farm field for land application. The facility averaged 10 to 15 6,800-gallon tanker loads per day. "But if it had rained and the field was wet, they couldn't land-apply, so the plant had to be prepared to store material in the digesters," Thompson says. "It's not surprising they knew a change was needed."

> "We were seeing new industries coming in regularly, and we knew we could soon run out of industrial fields like the one on which we'd been applying. So, we knew solids handling had to change."
> **SAM RUSSELL**

Finally, the previous clarifiers used a mix of organ-pipe and scraper-blade solids-removal systems. Disinfection, which originally used chlorine gas, was updated to UV in a 1999 facility modification.

IN WITH THE NEW

Thompson and his group worked hard to address all the issues with the existing facility and to ensure the new facility's long-term viability. Influent passes through an all-new headworks with two fine screens (Duperon) and a grit removal system incorporating Eutek HeadCell technology (Hydro International) and WEMCO Pumps Hydrogritters.

In aeration, to deal with high ammonia levels caused by an inability to nitrify, the design team chose a VertiCel suspended growth activated sludge process (Evoqua Water Technologies). "VertiCel uses a combination of disc aeration followed by fine-bubble diffused air," Thompson says. "In that way, we felt we could tap the efficiencies of both types of aeration to meet our need for an energy-efficient design and to get full biological nutrient removal. We always had issues getting enough oxygen transfer with the old system. The new combination powered by Howden positive displacement blowers is energy efficient and has great oxygen transfer."

ROAD TRIP

To explore solids handling alternatives, city and engineering firm representatives visited several clean-water plants throughout the Southeast. One factor driving the city's decision to create a Class A biosolids product was growth in the area.

"We were seeing new industries coming in regularly, and we knew we could soon run out of industrial fields like the one on which we'd been apply-

Included in the Pine Creek plant overhaul was a new headworks. Here, after fine screens (Duperon) remove trash and debris, a grit system (Hydro International) removes 95% of grit particles 75 microns and larger.

In a 22-foot-long reactor in the Schwing Bioset process, chemical reactions raise the biosolids temperature and pH level, creating a Class A product.

ing," says Sam Russell, former Pine Creek plant manager who was brought on as a consultant during the upgrade. "So, we knew solids handling had to change and that dewatering would be a huge part of that discussion."

Evaluation of dewatering options included visits to half a dozen facilities to view belt presses, screw presses and centrifuges and to converse with operators about their experiences with each. With the resulting information in hand, the group began seeing screw presses as the best fit for Prattville, and a visit to a plant in Immokalee, Florida, confirmed that impression.

"Immokalee was an eye-opener for us," Thompson says. "That installation uses a Schwing Bioset screw press for dewatering and creates a Class A product using the Schwing Bioset solution. We saw so many similarities between what Immokalee had dealt with and our own situation at Prattville that we all felt we had found our answer."

PRESSING ISSUES

Coming online in August 2019, the biosolids process at Pine Creek facility feeds mixed and aerated material from waste activated sludge storage basins to a pair of new Model FSP 1002 screw presses (Schwing Bioset). Each press is rated for 1,122 pounds of dry solids per hour, with a minimum 17% cake solids and a 95% minimum system solids capture.

While performance metrics were key to the screw presses' selection, the Prattville team was also drawn by the self-cleaning function, where the units continue to dewater while cleaning cycles are performed. This ensures that no storage is necessary between dewatering and the Class A operations.

"We have each unit scheduled to clean itself every hour, but that function is flexible and easily changed," says Napoleon Wilks, current Pine Creek plant manager. "We also like that these presses are almost self-operating. We have them programmed to run for only seven hours a day, five days a week, which allows us to keep staffing costs down."

ACHIEVING CLASS A

A key reason to develop a Class A product was that Russell and Gandy

CENTER OF ATTENTION

Just outside the fence of the Pine Creek Clean Water Facility sits a structure built along with the recent facility expansion. Known as the City of Prattville (Alabama) Learning Center, the building signifies the city's commitment to its clean-water process — today and in the future.

"In the long-term, this is something we felt could be as important as the upgrade itself," says Dale Gandy, director of Public Works. "With so many wastewater professionals retiring and no one to replace them, there is a real shortage of the next generation of operators in the industry today. We hope to do our part to turn that around here."

The city envisions the center becoming a site for continuing education for water and wastewater operators and a vehicle for promoting water treatment as a viable career.

"We will be bringing outside entities into the center to help train Prattville personnel in developing technologies, and we will invite other water and wastewater professionals in for training," Gandy says. "We feel strongly about this industry and think this could be a real positive as we move forward."

> “This is amazing to comprehend but, despite almost doubling the plant capacity, our energy consumption only increased by 8%.”
> **DALE GANDY**

had backgrounds in farming and understood the benefits a soil amendment can bring and how it can be used.

“We like what can be done with a good Class A product, whether it’s for a resident’s flower beds, for grass in front of City Hall or for a farmer using it on crops,” Russell says. “We also felt there was a real upside in accountability to sourcing the dewatering and the Class A process from the same company.”

The Schwing Bioset process uses a screw conveyor to take dewatered biosolids to a twin-screw mixer where quicklime and sulfamic acid are added. From the mixer, a Schwing Bioset KSP-25VKL pump adds the material to a 22-foot-long reactor where chemical reactions raise the temperature and pH, stabilizing the mixture and creating a Class A product.

Each screw press is rated for 1,122 pounds of dry solids per hour, with a minimum 17% cake solids and a 95% minimum system solids capture. The presses continue to dewater during cleaning cycles so that no equalization storage is needed between dewatering and the Class A operations.

The material is maintained in the reactor at a minimum temperature of 131 degrees F for a retention time of 40 minutes, in accordance with U.S. EPA specifications for a process to further reduce pathogens. “The way we process our biosolids today, pushing a lower quantity through than our future design conditions, the material is actually in the reactor far longer than that,” Wilks says. “The result has been a consistently good Class A biosolids.”

The material is spread on a city-owned field and turned for a few days until it is dry enough to deliver to a farmer, who takes all the city can provide.

A screw conveyor takes untreated biosolids from the screw presses to a twin-screw mixer, where quicklime and sulfamic acid are added and mixed before being pumped to the reactor.

REAPING REWARDS

The city once hauled up to 81,000 gallons of Class B material per day to farms. Today, just two tri-axle trucks per week loaded three-fourths full can do the job.

“This is amazing to comprehend but, despite almost doubling the plant capacity, our energy consumption only increased by 8%,” Gandy says. “Thinking I must have missed something, I checked the data several times and even had a representative from Alabama Power verify it for me. There was no mistake — that’s how energy efficient this plant is.”

The biosolids process is working so well that the Pine Creek facility has begun processing material from the city’s 4 mgd Autauga Creek Clean Water Facility. That means hauling approximately 200,000 gallons of biosolids per month at 1.75% solids from the Autauga Creek facility to Pine Creek facility.

Gandy says, “We set out with a pretty challenging to-do list. But by tapping the innovative technology available to us, we feel we accomplished it all, and then some.” **tpo**

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The West Side Wastewater Treatment Plant has an average flow of 10 mgd.

Going Big for Solar

PHOTOVOLTAIC ARRAYS AND A LARGE BATTERY STORAGE INSTALLATION PROPEL AN ARKANSAS CITY TOWARD AN AMBITIOUS LONG-TERM CLEAN-ENERGY GOAL

By Steve Lund

The city of Fayetteville, Arkansas, jumped on the solar energy bandwagon in a big way in 2019.

In September, the city in northwestern Arkansas connected its two wastewater treatment plants to 10 MW of solar energy with 24 MWh of battery storage. The three solar farms on city-owned land next to the plants represent a big step toward the goal to have 100% of city government operations running on clean energy by 2030.

Wastewater treatment is the city's biggest energy consumer. The Paul R. Noland Wastewater Treatment Plant (30 mgd design, 12.6 mgd average) and the West Side Wastewater Treatment Plant (32 mgd design, 10 mgd average) account for about two-thirds of the electric load.

The solar farms were developed by Today's Power, a subsidiary of Arkansas Electric Cooperatives, which includes the power distribution co-op Ozarks Electric. Fayetteville has a power purchase agreement with Today's Power that is expected to save the city about $180,000 a year. The rate for the solar-produced electricity is set for 20 years.

Tim Nyander, utilities director, says the city had contemplated small solar projects but had not installed any until last year. "We had thought about solar panels on some of the buildings, possibly for lighting, but nothing on the scale that was proposed by Ozarks Electric," Nyander says. "We thought it was a great idea."

GOOD FOR EVERYONE

Peter Nierengarten, P.E., environmental director, recalls the electric utility approaching the city with a win-win-win: good for the wastewater treatment plants, the developer and the utility. "We had the land, but Today's Power brought the money for the investment in the solar generation components," Nierengarten says.

"We had to put in a little bit of money to upgrade to connect to the solar array. Today's Power borrowed $23 million or so to buy the solar components. They were able to take advantage of tax credits. Their revenue stream to pay off that loan is the payments we make." Nyander and Nierengarten estimate the city's make-ready expenses at $760,000, which should be recovered by the cost savings in a little over four years.

The lithium-ion batteries are made by Northern Reliability. The Fayetteville project is the largest energy storage facility in the Southeast. The batteries are owned by Today's Power but operated by Ozarks Electric to shave demand during periods of peak demand when buying additional power from the grid is expensive.

The solar panels are on a tracking system that follows the path of the sun to maximize the energy they produce. The batteries can be charged either from the solar panels or the grid.

> "We had thought about solar panels on some of the buildings, possibly for lighting, but nothing on the scale that was proposed by Ozarks Electric."
> **TIM NYANDER**

The project was sized to offset 100% of the electricity consumed by the wastewater treatment plants. The city uses net metering with the grid to bank extra power produced on sunny days and draw electricity from the grid at night and on cloudy days. "We're using everything the panels produce," Nyander says.

REDUCED DEMAND

Before the solar project, Fayetteville had taken numerous steps to reduce power consumption at the plants. Those steps include:

- Installing 66 variable-frequency drives — Altivar (Schneider Electric), Allen-Bradley (Rockwell Automation) and ABB — on motors
- Installing high-efficiency motors when old motors wear out
- Installing capacitors to prevent power factor penalties
- Using solar dryers to dewater biosolids
- Conducting an energy management assessment to identify future energy reductions
- Switching to LED lighting and putting all light switches on motion detectors
- Making adjustments to mechanical mixers

The Paul R. Noland Wastewater Treatment Plant in Fayetteville, Arkansas, has an average flow of 12.6 mgd.

"At one of the facilities, we went to bare-minimum lighting at night because it can be operated by SCADA from the other facility," Nyander says. "That does cut down on electrical usage."

Fayetteville also generates power with three 2 MW diesel generators from Caterpillar Inc., Electric Power Division. "The on-site generation is for load shedding, so we are not on the grid when it is stressed due to demand versus capacity," Nyander says. "We would pay exorbitant prices for electricity at that time."

The solar power will not eliminate the need to operate the generators to cut peak summer demand. "We still need to load-shed between June and September each year," Nyander says. "The solar is tied to the grid, and we must be off the grid during peak demand."

OZONE DISINFECTANT

The city has increased demand by switching from UV to ozone disinfection at the Noland plant starting in June 2017. The plant uses the HyDOZ (hyperconcentrated dissolved ozone) disinfection system from BlueInGreen, a company in Fayetteville.

"We're preparing for emerging contaminants," Nyander says. "Someday we're going to be regulated on pharmaceuticals and those types of things, so we are using ozone for disinfection."

Fayetteville already faces strict effluent limits because both treatment plants discharge to high-quality waters. The West Side plant empties into Goose Creek, which flows into the Illinois River, classified as a scenic river in neighboring Oklahoma. The Noland plant discharges to the White River, which flows into Beaver Lake, the drinking water source for 600,000 people, including Fayetteville residents.

The solar panels installed by Today's Power are on tracks so they can follow the path of the sun and maximize electricity production. Fayetteville had 10 MW of solar power capacity installed on land between its two wastewater treatment plants.

The city takes prides in pioneering new environmental technologies. In 2016 it was designated as a Utility of the Future by the Water Environment Federation and partnering associations. In 2018, the city adopted an energy action plan that looks to have the entire city — not just government operations — running on clean energy by 2050.

Before the solar panels were installed, Fayetteville was about 16% of the way toward the 2030 goal of running government operations on clean energy. Now, Nierengarten says, it's about 72% of the way there. tpo

An Association for Industry

THE INDIANA INDUSTRIAL OPERATORS ASSOCIATION CATERS TO A SPECIALIZED GROUP OF CLEAN-WATER PROFESSIONALS WITH A CONFERENCE, CREDENTIALING, MENTORING AND MORE

By Ted J. Rulseh

Municipal and industrial clean-water operators are brothers and sisters in arms, facing different treatment processes but many of the same basic challenges and the same ultimate objective: protecting water resources.

But while municipal operators are well connected by various regional and state-level associations, most industrial operators don't have a similar home base. A notable exception is in Indiana, where for a quarter century an association has represented the industrial side of the profession.

The Indiana Industrial Operators Association reports 1,200 members and an active program that includes the Wastewater Industrial Technical Training Education Conference (WITtec), which marks its 25th anniversary in Indianapolis March 30 to April 1. It's sponsored by the IIOA and the Indiana Water Environment Association.

The conference offers industrial- and municipal-focused concurrent sessions covering regulatory, industry and pretreatment topics, along with current technical information that attendees can take back and put in practice at their facilities.

The association offers a range of professional credentials that include Registered Industrial Wastewater Professional (RIWP, Basic, Masters and Ph.D.) and Industrial Environmental Manager (IEM, Basic and Masters).

Three leaders of the association talked about it in an interview with *Treatment Plant Operator.* They are:

- Al Goodman, P.E., RIWP-Master, principal at CDM Smith, IWEA and Water Environment Federation past president, and IIOA board member
- Thomas Martin, consulting chemist with Delta Chemicals and Equipment, IIOA co-founder and past president
- Russell Eiler, CEF, RIWP-Master, director of global environment, health and safety compliance with Allegion, IIOA board member

Al Goodman

Thomas Martin

Russell Eiler

tpo: Do other states have similar associations for industrial operators?

Martin: I believe about six states license industrial operators separately from the municipal side, but I don't know of any other state associations that are strictly formatted around industry.

tpo: How did the IIOA get its start?

Martin: I was a member of the IWEA, which was then called the Indiana Water Pollution Control Association. I was on the industrial committee, and we always felt like stepchildren. We weren't very successful in getting industrial people to present papers and come to the forum with the same enthusiasm as people on the municipal side. Finally, seven of us from industry decided to form the IIOA.

tpo: What was your first step toward organizing the association?

Martin: We decided to put on a conference, and even before it was held, we got over 100 people to sign on as charter members. A comment from industrial operators was that at the municipal conferences all they heard were papers on activated sludge. It's not unusual to see activated sludge in food processing, for example, but they wanted to hear more. Back then there was a lot of metal finishing done here. Our people wanted papers about new technology in that area. So that's what we did during out first conference. Today, for a typical three-day conference, we'll have a total of more than 600 people attend.

> "Industry faces a lot more challenges than municipalities do. For one thing, the influent concentrations in industry are usually much higher." **AL GOODMAN**

tpo: Is the attendance limited to operators from Indiana?

Eiler: I work for a global company, and we have wastewater treatment plants and operators across the globe. I thought it would be good to bring our operators and environment, health and safety managers from our facilities together for what I feel is a very beneficial conference.

tpo: As you see it, what do municipal and industrial operators have in common?

Goodman: An important commonality is a desire to understand the treatment the processes, and the technology and where it's going, so that they can become better operators and make adjustments that make their lives easier in their own treatment plants.

Martin: We also share a desire for clean water. Both groups are water-quality protectors.

tpo: What are the major differences between municipal and industrial operators?

Goodman: Industry faces a lot more challenges than municipalities do. For one thing, the influent concentrations in industry are usually much higher. It's not uncommon in industry to see BODs in the tens of thousands and TSS and FOG in the hundreds of thousands of milligrams per liter. In addition, industrial flows can change radically, even during an operational day. There may be a product changeover that results in the influent changing. Operators are challenged with much more variability in the wastewater.

Eiler: We have some very low discharge limits in industry. In our facilities, we have parts per trillion for mercury and a parts per billion requirement at one of our sites for arsenic. Also, industry wants to reuse water within the production process and looks at it from a cost perspective. There's an emphasis on the dollar factor that isn't as common to municipal plants.

tpo: Are there differences in how industrial treatment operations are regulated?

Goodman: Industries are most often regulated by the municipalities through our pretreatment permits. The cities have pretreatment coordinators. The IWEA has a Pretreatment Committee, and they have a conference, too, with roundtable discussions and other events.

tpo: Does the IIOA interact with the pretreatment coordinators?

Goodman: The IWEA Pretreatment Committee invited us to their conference one year, and we presented some papers. Then, since our conference was much bigger, we invited them to join with us and gave them their own venue. It gives them a chance to meet those of us in industry. We want the regulated people to know their regulators on a first-name basis. The coordinators gain technical information about industry and how we treat the water before it goes to the city sewer system. So when they're inspecting an industrial system, it helps them to understand what they're looking at and how that process and technology should work.

tpo: What are some of the most common treatment processes found in industry?

Martin: Dissolved air flotation is common for removing FOG. Food processing facilities use membrane bioreactors and moving bed bioreactors. On the metal finishing side, we use technologies like chromium reduction, cyanide oxidation and metal hydroxide precipitation. The technology is much more complicated. For the most part, the processes are set up for continuous flow.

tpo: Why was it important for the IIOA to establish the professional credentials?

Martin: Originally, the barrier to entry for a career in Indiana was that if you didn't have one year of experience, you couldn't take a wastewater license test. You went to get a job, they asked if you had a license. You said no. They asked why. You said, "I don't have the experience." They wouldn't hire you so you could get the experience and get your license. We were fortunate to be able to get that changed. Our first credential was Registered Industrial Wastewater Professional. For that, you had to take a course and pass a rigorous test. You also had to have at least one year working in industry, but that wasn't limited to hands-on experience in a wastewater treatment plant.

tpo: Beyond attaining licensing, how do the credentials benefit the operators?

Goodman: Credentialing helps industrial treatment operators in their performance reviews. Many industries put an emphasis on credentials as a mark of accomplishment, so it is financially beneficial to operators to have them.

tpo: Are any credentials available to the pretreatment coordinators?

Goodman: Years ago, pretreatment coordinators had nothing like the credentials we have. So we got a team together and created the Registered Pretreatment Coordinator credential, and they ran with it. During our conference, the IWEA Pretreatment Committee offers two courses that are open to all, and credentials are awarded based on examination and experience criteria. There is a Registered Pretreatment Coordinator credential, and a Certified Pretreatment Coordinator credential for more experienced professionals.

tpo: What is the nature of the IIOA mentoring program?

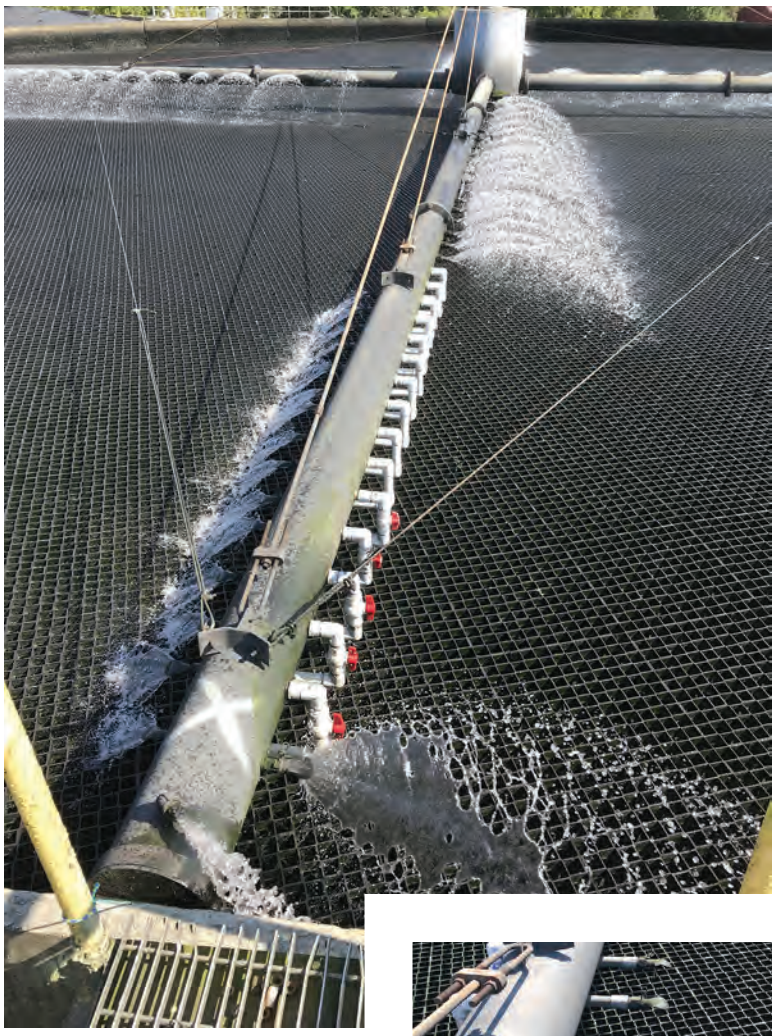
Martin: The intent is to help people qualify for an industrial operator license. It's an online program. Homework assignments are based on the textbooks they have to study for the state exam. After each assignment, they take a quiz. When they finish the first textbook, they meet with a mentor at a public library and take a three-hour midterm exam. When the exam is over, the student and mentor go through and grade the exam. If the student missed questions, the mentor explains why. Then they go through the same process with second textbook and take a mentored final exam. This program has greatly increased the pass rate on state exams.

tpo: After the 25th annual WITtec event, what lies ahead?

Goodman: We see the conference growing into a regional, if not a nationwide, event. We want to attract a lot of different industries from all over the country. We see the opportunity for the IIOA to grow and expand.

tpo

PHOTOS COURTESY OF JEFF ADAMS



The braking system in action. Operators open or close the red valves based on flow changes. In dry weather, closing three valves on one arm makes the stalled trickling filter move again. INSET: Reversing the direction on the distribution arms creates drag and slows the trickling filter rotations from 28 seconds to 12 minutes per revolution.

Fly Away

OPERATORS USE MECHANICAL INGENUITY AND SCIENCE TO OVERCOME THE ANNUAL INFESTATION OF TRICKLING FILTER FLIES AT AN ALABAMA PLANT

By Scottie Dayton

From May through October, trickling filter flies *(Psychoda alternata)* and odors plagued the Cullman (Alabama) Wastewater Treatment Plant and residents of a 50-home subdivision across the fence line.

At a January 2019 City Council meeting, homeowners said mild and intermittent odors had always wafted over their neighborhoods. Since 2017, however, the odors had become more frequent, the stench was putrid, and swarms of flies drove them inside on warm evenings.

Jeff Adams, superintendent of the multistage 4.75 mgd (design) trickling filter plant, was desperate for help. He called Tony Glover, the county extension coordinator. Glover called Ron Trygar, a senior training specialist in water and wastewater at the University of Florida TREEO Center.

"Ron ran a few calculations based on our plant data and suggested slowing down the trickling filter's dosing rate," Adams says. "The dosing rate is given as inches per pass of a distribution arm and quantifies the depth of water it applies over the surface of the filter before the next arm passes. That's what we implemented by modifying the plumbing, and it's been fantastic."

John Gaines, left, assistant superintendent, and Whit McCurley, mechanic, install 1.25-inch PVC pipe to distribute effluent behind the distribution arms.

INITIAL EFFORTS

Adult female flies laid their eggs in the organics in the primary trickling filter and ignored the secondary trickling filter. Operators used a synergized permethrin formula to control the insects until they seemed to develop an immunity to it. The seasonal increase in BOD loading also contributed to several other products, including a chemical fogging machine, not working as effectively as they had hoped.

In 2019, Adams found Essentria (Zoëcon Professional Products), a natural product containing oils of rosemary, wintergreen and peppermint. "In tests, it killed the flies in 20 seconds," Adams says. "I prefer it over releasing chemical pesticides into the environment."

He also consulted Fudd Graham, Ph.D., an entomologist at the Auburn University. Graham collected some flies to identify the species. "He was a big help," Adams says. "If we knew the exact species, we'd know which chemicals were the best match."

MAKING CHANGES

Gaining some control over the infestations was a step forward, but Adams wanted to end them. Trygar's suggestion to reduce the dosing rate from 28 seconds per revolution to four minutes per revolution had potential to drown the air-breathing midges, or fly larvae, maturing in the effluent.

The operators first considered putting a wheel with a brake on the end of the distribution arms, but the basin with standing columns wasn't perfectly round. Adams envisioned mounting spray nozzles on the back of the arms to create drag. His operators and Whit McCurley from maintenance went to work.

Beginning the week of July 22, 2019, John Gaines, assistant superintendent, and McCurley removed the first five of 33 nozzles at the end of each arm and inserted 2-inch stubs of 1.25-inch PVC pipe with a stop nut into the orifices. Then they chemically welded sections of PVC pipe into J-shapes, with the short leg fitting over the stub. The long leg, passing beneath the distribution arm, received the spray nozzle and rode 12 inches above the surface grating.

HAPPY NEIGHBORS

"The trickling filter's normal flow was 1 inch of water column, but 4 inches flooded it," Adams says. "The unknown was how many minutes it took to apply that much effluent. We tried five reverse nozzles on each arm, but they didn't slow it down enough.

"A month of adjustments and 60 reverse nozzles later, we achieved 12 minutes per revolution. That's still not long enough to hit our target of 4 inches water column, but we're almost there. What makes it tricky is that the two primary arms are 2 inches lower than the secondary arms."

By early September, the vicinity was 98% free of flies. Operators continued to fog to play it safe, but one morning Adams didn't see a single fly. "The mayor, council and neighbors are smiling from ear to ear," he says. "One man told me he can drink two cups of coffee on his front porch now instead of one, and there are no flies floating in it."

An unexpected advantage of the higher water column has been increased BOD removal. "It's been fantastic, dropping from 95% three months ago to 97% in September," Adams says. "Our effluent BOD went from 6.4 mg/L to 4.3 mg/L, despite influent BOD increasing over summer from 135 mg/L to 158 mg/L." **tpo**

Jeff Adams, superintendent of the Cullman (Alabama) Wastewater Treatment Plant, with the modified primary trickling filter in the background.

> "The mayor, council and neighbors are smiling from ear to ear. One man told me he can drink two cups of coffee on his front porch now instead of one, and there are no flies floating in it."
> **JEFF ADAMS**

Adam Brown, operator, adds water to Essentria (Zoëcon Professional Products), the natural chemical in the fogger, while Jeff Adams programs the amount to spray to kill adult trickling filter flies in the neighborhood. INSET: Infestations of trickling filter flies made sitting outside on warm summer evenings unbearable for some homeowners in Cullman, Alabama.

Biosolids Management and Headworks

By Craig Mandli

Belt Filter/Rotary Press

BRIGHT TECHNOLOGIES, DIVISION OF SEBRIGHT PRODUCTS, 0.6-METER SKID-MOUNTED BELT FILTER PRESS

Belt filter press from Bright Technologies, Division of Sebright Products

The compact 0.6-meter skid-mounted belt filter press from Bright Technologies, Division of Sebright Products, has stainless steel frame and roller construction, and radius wedge zone and wing roller for sludge dewatering. Components include a sludge pump, polymer system and wash-water booster pump. Options include a sludge flowmeter, air compressor and discharge conveyors. The compact walk-around skid design can be utilized in as little as a 20-by-10-foot floor area. The Boerger rotary lobe sludge pump has a maintain-in-place design offering ease of maintenance. Cake solids of up to 35% can be achieved. Rates of 25 to 50 gpm make it ideal for small applications or when a processor has outgrown dewatering containers. **800-253-0532; www.brightbeltpress.com**

Biosolids Handling/Hauling/ Disposal/Application

BLUEline rotary lobe pump from Boerger

BOERGER BLUELINE ROTARY LOBE PUMP

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

JDV EQUIPMENT LEVEL LODOR

Level Lodor cover system from JDV Equipment

The Level Lodor cover system from JDV Equipment helps contain odors by covering standard dump containers used for hauling processed material. The design allows for even distribution, increasing the fill percentage without having to manually even out material. Enclosing containers allow outdoor installation without exposing material to the environment or pests. **973-366-6556; www.jdvequipment.com**

Longopac Fill continuous bag system from Paxxo

PAXXO LONGOPAC FILL

The Longopac Fill continuous bag system from Paxxo can connect to the discharge point of machines used to move, dewater or compact screenings, grit and biosolids. Material is then deposited in a 90-meter-long continuous bag for odor containment and spillage control. The cassette bag can be sealed with ease, and the material and odors are trapped inside, cutting down development of bacteria and fungus spores. **770-502-0055; www.paxxo.com**

Biosolids Heaters/Dryers/Thickeners

BDP INDUSTRIES ROTARY DRUM THICKENER

Rotary drum thickener from BDP Industries

The rotary drum thickener from BDP Industries is a suitable solution to thicken at water and wastewater treatment facilities. Internally baffled thickening zones lead to higher solids capture and higher throughput capability, all with reduced polymer usage. A full stainless steel construction with all bearings located outside of the enclosure makes operations and maintenance activities simple and easy. **518-796-1440; www.bdpindustries.com**

JWC ENVIRONMENTAL MONSTER DRUM THICKENER

Monster Drum Thickener from JWC Environmental

The JWC Environmental Monster Drum Thickener is designed to achieve 5% to 12% solids from biosolids containing 0.5% to 3% solids. It uses individual panels of woven wire mesh for high solids capture rates. The individual panels can be removed from the frame of the rotary drum, which allows for an efficient exchange if they are damaged or if operating conditions dictate a screen change without having to replace a full drum. Additionally, it has a short biosolids dwell time in the flocculation tank to achieve the required floc structure, minimizing polymer consumption and tank size, which translates to lower operating costs. The system is fully enclosed to collect filtrate water and can be connected to a plant's odor control system. **800-331-2277; www.jwce.com**

KRUGER BIOCON ERS DRYER FOR PFAS REMOVAL

BioCon ERS from Kruger

Rising concern of per- and polyfluoroalkyl substances (PFAS) contamination of water and soil has sparked interest in this emerging contaminant as it pertains to wastewater sewage sludge. BioCon ERS from Kruger offers a safe and sustainable drying and combustion system for treating PFAS-laden municipal sludge. It combines the efficiencies of a con-

vective-air, medium-temperature belt dryer with a biomass furnace, which uses the dryer output (dry product) as a biofuel. The heat available in the exhaust is captured and used as process heat in the belt dryer. This integrated dryer and energy recovery system is sustained by heat generated by the combustion of biosolids to drive the drying process, and in turn, the dried material fuels the combustion system, making it a fully energy-sufficient and sustainable operation. It combusts sludge at a temperature higher than the minimum required for PFAS destruction. **919-677-8310; www.veoliawatertech.com**

SUEZ WATER TECHNOLOGIES & SOLUTIONS STC SYSTEM

STC System dryer from SUEZ Water Technologies & Solutions

The STC System low-temperature thermal dryer from SUEZ Water Technologies & Solutions enables an operator to reduce biosolids and recover a resource as fertilizer or fuel, using an energy-efficient belt dryer. It is fully automatic and offers efficient odor control and simple operation and maintenance. It is intrinsically safe, thanks to low-temperature and dust-free operation. The efficient and flexible unit uses hot water from 158 to 194 degrees F and can be fully supplied by waste heat, with a wide range of primary heat sources possible. It produces Class A biosolids at 90% dry solids, to be recycled as fertilizer or as solid fuel. **www.suezwatertechnologies.com**

Centrifuges/Separators

Centrifuges from Centrisys/CNP

CENTRISYS/CNP CENTRIFUGE

Centrifuges from Centrisys/CNP apply 3,000 g (G-force) to dewater solids while accelerating the liquid end sedimentation of fine particles, resulting in drier solids and cleaner discharge water, which may reduce disposal costs. With a hydraulic back drive system, a centrifuge delivers high torque and low horsepower to reduce moisture in an energy-efficient manner. The three-phase centrifuge divides feed into solids, water and FOG from the grease trap or other biodiesel production sources. Inside the centrifuge, lighter oil separates from the water and discharges through an adjustable nozzle, while the heavier solids dewater and discharge from the opposite end. Centrifuges are available with flow rates of 5 to 700 gpm and can be a stationary skid-mounted unit or a mobile trailer. **262-654-6006; www.centrisys.com**

FLOTTWEG SEPARATION TECHNOLOGY XELLETOR

Xelletor series separators from Flottweg Separation Technology

Xelletor series separators from Flottweg Separation Technology include a rotor and scroll designed to reduce the consumption of polymer while also reducing energy consumption. Depending on biosolids quality, the centrifuge can save about 20% on energy while providing significantly better performance. It can increase throughput by up to 15%, reduce the volume of biosolids by as much as 10% and save up to 20% in energy and polymer consumption. **859-448-2331; www.flottweg.com**

Chemical/Polymer Feeding Equipment

ADEDGE WATER TECHNOLOGIES ADIN CO2

ADIN CO2 injection system from AdEdge Water Technologies

The ADIN CO2 injection system from AdEdge Water Technologies is an alternative to other methods of alkalinity control and pH reduction. It's ideal for the reduction of alkalinity prior to primary treatment components for optimizing contaminant removal. The system uses carbon dioxide gas, which when released in water, forms carbonic acid — a weak acid that immediately reacts with alkalis to reduce pH. As a gas, carbon dioxide is inert, noncorrosive and easy to store. With the use of the included monitoring equipment and injector, the control panel can be used in several different configurations to reduce pH. The automatic systems use a pH probe downstream of the system to regulate the amount of carbon dioxide being injected into the water. An injector and mixer are provided with all systems for optimal injection. A manifold and regulators are provided for carbon dioxide cylinders. **866-323-3343; www.adedgetechnologies.com**

Drumm-Scale from Force Flow

FORCE FLOW DRUMM-SCALE

The Drumm-Scale from Force Flow is a simple and reliable way to accurately monitor the amount of polymer fed from a day tank, and it enables accurate compliance with government-required documentation of chemical use. It helps maximize solids yield with minimal polymer use. The low-profile Tuf-Coat steel platform permits easy on- and off-loading of tanks without the need to pit-mount the scale. The unit is available with any of the company's indicators, including the economical SOLO G2, the advanced multichannel Wizard 4000 and the rugged Century hydraulic dial. **800-893-6723; www.forceflowscales.com**

Digester/Component

WESTECH ENGINEERING EXTREMEDUTY SLUDGE MIXER

ExtremeDuty sludge mixer from WesTech Engineering

The ExtremeDuty sludge mixer from WesTech Engineering is designed to improve the anaerobic digestion process. The mixer provides aggressive mixing in the digester with low power requirements. While keeping grit suspended, it also reduces foaming and provides even heat distribution throughout the digester. When combined with a draft tube heat exchanger jacket, the mixer eliminates the need for extra pumps and a heat exchanger by heating the sludge while mixing. It includes reversible mixing, with low operating costs and an integral early warning system. **801-265-1000; www.westech-inc.com**

(continued)

Grinder/Shredder

VAUGHAN CHOPPER PUMPS

Vaughan chopper pumps deliver performance in the toughest applications. With flushable wipes clogging sewer systems across the country, the pumps easily handle difficult solids like disposable pads, wipes, duster cloths and diapers. The conditioning pump and self-priming chopper pump can help keep the water moving. **888-249-2467; www.chopperpumps.com**

Chopper pumps from Vaughan

Grit Handling/Removal/Hauling

Hydrogritter from WEMCO Pumps

WEMCO PUMPS HYDROGRITTER

The WEMCO Pumps Hydrogritter is a grit classifier system that removes 95% of particles of 105 micron/150 mesh with a specific gravity of 2.65 and greater. The unit's main purpose is to protect downstream equipment from damage due to abrasive wear. A cyclone concentrates the grit slurry to approximately a 10-1 ratio. After the grit is concentrated, it drops into a settling pool, specifically sized for removing fine grit. When in the pool, the grit particles settle, while the lighter particles, such as organics, float and are carried over the weir at the end of the pool, to be returned to the wastewater stream. The settled grit is then carried up the inclined bottom of the unit to the discharge chute, where it is dropped into a dumpster for final disposal. **801-359-8731; www.trilliumflow.com**

Screening Systems

BIOMICROBICS MYTEE

The MyTEE screen from BioMicrobics provides effective separation of nonbiological solids and grit prior to the AMS Zone in the MyFAST system. The device comes standard with wall-mounted top diverters, base supports and internal/external cleaning swabs for easy maintenance. **913-422-0707; www.biomicrobics.com**

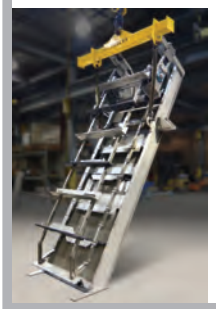
MyTEE screen from BioMicrobics

ENVIRO-CARE SAVI GVS MULTIRAKE PERFORATED PLATE SCREEN

SAVI GVS Multirake Perforated Plate Screen from Enviro-Care

The SAVI GVS Multirake Perforated Plate Screen from Enviro-Care is a unique multirake design where the bars have been replaced by a stainless steel perforated plate to achieve higher debris capture. Multiple wipers remove the debris from the perforated plate and transport the screened material to discharge. Independent testing has proven that perforated plate screens have higher capture rates, which can be as high as 85% depending on design. It can be mounted in traditional channels at 75 degrees, or at 90 degrees for deep, narrow channels and wet wells. The low-maintenance design makes it a suitable choice for remote locations. **815-636-8306; www.enviro-care.com**

PARKSON CORP. AQUA CAIMAN



Aqua Caiman rake screen from Parkson Corp.

The Aqua Caiman articulating rake screen from Parkson Corp. provides durability, ease of operation and protection of downstream process equipment. The system's flexible belt assembly handles large solids with ease and eliminates the need for bottom bearings. Teardrop-shaped bars and low-profile screen bottom are designed for low headloss. True 100% rake engagement is achieved with the True-Engage bar fastening design. The True-Track chain positioner allows for rake engagement adjustment without a hoist. It is designed to fit various applications and is suitable for plants seeking low-maintenance screening. It can be used in conjunction with conveyors or wash compactors to complete the screening system. **888-727-5766; www.parkson.com** tpo

By Craig Mandli

Decanter centrifuge reduces biosolids disposal costs

Problem

Hollandia Dairy in Southern California was paying to transport 25,000 pounds of wastewater biosolids a day.

Solution

An **Alfa Laval ALDEC 20 decanter centrifuge** now concentrates solids from moving bed biofilm reactor (MBBR) wastewater before further processing into Class A biosolids. The skid-mounted unit was selected as a tried and tested technology; it includes the company's Connectivity remote monitoring support.

RESULT:

The decanter handles 3,000 gpd of wastewater and achieved the expected results. With the additional processing, the dairy now trucks away only a small amount of Class A biosolids that can be used for purposes such as fertilizer. "After meeting the experts at Alfa Laval, my world became so much easier," says Hank van Nieuwenhuyzen, Hollandia chief operating officer. "I had someone to guide me through the possible solutions, and during the process, I learned so much about wastewater." **866-253-2528; www.alfalaval.us**

Dewatering drum a fit for compact space

Problem

The owners of Greenway Waste Solutions of Charlotte, North Carolina, set out to build a compact dewatering facility that would be easy to replicate on other small parcels.

Solution

The company chose the **dewatering drum** from **In The Round Dewatering,** as it can be left stationary without affecting other parts of the operation. "This saves us time and space because we are able to build close to the drum," Reese Blackwell says. "Our cake comes out exponentially drier than with the dewatering options we have used in the past. We do not need to get into the drum to wash it down. This cuts downtime for hauling a box to and from a composting site and the intensive washing when it returns." A technician augers out the solids onto a pad and then loads a roll-off container. Automatic rotating pressure nozzles clean the unit for the next batch to load.

RESULT:

"We have really enjoyed the drum, and it has made our operations more efficient," Blackwell says. **317-539-7511; www.itrdewatering.com**

Rotary press enables city to dewater more efficiently

Problem

The City of Lancaster, South Carolina, had a biosolids dewatering system that could not keep up with demand. Population growth along with aging, unreliable equipment forced the city to haul liquid material at high cost even when the dewatering system was running. The system could process only 14 gpm and deliver 8% solids.

Solution

After a successful pilot test, the city installed a **rotary press** from **Fournier Industries** while the dewatering system was down. The city chose a six-channel rotary press, which was installed in July 2019.

RESULT:

After four months, the press was processing at 80 to 100 gpm and delivering cake at 17-18% solids. The digesters are now emptied in two to three days rather than two weeks. The staff now can choose which days to run. "Our budget for polymer is going to drop by two-third, and I no longer have to worry about my solids levels," says Donnie Ledford, plant superintendent. **418-423-4241; www.rotary-press.com**

City upgrades headworks package to meet regulations

Problem

To comply with stricter phosphorus effluent limits, Morgan City, Utah, needed to upgrade its headworks.

Solution

The city chose an all-stainless steel **headworks package** from **Lakeside.** The system combines a 6 mm Raptor mechanical fine screen with a bypass bar rack, plus a SpiraGrit vortex grit chamber in an elevated, preengineered system. Jamie Grandpre, senior water/wastewater operator, worked with J-U-B Engineers on phased solution. "We needed a long-lasting mechanical fine screen and grit removal system and so visited other facilities in Utah to speak to operators," says Gary Vance, project engineer at J-U-B. "Finding reliable, low-maintenance equipment that could stand the test of time was a must."

RESULT:

"With a strong and reliable screen and grit removal system, the negative impact on the plant has been solved," Grandpre says. "We've had no issues with the equipment. It is very easy to maintain." **630-837-5640; www.lakeside-equipment.com**

Mixer helps municipality save on polymer costs

Problem

City of Port Angeles, Washington, needed to mix a 24-by-27-foot, cone-shaped biosolids storage tank holding 40,000 gallons of biosolids at 2% solids. The material would then be sent to a dewatering press.

Solution

The Kennedy/Jenks engineering firm looked for a system to maintain biosolids consistency before sending to the dewatering press. **Pulsed Hydraulics** provided a **Model 310 large-bubble mixer** with one bubble-forming plate and a 7.5 hp rotary screw compressor (sized for additional plant uses). The plate is at the bottom of the cone next to the discharge valve. The system was adjusted to inject one large bubble every 20 seconds.

RESULT:

Before the installation of the mixer, the plant was using 1.5 totes of polymer monthly at a cost of $5,300 per month. The consistent biosolids from the mixed storage tank reduced polymer consumption to one tote per month, saving $19,300 per year. The belt press no longer requires constant adjustment. **800-641-1726; www.phiwater.com**

Utility authority to install three new screw presses

Problem

The West Rankin Utility Authority serves several communities in Mississippi, sending 10 to 12 mgd of wastewater to the Savanna Wastewater Treatment Plant in Jackson at a cost of a few million dollars per year. To save money and operate independently, the authority decided to build a wastewater treatment plant.

Solution

The authority selected three of **Schwing Bioset's** largest dewatering **screw presses,** model **FSP 1203,** designed to handle up to 7,468 dry pounds per hour. The authority expects to process 24 dry tons per day operating 60 hours per week, dewatering waste activated sludge at 0.75% solids to a 17% solids cake with at least a 90% solids capture rate.

RESULT:

With the screw presses, the authority will bring its system into compliance with federal water-quality laws, increase plant capacity and save costs. **715-247-3433; www.schwingbioset.com**

(continued)

Screw press enables efficient dewatering at resource recovery facility

Problem

Utah-based Wasatch Resource Recovery is a treatment facility that processes food and other organic wastes. When the engineering team investigated biosolids dewatering options, Trident Processes provided early-stage design and capacity recommendations.

Solution

To provide efficient, reliable dewatering, the company chose the **MD 454 multidisc screw press** with floc and mixing tank from **Trident Processes.** The four-cylinder press dewaters anaerobically digested biosolids at 185 gpm to dry, phosphorus-rich cake for land application. Norman Robinson, senior plant operator, observes, "Because we receive a variety of organic wastes, we need to process sludge that often changes its characteristics, but still produce a consistent, dry cake." The press is integrated with the plant's automation system and processes biosolids continuously.

RESULT:

The cake is consistently at 21%-25% solids range, allowing smooth handling and transportation. After the initial optimization, the client has seen low polymer consumption and low operating cost. "We do some visual checks during the day and perform the occasional washdown and greasing," Robinson says. "The press simply does its job without requiring much of my time." **800-799-3740; www.tridentprocesses.com**

District upgrades grit removal system to save on process wear

Problem

Aging aerated grit facilities at the North Davis Sewer District treatment plant in Syracuse, Utah, caused downstream process tanks to fill with grit and accelerated wear on process equipment. Annual basin clean-outs burdened the staff.

Solution

The district employed an in-house plan involving all 24 staff members to design, install and maintain a new grit removal system inside the existing tankage. It includes a hydraulic forced-vortex **grit removal system** from **Smith & Loveless,** installed as an in-kind replacement that did not require new-construction permits. The in-house project eliminated consulting and contracting costs and reduced grit handling and maintenance expenses.

RESULT:

The district completed the first round of the project in 2018, converting one of two aerated grit chambers to the hydraulic forced-vortex process. The system is online and removing ample grit to protect downstream processes and equipment. **800-898-9122; www.smithandloveless.com**

Screening system eases district's septage receiving

Problem

The West Montrose Sanitation District in Colorado needed a low-maintenance septage receiving unit requiring minimal staff operations time.

Solution

The district chose the **Maxi Screen 400 unit** from **ScreencO Systems.** It was built and designed by operators who struggled with automatic screening equipment, and it has virtually no moving parts and requires minimal maintenance.

RESULT:

In the first two years, the district received 1,283 loads and processed 1.47 million gallons of septage. The dual screen size enables rapid dumping without compromising screening. "We were amazed at the amount of material the screens collect," says Andres Garcia, district manager. The Grit Eliminator in 2018 removed roughly 8.2 tons of grit, reducing wear and tear on pumps and cutting costs for cleaning out basins, pits and pipes. "We intended our receiving station to be an alternative to land application but quickly found that most haulers prefer to dump at our facility," Garcia says. "They can haul two to four additional loads per day due to the ease and practicality of the facility." **208-790-8770; www.screencosystems.com**

Gravimetric selection technology employed at recovery facility

Problem

The Ephrata Borough (Pennsylvania) Authority Water Resource Recovery Facility has battled chronic sludge settling issues since a biological nutrient removal upgrade in 2011. During winter, sludge volume index values have reached up to 300 g/mL.

Solution

The authority chose gravimetric selection technology to retain denser biomass while wasting the lighter fraction of mixed liquor suspended solids. A **gravimetric selection system** from **World Water Works** became operational in January 2019. The overflow of MLSS light fraction gravity-feeds to an existing scum collection pit, where pumps transfer waste sludge to solids handling. The underflow of the denser MLSS gravity-feeds back into the return activated sludge tank, from which it is pumped back to the head of the oxidation ditch.

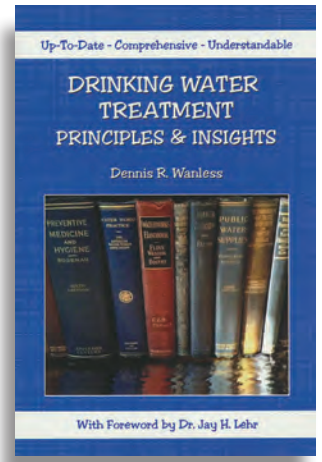
RESULT:

Within several weeks, the SVI was reduced from a monthly average of 144 g/mL to 71 g/mL. The MLSS settling velocity also improved with the clarifier sludge blanket levels. As settling continued to improve, the plant reduced their powdered activated carbon addition by about 70%. The system continues to show stable performance with effluent ammonia less than 1 mg/L on average. **800-607-7973; www.worldwaterworks.com** tpo

Drinking Water Treatment: An Introduction

A NEW REFERENCE BOOK AIMS TO GIVE WATER PROFESSIONALS AN UP-TO-DATE, COMPREHENSIVE AND UNDERSTANDABLE LOOK AT THE BASIC PROCESSES

By Ted J. Rulseh



In my exploration of books about water and wastewater treatment, I usually find two extremes: highly technical tomes that are the basis for licensing exams and other formal purposes, and lightweight volumes that are too thin and too basic to be of value to anyone intent on really learning about the profession.

A new book by professional water educator Dennis Wanless aims to split the difference. *Drinking Water Treatment – Principles & Insights* is a 275-page paperback that walks readers through 10 chapters that cover essential water treatment and water-quality topics. It's written as a certification study guide, textbook and reference manual for waterworks operators, students, young engineers, treatment plant managers, administrators and members of the public.

That's casting a pretty wide net — one book can't be all things to all those people. Still, to my admittedly less-than-expert eye (I am not a water operator, just an editor), Wanless seems to have found a good niche.

Wanless calls it "a readable and career-long self-education resource for both water novices and water professionals." In the foreword Jay H. Lehr, author of many books on environmental and policy topics, observes, "It is clear that Dennis Wanless has had a passion for his subject throughout his three-decade career … he separates the wheat from the chaff by providing information of daily value that is commonly ignored or forgotten."

The book opens with a chapter on preparing for and taking licensing exams. That's a smart move, since for many aspiring and established water professionals, exams are obstacles to be feared. That's followed by chapters that cover, among other topics, source water, disinfection, microbiology, water chemistry, sample collection and handling, conventional treatment steps, pumps and pumping, distribution systems and backflow/cross-connection control.

I suspect many readers will gravitate toward the back of the book, where Wanless has included a set of commonly used conversion factors and, much more significant, some 38 pages of math review examples, and practice problems, answers to which appear in a following section.

The one question I came away with after reviewing this book: Why no visuals? Pictures and diagrams certainly would help the presentation of many of the concept this book contains. That said, this appears to be a book worth exploring for people interested in entering or advancing within the water treatment profession. You can get this book by visiting www.denniswanless.com or calling 336-538-2262. tpo

Flomatic Valves Model 5400 Flo-E-Centric plug valve

Flomatic Valves' Flo-E-Centric Model 5400 is an energy-efficient round-port eccentric plug valve designed in compliance with AWWA C517-16. The body, bonnet and NBR-encapsulated plug are constructed of ASTM A536 grade 65-45-12 ductile iron. The body and bonnet come standard with fusion-bonded NSF 61 epoxy powder-coated, inside and outside. The valve stem is equipped with V-type packing that is self-adjusting and replaceable while the valve is under pressure. Flomatic plug valves incorporate a nickel-welded seat for long service life and are designed primarily for applications where slurries, solids or grit are present. Designed for both on-off function and process control in industrial and municipal applications, the Model 5400 is available in six different configurations in a size range from 2 through 24 inches. They are also available with a bare stem, operating nut, mechanical joint plug, electric actuator, gearbox and with standard ISO top-mounting flange. **800-833-2040; www.flomatic.com**

Emerson Ovation playback recorder

Emerson's Ovation playback recorder automatically and continuously records operational data at the same resolution as the live control system. Like a digital video recorder, it has standard functions such as play, pause, fast forward and rewind. With the ability to visually step through logic sequences using process graphics and signal diagrams, users can view historical data through the lens of what the operator would have seen under actual plant conditions. This holistic and repeatable view of plant events can be used to speed troubleshooting, enhance training and support decision-making. Plant personnel can review actions taken during an abnormal event, such as a chemical spill or wet-weather event, to identify best mitigation responses. They can then update operating procedures to better manage similar events in the future. The recorder lets them quickly diagnose problems, minimize equipment damage and reduce maintenance. **888-637-7333; www.emerson.com**

product spotlight

wastewater

Centrifugal blowers designed for increased efficiency

By Craig Mandli

The energy demand for the water and wastewater industry is approximately 75 billion kWh per year, or about 3% of the electricity consumed in the U.S., according to an Electric Power Research Institute report. Specifically, the aeration process at most wastewater treatment plants accounts for the largest amount of energy consumption and is as much as 40% to 60% of the plant's total energy usage.

"Turbo blowers are a significant area of innovation in blower design offering energy savings for the wastewater industry," according to a recent EPA report. It also says that overall there have been, "increases in energy costs for the wastewater industry." Additionally, the EPA suggests, "Equipment upgrades and operational modifications to reduce energy should not be one-time events, but should be incorporated into a comprehensive energy review and management strategy."

In an effort to combat that high energy usage, **Inovair** has introduced two new series of geared single-stage **centrifugal blowers** designed for smaller plants to significantly cut plant energy usage, offer improved functionality and intelligent controls, resulting in thousands in operating cost savings.

The **IC Series** — in ratings from 5 to 50 hp — is designed to deliver cost-effective and durable solutions for smaller wastewater facilities. The IC system design minimizes the footprint and allows the use of standard NEMA premium efficiency motors and variable-frequency drives along with a simple and affordable integrated control system.

IC Series from Inovair

The units can achieve 10% to 35% energy savings versus other types of blowers, according to the manufacturer. The units include an automatic belt tensioner, high-flow synthetic intake filter and quiet belt drive. Flow capacities range from 150 to 1,200 cfm.

The **IM Series** is a truly modular blower design. Offering high efficiency and turndown, modules can be deployed singly or in a stacked configuration. The units help treatment plants optimally regulate airflow and avoid overaeration or the blowing off of excess air. The IM Series provides modularity without burdening the overall blower footprint. Stacked units provide up to 4-1 turndown, with flow capacities ranging from 300 to 3,600 cfm and motor power rating from 20 to 75 hp per module.

Both models have a compact footprint and offer a wide range of airflow demands with a broad turndown for various aeration requirements. Intermittent duty blowers for flush water and backwashing are also available. **855-466-8247; www.inovair.com**

KH Industries HazRay hazardous location lighting

KH Industries' LED HazRay hazardous location lights are available in single hand-held, a stringer and multihead light versions. Designed with versatility and safety in mind, the lights are Class I, Div. 1 and 2 lighting that holds CSA certification for U.S. and Canada. The NEMA 4X rating allows for integration in a wide range of outdoor and harsh-condition work site applications. Already being utilized in aerospace maintenance, repair and overhaul; shipbuilding; and utility markets, these lights will also perform in agricultural environments, paint booths, at oil and gas refineries, and many other industries. The bright lights provide users with a durable, lightweight body, staving off fatigue in employees at the job site. **716-312-0088; www.khindustries.com** tpo

product spotlight
water

Device helps facilities comply with trace metal standards

By Craig Mandli

MetalGuard from Aqua Metrology Systems

Without proper detection, trace metals in a water system can lead to human and environmental health risks. To combat this issue, **Aqua Metrology Systems** offers the **MetalGuard online trace metals analyzer** that enables facilities to gain real-time control of the performance of water treatment/remediation systems, acting as a "canary in the mine" by providing alerts when these systems fail.

When integrated into a drinking water, process or wastewater remediation control, the device helps enhance regulatory compliance with trace metal standards. The online analyzer provides automated, unattended measurement of trace metal contaminants such as arsenic, hexavalent chromium, selenium and more across municipal and industrial sectors.

"The system features a self-regenerating sensor that contributes to the system's long life and robust uptime," says Rick Bacon, CEO of Aqua Metrology Systems. "The self-calibrating system also minimizes the risk of false positives and negatives."

The analyzer supports intelligent water treatment systems, since real-time sensing optimizes performance to avoid under- or over-treatment. Any deterioration in system performance is signaled to permit timely intervention. Online trace metal analyzers help users protect the environment from harmful contaminants while controlling operational and treatment costs. The system delivers accurate and reliable results (up to 1 ppb or plus or minus 15%, whichever is higher) with a typical measurement time of less than 30 minutes. It also allows for manually collected samples to be analyzed.

"The device helps users make informed decisions throughout all phases of contaminant remediation, quickly detect changing contaminant levels, monitor critical process steps and optimize chemical usage and related labor costs," Bacon says. "The efficiency the technology provides also helps to control operational and treatment costs."

The technology is designed to help maximize media life, extend the time between media replacements, reduce downtime, maximize blend efficiencies and minimize treatment usage, reduce labor and sampling cost, and quickly detect the effectiveness of remediation. The operation of the MetalGuard system is supported with remote, around-the-clock factory monitoring to ensure the quick identification and remediation of operational issues. According to Bacon, the technology has proved its effectiveness.

"We have multiple positive references from end-use clients and engineers; and a number of customers have multiple analyzers," he says. "Replacement purchases are typical after 10 years."

408-523-1900; www.aquametrologysystems.com

industry news

Holland Pump acquires Alpha Pump and Equipment

Holland Pump announced it acquired Alpha Pump and Equipment based in Baton Rouge, Louisiana. The acquisition provides Holland Pump with enhanced product and engineering capabilities to service industrial facilities and expands its footprint in the greater Gulf Coast region. With over 16 years of experience, Alpha Pump has developed a reputation for a high level of customer service and industrial pumping expertise, especially when dealing with highly technical applications such as pumping hydrochloric acid, phosphoric acid, sulfuric acid, sodium hydroxide or benzyne.

Lovibond Tintometer names new managers


Brandon Lucas


Shaina Marfil

Lovibond Tintometer announced that Brandon Lucas joined its team as sales manager, water products. Lucas will focus on analytical and process instrumentation growth in the water sector and will work with distribution partners, as well as the internal team. He has a background in marketing management with certifications from leading national sales programs and experience in business-to-business sales.

Lovibond Tintometer also announced that Shaina Marfil joined the company as North American laboratory and portable products sales manager. She has a background in environmental policy and management with experience in environmental laboratory sales. **tpo**

people/awards

NEW Water team members at the Wisconsin Wastewater Operators' Association conference include, top row, from left, Aaron Eichhorst and Jake Becken, treatment leaders; Kayli Van Effen, operator-in-training; Corey Evers, former treatment operator; and Bobby Zepnick, mechanic. Second row: Bruce Bartel, treatment manager; Holly Blazer, lab analyst; Kim Williams, field services technician; Bryan Thomson, electrical and instrumentation technician; and Matt Schmidt, operations trainer. Bottom row: Ashley Clark, lab analyst; and Matt Pamperin, treatment operator.

Many staff members from **NEW Water** in Green Bay took part in the 53rd annual Wisconsin Wastewater Operators' Association conference. During the October event at Green Bay's KI Convention Center, staff received numerous accolades. Bruce Bartel received the Koby Crabtree Award for excellence in the industry; Jeff Smudde was named WWOA president; and Brian Vander Loop and Bill Oldenburg were honored for 25 years of membership, each earning a Life Membership. Aaron Eichhorst, Jake Becken, Matt Schmidt, Bobby Zepnick and Holly Blazer served as judges in the Operations Challenge. Two NEW Water teams competed in the Operations Challenge. The state's first all-women team of Ashley Clark, Kim Williams and Kayli Van Effen took second place; and the men's team of Corey Evers, Bryan Thomson and Matt Pamperin placed third.

Todd Ellis was hired as water and sewer superintendent for the Village of Montgomery, Illinois.

The Water Team at the **Jones|Carter** civil engineering firm received the 2019 Environmental Project of the Year award from the Texas Chapter of the American Public Works Association for rerouting of the Dallas Salmon Wastewater Treatment Plant effluent line and rebuilding of North Kansas Avenue to meet Texas Commission on Environmental Quality copper and zinc discharge limits.

The **Town of Bradshaw,** West Virginia, received a $1 million federal grant from the Appalachian Regional Commission for water and wastewater structure improvements.

events

Feb. 3-5
New York Water Environment Association Annual Meeting and Exhibition, Marriott Marquis, New York City. Visit www.nywea.org.

Feb. 5-8
Water Environment Federation Midyear Meeting, Hyatt Regency Riverwalk, San Antonio. Visit www.wef.org.

Feb. 10-11
American Water Works Association International Symposium on Potable Reuse, W Atlanta Downtown. Visit www.awwa.org.

Feb. 12-13
AWWA International Symposium on Biological Treatment, W Atlanta Downtown. Visit www.awwa.org.

Feb. 17-20
2020 Water & Wastewater Equipment, Treatment & Transport (WWETT) Show, Indiana Convention Center, Indianapolis. Visit www.wwettshow.com.

Feb. 20
Virginia Water Environment Association Technical Online Conference. Visit www.vwea.org.

Feb. 25-26
Michigan Water Environment Association Borchardt Conference, University of Michigan, Ann Arbor, Michigan. Visit www.mi-wea.org.

Feb. 25-28
Utility Management Conference, presented by the Water Environment Federation and AWWA, Hyatt Regency Orange County, Anaheim, California. Visit www.wef.org or www.awwa.org.

The **Village of Sister Bay,** Wisconsin, received a $1.6 million grant and accompanying $3.4 million loan from the U.S. Department of Agriculture to upgrade its wastewater treatment facility.

The **North Red Deer Regional Wastewater System** received Project of the Year honors from the American Public Works Association Alberta Chapter.

The **Grand Coulee Wastewater Treatment Plant** received its fifth straight Award of Excellence from the Washington Department of Ecology.

Dr. Michael Richard, a world authority on wastewater treatment microbiology, has retired after more than 35 years in the industry.

The **Southwestern Parkway Combined Sewer Overflow Basin** project in Louisville, Kentucky, received the Best in Engineering Design award and a National Award of Excellence in water and wastewater from the Design-Build Institute of America.

The **City of Concord Wastewater Department** received a 2019 Collection System of the Year award from the North Carolina Water Works Association.

The **Linden (Michigan) Wastewater Treatment Plant** received the state's first Premier Utility Management Performance Award from the Michigan Water Environment Association in partnership with the state Department of Environment, Great Lakes and Energy.

Southside Wastewater Treatment Plant in Clinton was named the Mississippi Water Environment Association Plant of the Year for the third time since 2008.

The **Thomas E. Taylor Water Treatment Plant** in Lewisville received the Best Tasting Water in North Texas Region Award from the Texas Water Utilities Association.

The **Tom Harpool Water Treatment Plant** near Providence Village, Texas, received the Outstanding Large Membrane Plant Award from the South Central Membrane Association.

The **Town of Summerland** received the Brian Harvey Award of Excellence from the Water Supply Association of British Columbia.

Gary Robertson, executive director of the Western Virginia Water Authority, retired in fall 2019 after more than 15 years in the position.

The **Bloomfield Borough (Pennsylvania) Water Authority** broke ground on its new water treatment facility.

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

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

Where do the bacteria obtain the necessary oxygen to survive in an anoxic zone?

A. Remaining dissolved oxygen
B. Nitrite and nitrate
C. Carbonaceous oxygen
D. The bacteria in an anoxic zone do not require oxygen

ANSWER: B. Anoxic zones are generally found in denitrification treatment processes. Anoxic conditions are created when dissolved oxygen has been depleted, leaving oxygen only available in the form of nitrite and nitrate. More information may be found in the Water Environment Federation textbook: *Wastewater Treatment Fundamentals I – Liquid Treatment*, Chapter 9.

DRINKING WATER

By Drew Hoelscher

The raw water to be treated has a total alkalinity of 275 mg/L as $CaCO_3$ and a total hardness of 375 mg/L as $CaCO_3$. What is the concentration of noncarbonate hardness?

A. 100 mg/L
B. 187.5 mg/L
C. 275 mg/L
D. 375 mg/L

ANSWER: A. When total hardness and total alkalinity are known, comparing the two informs an operator on the concentrations of hardness related to calcium and/or magnesium linked with bicarbonate and carbonate (CH), as well as hardness related to calcium and/or magnesium linked with chloride and sulfate (NCH). The table below illustrates that the amount of NCH is equal to the difference between the total hardness and the total alkalinity.

Lab Results	Carbonate Hardness	Noncarbonate Hardness
TH TA	CH TH	NCH 0
TH TA	CH TH	NCH TH TA

ABOUT THE AUTHORS

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

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