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Reno's Rising Star

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Lydia Teel
Emerging Resources Program Administrator
Reno, Nev.

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ecosystems. It all comes at a critical time in
our industry because while many see uncertainty,
we see opportunity. It's all in how you look at it.

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let's be clear

There's Only One Water

WHILE WE FOCUS ON OUR SPECIFIC NICHE IN THE INDUSTRY, IT'S ESSENTIAL TO REMEMBER THAT ALL WATER, FROM RAINFALL, TO GROUNDWATER, TO LAKE, STREAMS AND OCEANS, IS CONNECTED

By Ted J. Rulseh, Editor



In my business life I deal with drinking water and wastewater. In my personal life I advocate for the protection of inland lakes.

But I know the world of water is much bigger than that. In my own activities I barely touch on rivers. Trout streams. Wetlands. Stormwater. Oceans. And the reality is that all these — along with rain and snow from the sky — are components of the single entity called water.

That's right. It's all connected, every bit of it. We know about the natural water cycle — from evaporation, to rainfall, to the water resources on and under the ground. We also know about the urban water cycle, from ground or surface water, to treatment, to our household taps, and back to the source by way of wastewater treatment.

But better than thinking about those cycles is to consider water in all its forms and places. Thinking that way helps us see the bigger picture of the system in which we do our work.

KNOWING WATERSHEDS

There's the concept of watersheds. To understand it, picture a large, shallow bowl. Water falling anywhere on the bowl's surface will run toward the low point at the center. In a landscape, hills and slopes form the sides of the bowl; water drains down to the lakes and streams at the bottom. A watershed includes all the lakes, streams and wetlands in the area being drained, and all the groundwater underneath.

All the waters are connected, and in working to protect them, so are all of us.

A watershed can be large or quite small. For example, a small lake surrounded by hills might have a watershed of just a few square miles. On the other extreme, a river like the Mississippi has a watershed that encompasses a large share of a continent.

Getting back to groundwater, there's a great deal more water beneath us than on the surface. For example, it has been estimated that the groundwater beneath my home state of Wisconsin would be enough to cover the entire state to a depth of 100 feet. In a bigger picture, scientists estimate that groundwater in the United States comprises at least 33,000 trillion gallons, about as much as the Mississippi River has emptied into the Gulf of Mexico over the past 200 years.



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Let's Solve Water

This water doesn't consist of an underground lake. Instead, the water fills the spaces between the particles of sand and gravel. To observe what this is like, fill it with sand and then pour in water until the sand is saturated. That is how the groundwater exists.

WATER ON THE MOVE

The groundwater does flow, very slowly, from higher to lower elevations, obeying gravity. The surface of the groundwater is called the water table. It's fed by rain and snow melted snow percolates down through the soil. The groundwater then gradually follows the slope of the landscape until it finds an outlet in a lake or stream.

It can take years or decades for a drop of water to travel from where it fell to a body of water. The slow, steady flow of groundwater is the reason streams run all year, even during drought. And most lakes are essentially places where a depression in the landscape causes the water table to be exposed. That is, looking out across your favorite lake, you are seeing the surface of the groundwater.

The level of the water tables changes year to year, decade to decade. In the simplest terms, its level depends on the amount of rain that falls and the amount of evaporation. So the water table will rise in wet years and fall during dry years. Eventually, much of the water that falls as rain or snow enters the groundwater system and ultimately finds an outlet in a stream. One stream flows into another, until a major river delivers it to the oceans.

So as we go about our jobs dealing with our specific water-related areas, it's useful to remember how it all fits together. All the waters are connected, and in working to protect them, so are all of us. **tpo**

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RECENT SURVEY

Americans Unaware of Water Use

According to new research conducted by global agency Opinium on behalf of American Water, Americans underestimate the amount of water they use daily by 90%. Most believe they use less than 100 gallons of water each day, when the actual average number is more than 2,000 gallons on average, counting both direct and indirect water use.

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OVERHEARD ONLINE

“Recently systems have incurred issues such as delayed or limited access to necessary treatment chemicals such as chlorine and sodium permanganate, and also products such as pipes and fittings.”

NRWA Urges Utilities to be Prepared for Ongoing Supply Chain Issues
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BIOSOLIDS APPLICATION


Studying the Soil

While scientists know that biosolids application can benefit the soil, they are still learning about the best ways to measure this. It can also be hard to determine how much it helps the soil over a long period. That's where Yocelyn Villa from the University of California-Merced comes in. She and her collaborators studied fields in California where biosolids have been applied for 20 years.

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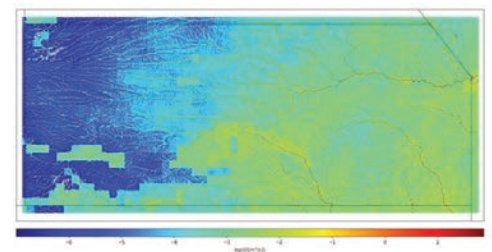
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NEW MODELS

Forecasting Water Availability

Researchers at the University of Kansas are teaming up with the Kansas Water Office to create models accounting for uncertainty about the state's future climate so officials who allocate water can better forecast supply and demand of the vital resource. Read more about the project in this online exclusive article.

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Terrific Twins

TWO WATER RECLAMATION PLANTS IN A GROWING PHOENIX SUBURB ARE FACING EXPANSION. ENERGETIC OPERATIONS TEAMS KEEP THEM RUNNING SMOOTHLY.

STORY: **Jim Force** | PHOTOGRAPHY: **Mark Henle**





When Hector Delgadillo talks about meat and potatoes, he doesn't mean dinner. He's talking about his staff at the Jomax and Beardsley Water Reclamation Facilities serving Peoria, Arizona. "They do a great job day in and day out," Delgadillo says. "They take pride in what they do. I can't say enough about them."

Delgadillo, water treatment supervisor, oversees the plants, both activated sludge facilities. Jomax (2.25 mgd design) serves the community of Vistancia, just west of the Agua Fria River. Beardsley (4.0 mgd design) serves the northwest portion of Peoria. Both reclaim 100% of their effluent, and both face expansion as this suburban Phoenix community continues to grow while water resources remain scarce.

And that staff Delgadillo is so proud of? At Jomax, Tom Jessing is the lead operator, with operators Crystal Roy, Jonathon Heyland and David Schroeder. At Beardsley, the lead operator is Jacob Hunter with operators Lonnie Minton, Randy Loehr and Lisbeth Cresbo. "They are as good as they come," Delgadillo says.

ADVANCED PROCESSES

The two plants are designed for biological nutrient removal using extended aeration and sand filtration. Both produce a Class A-plus water quality for reuse, following water quality standards for the highest classification set by the Arizona Department of Environmental Quality.

At Jomax, wastewater enters through an influent pumping station. In the headworks, a Muffin Monster grinder (JWC Environmental) chews up rags and other solids and compacts them. That is followed by a mechanical screen (Parkson Corp.) a grit classifier (Lakeside).

Paddle mixers and a splitter box follow, directing the water to three intermittent-cycle aeration basins that operate in the extended aeration mode and are equipped with APG-Neuros Turbo Blowers. Gardner Denver centrifugal blowers serve as backup.

The basins accomplish nitrification and denitrification before the water passes to a pair of clarifiers. Three travelling bridge shallow-bed sand filters remove remaining solids; the effluent is UV disinfected (Trojan Technologies) with sodium hypochlorite addition as needed. Biosolids are centrifuged (GEA Group) to 18-20% solids and landfilled.

Final effluent is discharged to a 1.5 million-gallon nonpotable reservoir and then piped to the Vistancia development for irrigation of golf courses, highway landscapes and parks, and for water features. Reuse demand is steady during summer, but in winter some effluent is discharged to the McMicken Wash.

The pace of development at Vistancia dictates development at Jomax. At present the plant treats 1 mgd on average. Phased expansions will increase design capacity to 3 mgd and finally 6 mgd.

Lonnie Minton, operator II, at the Beardsley Water Reclamation Facility in Peoria, Arizona.

“We're catering to a new generation of operators. The new building will feature ergonomic seating and open areas for meetings.”

HECTOR DELGADILLO

David Schroeder, Operator I, is part of a four-member team that keeps the Jomax plant compliant, clean and well-cared for as it provides quality water for reuse.

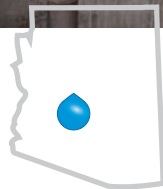
Hector Delgadillo, water treatment supervisor



Jomax and Beardsley Water Reclamation Facilities

Peoria, Arizona

www.peoriaaz.gov



BUILT:
Jomax 2004, Beardsley 1985

FLOWS:
Jomax 2.25 mgd design, 1 mgd average; Beardsley 4.0 mgd design, 3-4 mgd average

TREATMENT PROCESS:
Activated sludge biological nutrient removal; sand filtration

TREATMENT LEVEL:
Tertiary

EFFLUENT DISPOSITION:
Recharge basins, irrigation, water features

BIOSOLIDS:
Dewatered and landfilled

ANNUAL BUDGET:
\$ 3.26 million (both plants)

A recent improvement at the plant has reduced energy costs and maintenance. Operator Crystal Roy explains that every couple of years the mechanical mixers in the return activated sludge basin had to be replaced or rebuilt, at a cost of about \$10,000. “We did a search online and found an aeration cylinder called Well Wizard [Reliant Water Technologies],” she says.

One was placed in the return activated sludge tank and a second in the aeration basin, with good operating results and significant power savings, Roy reports.

For performance and improvements like that, the Jomax plant received the 2021 Small Treatment Plant of the Year award from the Arizona Water Environment Association. “It was a nice thing,” says Delgadillo. “With only four operators, the plant is compliant, super clean and very well cared for. And it’s providing A-plus quality water for reuse.”

SIMILAR PROCESS

The Beardsley plant is older but similar. The main difference is a single large aeration basin, instead of three, for biological nutrient removal. Lead operator Jake Hunter says the plant is nearing its 4 mgd capacity and is being expanded to 6 mgd as 2021 ends: “We’re running at 3-4 mgd depending on the day, or about 90% of capacity.”

Influent first passes through an automatic bar screen (Parkson) and a vortex grit system (John Meunier). The single aeration basin can be set up to run in several different modes. “It’s kind of neat,” says Hunter. “It’s customizable, depending on RAS and influent flows.”

As of fall 2021, it was being operated in an anoxic-anoxic-aerated configuration with Hibon - Ingersoll Rand and Hoffman & Lamson centrifugal blowers and diffused membrane aerators (Sanitaire, a Xylem brand). Three

secondary clarifiers follow, and effluent is filtered in three veteran travelling bridge sand filters. A Trojan4000UV system disinfects the final flow.

The effluent passes to one or more of nine nearby recharge basins. While the quality is A-plus by Arizona standards, only B-plus quality is required.

Improved odor control is an important recent development at Beardsley. Previously a wet chemical scrubber was used, but it’s been replaced with a BOHN BIOFILTER bio scrubber. The operators like the new unit, which saves 50% on chemicals. Until the next expansion, Beardsley has no biosolids treatment; the material is sent to the city’s Butler treatment facility for processing before landfilling.

FUTURE CHALLENGES

As the community grows and the need for reclaimed water increases, innovations and improvements lie ahead for both plants. At Jomax, along with the increase in capacity, the plant is slated for a new biological earthen odor scrubber. Additional recharge basins will be constructed, and aeration systems will be automated.

But the change the staff most eagerly awaits is a new 10,000-square-foot operations center. For now the team works out of a modified double-wide trailer. “We’re catering to a new generation of operators,” says Delgadillo. “The new building will feature ergonomic seating and open areas for meetings.”



Schroeder cleans the centrifuge (GEA Group) at the Jomax facility.

Jomax Water Reclamation Facility PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
BOD	232 mg/L	2.7 mg/L	30 mg/L
TSS	383 mg/L	1.5 mg/L	30 mg/L
Total nitrogen	40 mg/L	3.08 mg/L	8 mg/L average 10 mg/L daily

It will also contain multi-use rooms, an operator gym and coffee bar, outside patio seating, rainwater harvesting, electric cart and vehicle charging stations, and solar panels.

At Beardsley, the expansion to 6 mgd means keeping everything running while the work takes place. Hunter says the team must decide which equipment to keep until the expansion is completed, and which to replace now because it's reached the end of its useful life:

"It's a question of where and when to spend the money."

Effluent from the Butler treatment plant will be sent to Beardsley in the future, to produce more high-quality reclaimed water. A 9-mile pipeline will direct Beardsley effluent to new recharge basins in Paloma Park in the northern section of the region. Odor control will also be upgraded at Beardsley.

At both plants, there are plans to reduce power consumption. "The blowers take a lot of energy," says Delgadillo. "At Beardsley, we're looking at taking out the old centrifugal blowers in favor of APG-Neuros turbo blowers." Both plants will also get TrojanSigmaUV systems.

TRAINING AND LEARNING

The staffs at Jomax and Beardsley will have no trouble learning the ropes of any new processes or management techniques: The city provides training through Peoria Service Excellence University courses. The online program allows city employees to study communication and leadership, management and supervision, city finance, and more for professional development.

"The operator supervisory academy is a one- to two-year program, with certification at the end," Delgadillo says, "It allows the operators to hone their skills, take on future leadership roles and fill vacancies left by retiring employees."

Peoria also takes full advantage of vendor training and enthusiastically practices mentorship: "Our people share their experience with new operators. In some cases, I do it too."

Maintenance and process troubleshooting is well organized as well. The plants rely on a computerized maintenance management system (Hanson) that produces work orders and records follow-up.

FAMILY ATMOSPHERE

While the plant of the year award and the excellent training are highlights at Peoria, It's the staff that makes things tick. It begins with Delgadillo, who years ago took his brother's advice to look at wastewater for a career. He self-studied, passed the state exams, and now has 25 years of experience in everything from oxidation ditches to membranes. He still gets excited watching the microorganisms in the microscope.

Beardsley Water Reclamation Facility PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
BOD	204 mg/L	<1 mg/L	30 mg/L
TSS	311 mg/L	2 mg/L	30 mg/L
Total nitrogen	45 mg/L	3.6 mg/L	8 mg/L average 10 mg/L daily

That level of experience and know-how extends throughout the Jomax and Beardsley staffs.

At Jomax plant, lead operator Tom Jessings started with the city 19 years ago in wastewater collections. He took training courses, eventually achieved his Grade 4 certification, and was involved in the startup of the Jomax plant. He worked his way up to lead operator.

(continued)

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PRECIOUS WATER

The drought in the western United States is affecting Peoria, Arizona, but Hector Delgadillo, water treatment supervisor, feels his utility is doing its part to sustain its water resource.

"We're doing OK here," he says. "We're banking water for future usage." The city is accumulating credits for water it can withdraw from the aquifer in the years ahead.

Direct potable reuse and aquifer recharge are essential for sustainability and water conservation in Peoria. The effluent from the Jomax and Beardsley water reclamation plants contributes significantly to the city's renewable water portfolio.

With the Colorado River and the Lake Mead water supply in decline, Arizona water officials have worked on plans to take less water from Lake Mead and share water use reductions across all users of the water sources.

Peoria has its own water conservation program. It includes education and outreach, efficient transportation, efficient buildings, best practices, recycling and waste reduction.

Daniel Kiel, manager of planning and engineering, says the Beardsley and Jomax plants are critical components in the city's overall water resources plan. "Especially at Beardsley, where we have plans to increase capacity by sending our Butler treatment plant effluent for further treatment, and perhaps implementing direct potable reuse sometime in the future."

He notes that the city is building a pipeline to move effluent from Beardsley to the northern part of the city and expand recharge basins there. Kiel says the city needs to continue to make better use of effluent: "Down the road, we know we are going to face cuts in the supply from the Colorado River."

Peoria offers several creative ways for residents to reduce water consumption, including rebates on water-saving appliances and promotion of native landscaping. "Our water-saving toilet rebate program has been a winner for us," Kiel says. "And our landscaping consulting service has had a significant impact on our water use. People don't realize how much water they use for irrigation of their lawns and gardens."

Roy is also in charge of the laboratory. "In school we took a field trip to a constructed wetland," she recalls. "I was interested and got a position as an intern, and that got my foot in the door." She came to Jomax after experience in large and small plants in Arizona and California.

John Heyland holds Grade 4 certification and six years of experience in the industry. David Schroeder joined the staff as an intern and has 12 years of experience. He has Grade 2 wastewater, Class 4 collection, and Class 3 distribution certifications.

Beardsley lead operator Jake Hunter (Grade 4) has 13 years in the industry with experience in industrial and private wastewater operations. Lonnie Minton (Grade 3) had a long career in operations including five years in Peoria. Randy Loehr (Grade 3) is also a longtime city team member who has worked in the engineering department.

Lisbeth Cresbo (Grade 2) came to the plant nearly two years ago; she took an interest in wastewater treatment while working for the janitorial service that cleans the Peoria plants. She recently acquired her Grade 2 operator classification.

MUTUAL TRUST

"It's a small crew and we rely on each other," says Hunter. "There's no one here I don't trust."



The Beardsley Water Reclamation Facility team includes Jacob Hunter, lead operator; Hector Delgadillo, water treatment supervisor; and Lonnie Minton, Operator II.



The team at the Jomax Water Reclamation Facility includes, from left, David Schroeder, Operator I; Hector Delgadillo, water treatment supervisor; Jonathan Heyland, Operator II; and Tom Jessing, lead operator.

Robert Garcia, utilities operations manager, observes, "Peoria team members pride themselves on quality service to the community. We live by the motto, 'PEORIA: Professional, Ethical, Open, Responsible, Innovative, and Accountable.'"

That's the way Delgadillo feels about the entire team: "We strive for everyone to get certified and advance their careers. I care for each one as if they were my family, brothers and sisters." **tpo**

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The interior of the Moleaer on-demand nanobubble generator trailer system.

Tiny Bubbles, Big Potential

A PILOT PROJECT AT A CALIFORNIA CLEAN-WATER PLANT SHOWS SIGNIFICANT POTENTIAL FOR NANOBUBBLE TECHNOLOGY TO IMPROVE TREATMENT EFFECTIVENESS AND REDUCE COSTS

By Suzan Chin-Taylor and Mary Shafer

In 2015, California's Fallbrook Public Utility District completed a two-year overhaul of its 2.7 mgd wastewater treatment plant.

The district wasn't in the market for any significant upgrades but was recently approached by Moleaer, a manufacturer of nanobubble technology. The company offered its system as a solution to a problem endemic to nearly every wastewater treatment stream: surfactants (soap and detergents) in the influent that inhibit aeration in activated sludge systems.

Owni Toma, chief plant operator, embodies the district's policy of staying on top of new technology that can create more efficient and cost-effective operations. The progressive culture encourages working with local educational institutions. Toma invited Moleaer's application engineer, Ph.D. student Federico Pasini, to enlighten him on the company's equipment.

The result was a co-funded pilot program to test the effect of injecting nanobubbles in a functioning plant environment. It showed strong potential for the technology to reduce operating costs and improve treatment effectiveness and capacity.

TESTING THE WATERS

"We wanted to test this system of injecting nanobubbles into the headworks, upstream of the aeration system, to reduce oxygen demand downstream," says Toma. "Every treatment plant is interested in curbing energy demand, and improving oxygen transfer helps that."

"If you reduce aeration demand downstream, where it's expensive, like the blowers at aeration basins, by injecting nanobubbles upstream, then you're looking at improved oxygen efficiency and reduced costs. Federico did a wonderful job designing this application for us."

Pasini adds, "Based on the results of internal laboratory testing data we collected, and seeking to validate results we had observed over the years for

wastewater applications, we wanted to figure out what nanobubbles could do in a wastewater treatment plant.

"The collaboration with Fallbrook was born from their reviewing the way they provide air to the preliminary headworks tank, and to the activated sludge process. We all decided that our best attempt injecting nanobubbles was to do it before primary treatment, as soon as the raw wastewater enters the plant."

“Our main focus was to evaluate how much the removal of surfactants would increase what we define as the oxygen transfer efficiency in the aeration basin.” **FEDERICO PASINI**

TREATMENT ON WHEELS

Moleaer brought in one of its proprietary mobile units, installed inside a trailer for easy transport. On site, the company constructed an external piping system that allowed the unit to reach the water in the 35-by-15-foot, 21-foot-deep headworks basin.

They installed a liquid pump, a gas compressor and a piping system to circulate water from the basin through the nanobubble generator. This injected nanobubbles — part gas and part dissolved oxygen — into the wastewater, which then discharged to primary clarification and the activated sludge system.

"Our main focus was to evaluate how much the removal of surfactants would increase what we define as the oxygen transfer efficiency in the aera-

tion basin,” says Pasini. “We know that soap in general reduces the ability to transfer oxygen from gas to liquid form.

“Bacteria in the activators require a minimum dissolved oxygen level to be able to assimilate the oxygen and perform uptake of the contaminants, along with carbon or ammonia produced by the surfactants.

“This dissolving of oxygen in the activated sludge is one of the main costs of wastewater treatment. We wanted to assess our ability to remove at least some surfactants and determine how that removal would affect oxygen transfer efficiency, and thereby the energy intensity and cost of that process.”

A BIG DIFFERENCE

It would be easy to confuse nanobubbles with industry-standard fine bubble aeration, but the difference between them and how they work is significant. In a fine bubble system, depth is important because the bubbles will ultimately rise and escape at the surface. The faster they rise, the lower the oxygen transfer to the water.

Nanobubbles are so small that they can't be seen by the naked eye, and they are not subject to buoyancy. Nanobubbles never rise because their tiny size allows them to move around through Brownian forces — weak electric interactions at an infinitesimal scale.

Nanobubbles also don't coalesce. They will stay indefinitely dispersed in the water, transferring oxygen even when no further aeration is provided. The bubbles will still be there days, weeks, and in some cases even months after injection. For that whole time they slowly release oxygen into the water.

FAVORABLE RESULTS

To their surprise, the team observed that the injection of nanobubbles in preliminary treatment also affected other processes. One was bacteria biomass activity. “It turns out we had a beneficial effect on the activated sludge process on one end because we allowed the existing aeration system to transfer more oxygen for the same energy intensity,” Pasini says.

“And on the other side, we saw that we created healthier bacteria because surfactants also inhibit biological processes that happen in an activated



The on-demand nanobubble treatment system underwent a successful pilot test, documenting that the technology could improve treatment efficiency and reduce energy costs.

sludge system.” The removal of surfactants allowed faster oxygen uptake and production of needed effluent quality.

The pilot project, in which the district paid for the energy cost to run the system and Moleaer covered everything else, brought three measurable results:

- The nanobubble treatment of influent allowed removal of surfactants. The activated sludge kinetic increased due to elimination of the inhibitory effect of quaternary ammonia compounds routinely released by surfactants.
- The aeration efficiency of the fine-bubble system in secondary treatment increased by an average of 45% with surfactant removal, and 60% more oxygen was transferred to the aeration basin, for the same cost, when influent was pretreated with nanobubbles.

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- There was increased wastewater emulsification — the physical separation of particulate and colloidal contaminants — that made them more digestible in secondary treatment.

ABOUT THE MONEY

Final results showed that nanobubbles transferred twice the oxygen for the same energy consumption if the generator power requirement isn't considered. If it is, savings are reduced to 15-20%. However, that was for the pilot test installation.

Pasini and his colleagues are now designing systems that require low to zero net energy consumption. Increased biomass activity was recorded at 20-25%, meaning that contaminants are removed from the wastewater at a faster rate.

This showed potential to expand capacity in the secondary treatment basin, allowing the plant to operate with a smaller footprint, because the retention time of the wastewater in the activated sludge basin could be reduced, or the process could operate at lower biomass concentrations.

Faster biomass oxygen uptake rate means less treatment time required and less treatment space needed. This makes nanobubble technology a great option for plants that need retrofitting or experience chronic overloading with no room to expand their footprint.

The study indicates that operation and maintenance costs could be reduced by 30-50% with nanobubble injection at the headworks, using existing pumping energy. There is opportunity for further efficiency increases with the injection of nanobubbles at several steps in the process. With projected payback on capital investment in less than 18 months, Pasini is bullish on nanobubble technology's future.

“We will come up with other pilot applications for biosolids dewatering, disinfection and increasing biogas production, all processes we should be able to affect with nanobubble injection,” he says. “We'll validate its use in a lot of applications in wastewater treatment. We're reproducing this experience in other plants, so we're confident that what we've seen at Fallbrook wasn't a fluke.” **tpo**

Reno's Rising Star

WITH A LOVE OF HER HOME REGION AND RELENTLESS STUDY, A YOUNG PROFESSIONAL ENGINEER SUCCESSFULLY SPEARHEADS KEY WATER SUPPLY AND TREATMENT PROJECTS IN NEVADA

STORY: **Suzan Chin-Taylor** | PHOTOGRAPHY: **Tom R. Smedes**

Lydia Teel has a special place in her heart for water resources.

Growing up in northern Nevada, where constant drought made being water wise essential, Teel knew early on that she wanted to do something involving environmental protection, wildlife conservation, hydrogeology or a related field.

Her college professors and industry mentors have encouraged her to push the envelope and take part in water and wastewater projects to support sustainable water management in the region.

As emerging resources program administrator for Truckee Meadows Water Authority in Reno, Teel holds a newly created position.



Lydia Teel, P.E., emerging resources program administrator with the Truckee Meadows Water Authority

Although the authority deals solely with drinking water, its leaders find that managing water for future generations means collaborating with other agencies, so that water and wastewater initiatives are seen from diverse perspectives. By combining resources, they have created sustainable initiatives for the greater good of the region.

BORN AND BRED

Teel began her academic career at the University of Nevada, Reno, majoring in hydrogeology; she completed a Ph.D. in environmental engineering there last December.

“During my undergrad studies I realized how much I enjoyed mathematics and applied science. So, I decided to take my career toward a degree in environmental engineering, which tied together everything I wanted to be involved with for my life’s work,” says Teel.

“I saw it as empowering to be involved in wastewater and water treatment along with hydrogeology and water conservation. Making all those pieces work together is where the future is.” During graduate school, Teel interned with Washoe County, working on reclaimed water and wastewater treatment design.

In 2019 she transitioned to Truckee Meadows to focus on the OneWater Nevada initiative, a regional collaborative effort to research and realize innovative water supply options and advanced water treatment technologies for northern Nevada. Teel’s diverse academic background along with design and treatment experience made her a well-rounded professional engineer ideally suited to the role.

Schooling gave Teel a good foundation for managing the different treatment processes, but she admits



CULTURE IS EVERYTHING

Although labor is a big challenge for most organizations, Lydia Teel notes that the Truckee Meadows Water Authority has created a culture where people want to come to work and tell their friends about it; it's becoming competitive to get a position with the agency.

The authority has built a dynamic workplace and provides the resources to help team members grow. Teel is encouraged by University of Nevada Reno, her alma mater, and its engineering program; she sees an upward shift in women students for environmental engineering and increasing interest in wastewater treatment.

"Working with the students on our projects is exciting, and being able to encourage other young women to pursue this career that has been so good to me is important. It's also important as leaders in this industry to make beginners feel they aren't alone."

Teel strongly supports mentorship, recalling how mentors helped her; she always had someone to go to for assistance: "I think that's really important for all of us in the industry, to make our colleagues feel they are making an impact, and that we're always available for each other. It just makes us want to give it our all."

“Take advantage of any opportunity that comes your way, because you never know where it will lead you. Just do it.”

LYDIA TEEL

Teel believes the future points to the successful merging of water and wastewater treatment with hydrogeology and water conservation.

that college can only teach an engineer so much; working in the field to see how things worked was a key to helping her to excel. She took every opportunity to ask questions and gain knowledge from the authority's large and diverse staff of mechanics and operators.

"That experience was crucial for my development," Teel says. "Maybe it wasn't official training, but it helped me progress and has been instrumental in gaining my certifications for treatment and distribution."

TEAM-BUILDING

Teel's position requires substantial autonomy, as she is the only full-time staff member devoted to the OneWater Nevada projects. Although not required to supervise anyone, she is able to pull talent from other groups and departments to advance collaboration and help achieve common goals.

One of her most pivotal projects is the OneWater Nevada Advanced Purified Water pilot study, which was several years in the making and was conducted at various treatment plants in the region. The project involved small-scale treatment trailers that processed secondary wastewater effluent at 15 gpm, treating it to drinking water quality. The pilot study enabled OneWater Nevada to be first in the state permitted to do groundwater recharge using advanced purified water.

Teel's deep ties and connection to her alma mater were beneficial, as the university led the treatment technology evaluations and water quality testing and compliance programs for the demonstration projects. Students helped with sampling and conducted special research studies that were key in answering crucial questions.

The trailers' purification technologies included coagulation, flocculation and clarification, granular media filtration, ozone-biological activated carbon, granular activated carbon and UV disinfection. After treatment, the purified water is introduced to the groundwater at a small scale for an extended period.

"The study showed that the advanced treatment cleans the water to a level that can meet all federal and state drinking water standards and can diversify our region's water portfolio by adding an option that is sus-



Lydia Teel works in the lab with Matt Burggraff, water reclamation plant operator.



“All of us in the industry [need] to make our colleagues feel they are making an impact, and that we're always available for each other. It just makes us want to give it our all.”

LYDIA TEEL

The Truckee Meadows Water Authority team includes, Justin Mercado, senior water reclamation plant operator; Matt Burggraff and Tom Pugh, operators; Teel, emerging resources program administrator; and Kyle Campbell and Jimmie Winters, plant operators.

tainable and energy efficient,” says Teel. “It can also reduce our region’s reliance on the Truckee River and provide a safe, sustainable water supply even during drought and at times when our supply may be uncertain due to changes in climate.”

Teel’s role included working with the hydrogeologists to monitor the water that was injected into the aquifer. She also worked with the City of Reno and Truckee Meadows operators to make sure the treatment trailers operated around the clock. Teel also worked in educating the public about OneWater Nevada projects.

During the demonstration, a feasibility study looked at the technical, social, environmental, financial, regulatory compliance, public engagement, testing and geotechnical aspects of adding advanced purified water to the regional water supply. It determined that the process showed great promise for delivering a substantial contribution to groundwater augmentation.

INCENTIVE TO GROW

Working on such a large-scale project and gaining hands-on experience across several applications inspired Teel to continue working toward certifications and increasing her operational knowledge.

“Even though I wasn’t required to have all the certifications, I really wanted them, as they could help me down the road if I began working with operators more,” she says. “They enable me to understand what they do and work with them a more closely.”

Teel loves field work, as it poses challenges that force her to think outside the box. One day she may be at a construction site for a new drinking water plant, the next at a wastewater treatment plant on a pilot study, or on a drill rig helping the hydrogeology team. Her favorite part of the position is the diversity of experience.

“I’m a huge proponent of school,” she says. “I enjoy going to school and learning, but one of the main things that has helped me in my career is working with operators, shadowing them, observing them and understanding their roles.”

“I may know how to design a treatment plan on paper, but I want to see how the people who operate one day-to-day make it happen. Seeing this firsthand helps an engineer understand different design criteria and what truly needs to be built into a plant to make it most efficient.”

DREAM TEAM

Teel has had many mentors, but three stand out. The most prominent, Rick Warner, a past president of the Water Environment Federation took Teel under his wing, sending her to conferences, and pushing her to get involved with different committees. He introduced her to her Ph.D. adviser Dr. Krishna Pagilla at her alma mater.

Teel also cites her current supervisor, John Enloe. She credits these three as a star team driving water solutions in northern Nevada; they have given her diverse knowledge to help her excel.

Her agency increasingly relies on Teel as the go-to person for public meetings involving the various projects, initiatives and pilots in the region. She enjoys speaking directly with the public, fielding questions, and bringing in the right experts when needed.

“I really enjoy this part of the job,” she observes. “I have so much history in this region and can relate to the people when they’re worried about their water resources or unsure about the projects we’re doing. Because of that, by simply speaking from the heart, I’m able to assure them that we are doing all of our work for the right reasons.”

Teel has received numerous industry honors, the latest being the 2021 WateReuse Association Up and Comer award and the 2020 WEF Canham Scholar. She has co-authored numerous publications and is a volunteer with many industry and community associations, Nevada WateReuse Association, WEF, Leaders Innovation Forum for Technology, and Nevada Bighorns Unlimited.

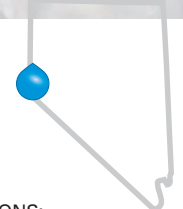
“Even though I wasn’t required to have all the certifications, I really wanted them.”

LYDIA TEEL



Teel continues working toward certifications while steadily increasing her operational knowledge.

Lydia Teel, P.E. Truckee Meadows Water Authority Reno, Nevada



POSITION:
Emerging resources program administrator

RESPONSIBILITIES:
Manage advanced purified water demonstration, operate filtration, biological and UV pilot units

EXPERIENCE:
Six years environmental engineering in municipal water utilities

EDUCATION:
Bachelor’s degree, ecohydrology; master’s, hydrogeology; master’s and Ph.D., civil and environmental engineering; all from University of Nevada, Reno

CERTIFICATIONS:
Professional Environmental Engineer, Grade 2 Drinking Water Operator, Grade 2 Water Distribution

AWARDS:
WateReuse Association Up and Comer 2021, WEF Canham Scholarship 2020

GOALS:
Encourage young water engineers, make a difference in the community

WHAT’S NEXT?

The Reno area has five wastewater facilities operated by Washoe County, the City of Reno and the City of Sparks. Although they’re owned by different agencies, Teel has worked at each of them in some capacity.

For those thinking about entering the industry Teel offers this advice: “Take advantage of any opportunity that comes your way, because you never know where it will lead you. Just do it.” Although she regards the OneWater Nevada pilot as the highlight of her career, she finds new projects also rewarding.

“With these projects I feel like I’m able to do something to benefit our region and help us understand what we need to design for full-scale implementation. It helps the Truckee Meadows and other area communities as well. They’ve been watching our projects and now are looking to do something similar.” OneWater Nevada is now looking to design and construct a 2 mgd advanced purified water demonstration study using similar technology as the pilot study. **tpo**

An Energy-Saving Journey

THE LOTT CLEAN WATER ALLIANCE HAS TAKEN NUMEROUS STEPS TO ENHANCE ENERGY EFFICIENCY. AND THE SEARCH FOR NEW IDEAS GOES ON.

By Steve Lund

The search for energy savings and more sustainable operations never ends at the LOTT Clean Water Alliance.

The wastewater management utility formed by the cities of Lacey, Olympia and Tumwater and Thurston County, Washington, has already done a great deal. Accomplishments include:

- Constructing a LEED Platinum certified administration building that has a green roof and uses reclaimed water for toilet flushing
- Operating a combined heat and power system with a Jenbacher (GE) engine at the Budd Inlet Treatment Plant for more than a decade, supplying heat to the digesters, the administration building and a children's museum, while also supplying electricity to the administration building.
- Producing Class A reclaimed water at two treatment plants for irrigation, cleaning, process water and aquifer recharge
- Producing Class B biosolids used in agriculture
- Replacing an old blower with a more efficient turbine blower for aeration and installing new diffusers in the aeration basins
- Converting to LED lighting and installing motion-detector switches.

CONSTANT SEARCH

In short, the utility has checked many boxes for energy efficiency and sustainability, along the way reaping substantial savings. Mark Petrie, environmental compliance supervisor, estimates that replacing a 500 hp centrifugal blower with a Neuros high-speed turbine blower with a variable-speed drive has saved \$48,000 a year. The combined heat and power system saves about \$99,000 a year. An energy committee makes sure efforts like these continue.

"LOTT has always been on the forefront to ensure that we use our resources appropriately," Petrie says. "We keep on looking, walking through the plant seeking new ways to improve energy efficiency."

The Budd Inlet plant (28 mgd design, 11 mgd average summer, 15 mgd winter), discharges UV-disinfected water to Puget Sound; about 10% of the flow goes through sand filtration or a membrane bioreactor and then chlorination to create the Class A reclaimed water.

AMMONIA-BASED CONTROL

One new way of saving power is to use probes that measure ammonia, instead of dissolved oxygen, to control aeration. "Most places use DO as the control to set appropriate levels of aeration in different zones of the process," says Petrie.

"We started using nutrient probes, measuring ammonia and the reduction of ammonia. We saw about 25% power savings in our blowers. We'll be adding more probes — pH probes, DO probes, ammonia-nitrate probes — throughout the process so we can measure and be prudent about reducing our total inorganic nitrogen and at the same time save energy."

The ammonia probes have been more reliable than DO probes. Petrie credits Terri Prather, assistant operations and facilities director, and Paul Jue, process control supervisor, for figuring out how to best use the probes.



The Budd Inlet Treatment Plant (Washington State Capitol in the background) treats flows of 10 to 15 mgd.



The Jenbacher (GE) engine has powered the cogeneration system at Budd Inlet plant since 2009.

"They help the operators understand the biological nutrient removal process," says Petrie. "They added more probes into the process so that operators can see live data coming in and adjust a blower or air control as necessary, or add methanol when needed. The more probes we install, the more data we provide to the operators and the process control supervisor to help them forecast and model the flows for future process control."

ADJUSTMENTS REQUIRED

The nutrient probes require some operator attention. "They can be very finicky," Petrie says. "They require some TLC to keep them calibrated and adjusted appropriately, but with our tight permit requirements, they help us



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Hawks Prairie Ponds is one site where the LOTT Clean Water Alliance recharges the aquifer with Class A reclaimed water.

“LOTT has always been on the forefront to ensure that we use our resources appropriately. We keep on looking, walking through the plant seeking new ways to improve energy efficiency.”

MARK PETRIE

saving ideas for the treatment plants and administration building; they're encouraged to submit ideas to the energy committee. In one case, workers suggested replacing some old windows with double-paned windows.

UPGRADE IN PROGRESS

The Budd Inlet plant is in the middle of an upgrade that will include a variety of energy savers. Two more APG-Neuros turbine blowers have been ordered, and Sanitaire Silver Series II fine-bubble diffusers (Sanitaire, a Xylem brand) and a compressed-gas solids mixing system (EnviroMix) will be installed.

LOTT stresses reducing peak electrical loads, and that makes variable-frequency drives especially important. “When we have to fire up multiple pieces of heavy equipment, sometimes we'll reach a peak demand that can cost up to \$22,000 a month,” Petrie says. “Our operations team tries to coordinate and sequence powering up when they can. The Neuros blowers being on VFDs make great buffers. They ramp up slowly, so it's a lot more cost-effective.”

The utility is also looking to boost its power generation capacity by adding solar panels. There is some rooftop real estate that might be used for that purpose: “We make use of all our resources as best we can and try not to waste them.” tpo

meet or outperform the parameters of our permit. There are definitely some costs to keep them operating correctly, but in the long run, it helps keep us in compliance.”

Operators, not the probes connected to the SCADA system, are still in charge of managing the treatment process: “We rely on the probes to give us good information and to instruct the blower to ramp up or ramp back, but at times the operators have to put their hats on. They still have to intervene and adjust as necessary.”

Although LOTT has partnered with power companies and consultants for many of its projects, the agency also relies on team members for energy-

Devoted to His Craft

IT'S NO EXAGGERATION TO SAY SCOTT MILLHOLLAND LIVES AND BREATHES HIS CAREER IN WASTEWATER. HIS WILLIAM D. HATFIELD AWARD IS A TESTAMENT TO HIS DEDICATION.

STORY: **James Careless**

PHOTOGRAPHY: **Denny Medley**



It didn't take long for Scott Millholland to choose his life's work.

It happened not long after he joined the team at the wastewater treatment plant in Gardner, Kansas. "Ever since I started working at the plant in 2000, the process of biologically cleaning wastewater without using chemicals has just fascinated me," says Millholland. "As soon as I was exposed to it, I thought to myself, 'This is where I want to go with my career.'"

For the past 10 years, he has been plant superintendent at the Kill Creek Water Resource Recovery Facility. A team member with the City of Gardner since 1998, Millholland is a friendly, intelligent man with a true passion in his work life: Treating wastewater to the very best of his ability.

In 2020, the Kansas Water Environment Association recognized his performance with the William D. Hatfield Award. "I was pretty excited to receive it, to be honest with you," he says. "There have been so many great wastewater operators I've been privileged to work with, and I've had some great teachers and mentors along the way. But a ton of the credit goes to my fantastic staff. They just go above and beyond every single day, working with me to build a better community for generations to come."

HARD WORK IS IN HIS BLOOD

Millholland was born in Kansas City in 1972. He and his sister grew up in a family where the will to work hard was instilled from an early age: "My grandma is still alive at age 95, and she only retired a few years ago."

After attending high school in Kansas City and community colleges in Fort Scott and Johnson County where he got degrees in applied science and environmental technology, Millholland worked for the Kansas cities of Prairie Village and Lenexa. At age 26 he joined the Public Works and Streets Division in Gardner, today a city of 24,000.

Scott Millholland, superintendent, Kill Creek Water Resource Recovery Facility



From left, Steve Duke, Scott Millholland and David Birzer are part of a team that routinely meets operating challenges.

“A ton of the credit goes to my fantastic staff. They just go above and beyond every single day.”

SCOTT MILLHOLLAND

Scott Millholland Gardner, Kansas



POSITION:
Superintendent, Kill Creek Water Resource Recovery Facility

EXPERIENCE:
23 years in the industry

DUTIES:
Operator, leader, mentor, compliance officer, teaching, engineering, finance

EDUCATION:
Fort Scott Community College, Johnson County Community

College (applied science and environmental technology degrees)

CERTIFICATION:
Class 4 Wastewater Operator, Class 3 Collections Operator, backflow/cross connection certification

GOALS:
Build a better community for future generations; provide the very best in service

“The City of Gardner was pretty small back then, at around 6,900 people,” he recalls. “So we pretty much did everything on an on-call basis. That included checking the water and wastewater plants, water breaks, turning meters on and off, and anything else that needed to be done.”

When city leaders decided to break Public Works into separate departments in 2000, Millholland opted to go with wastewater. In doing so, he didn’t just take on a job.

“I started taking classes at Fort Scott Community College and then the University of Kansas to get my accreditations and upgrade my skills,” he says. “I worked my way up the ranks at the Kill Creek plant, eventually earning my Class 4 Wastewater Operator certificate in 2004. Then I became a lead operator, and then superintendent in 2011 when my boss retired. I’ve been here ever since.”

SERIOUS ABOUT WASTEWATER

In his current position, Millholland manages a team of five: Steve Duke, chief operator, Class 4; Matt Solorio, operator, Class 3; and David Birzer, Dale Rittinghouse and James Allen, operators, Class 2.

“Steve’s my chief operator: He’s been here as long as I have,” says Millholland. “All the other guys have been with me at least five years. All are constantly taking training opportunities and upgrading their skills. Due to COVID, they’re doing a lot of that training online.”

Together, these men keep the Kill Creek facility clean, well serviced and running at peak efficiency. Seven times the facility has won the KWEA Wastewater Treatment Plant of the Year in Class 4, which includes plants that process wastewater so that the effluent can be reused or safely returned to the natural water cycle.

As superintendent, Millholland oversees the entire facility, but that's not all he does: As needed, he serves as an operator, mechanic/engineer, office worker managing the books, leader, mentor to his staff, and even janitor.

"My No. 1 job is to stay up to speed on my plant's operations," says Millholland. "In this position, you must communicate with all staff to see what needs or issues need to be addressed. And you can't do that behind a desk: You have to get out there and look over your plant daily."

In addition to his superintendent duties, Millholland develops capital improvements projects to enhance wastewater treatment and improve lift stations and collections. He also serves on the city's Safety Community. "Safety is huge within the city, as it should be," he says. "We have seen significant savings with worker's compensation and insurance cost since our Safety Community first formed in 2007." (Note: The Kill Creek facility just won the 2021 KWEA WWTP Safety Program Award of the Year.)

Millholland is also a compliance officer: "We have not had a permit violation in over 17 years." And he serves as a teacher: "I love to educate young and old on the importance of wastewater treatment and its importance to our overall health and environment."

Then there is his role as a talent scout. "Pay is always an issue. Gardner is located just outside of Kansas City. Trying to compete with the bigger cities and intermodal facilities is getting tough."

RECYCLING WATER

Millholland began his wastewater career at Gardner's Bull Creek Treatment Plant; he moved to the Kill Creek facility after it was built in 2001. "This is a Kruger Bio-Denitro phased oxidation ditch technology plant," he says. "It is designed to serve a population of 25,000 with a processing capacity of 2.5 mgd. We're running about 1.7 mgd right now with room to expand to 7.5 mgd."

The Kill Creek facility is equipped with four Fairbanks Nijhuis submersible pumps that send wastewater to the headworks, which houses two step



Scott Millholland has worked to improve and upgrade equipment, including investing in three new Inovair turbo blowers.

At this point, a portion of the recycled nonpotable water is fed to Gardner's Celebration Park and Sports Complex, using a Grundfos Hydro MPC primary recycled water system. The water is used for irrigation, with the remainder cascading down aeration steps to Kill Creek and ultimately into the Kansas River.

"Our biosolids are now processed with a new FKC screw press and land-applied," says Millholland. "We replaced the old belt press in hopes to get a drier sludge. We were getting around 14-15% with the press and hope to get around 20% with the new system. We also replaced our old seven-stage blowers with three new Inovair IM Series turbo blowers."

SAVINGS THROUGH TEAMWORK

When managing equipment, Millholland's goal is to save money wherever he can without compromising treatment quality. "Much of what we've got here is about 20 years old," he says. "To keep it running economically, we do 99% of our own maintenance." That includes pulling and rebuilding pumps, except for the larger submersibles, which are sent out for service. The work also includes managing 23 lift stations. "Add the cleaning and mopping of the floors, mowing and trimming, we're always hopping," Millholland says.

Consistent contact between staff members is the key to staying on top of things: "We've got Mission Communications in all of our lift stations, so if a pump has started to run longer than it should or has restarted too many times, we pass the information on to each other pretty quick. We also visit all 23 lift stations every day, so it makes it easy to ensure that we're getting all of our gallons per day through."

Teamwork is at the heart of Kill Creek's success. Millholland and his staff hold tailgate safety meetings every morning where "We figure out what we're going to do for the day. As well, the guys are constantly upgrading their operator skills. During COVID, they took classes online. And we all pretty much can do everything, so we

take turns doing lab work, plant work, fieldwork and whatever else has to be done to process wastewater effectively."

The result is a plant that runs smoothly and reliably, no matter who's on shift and whatever is happening. "A lot of our visitors are astonished at how clean the plant is," says Millholland. "It's all due to the attitude of the people on our team."

"Everyone is passionate about what we're doing, and cares deeply about providing our community with the cleanest water possible. Just because it's a wastewater plant doesn't mean it has to look like one. I spend 10-12 hours



The team at the Kill Creek Water Resource Recovery Facility includes, from left, operators Dale Rittinghouse, Matt Solorio, James Allen, Steve Duke (chief operator), David Birzer, and superintendent Scott Millholland.

screens and wash presses (Keith Huber (Hol-Mac Corporation)), followed by two Mectan grit chambers and a grit screw (both John Meunier).

"The wastewater passes through the phased-flow oxidation ditches, which removes BOD and nutrients," says Millholland. "The water next settles in a pair of rapid sludge removal sedimentation basins made by Ovivo. It is then disinfected using UV light."

Kill Creek installed a new Glasco UV system in September 2021: "We went with the NONCON option because the old UV had seen its fair share of repairs and used a lot of power."

Millholland (left) and Steve Duke use a Hach DR1900 spectrophotometer to test ammonia content in the lab.

here every workday, and I expect the bathrooms here to be as clean as they are in my home.”

TACKLING CHALLENGES

Even in the best-run plant, serious challenges occur from time to time. The ways in which operator teams tackle them speak volumes about who they are and what they can do.

For Millholland, three challenges come to mind. “We had one situation where a brush rotor’s end bearing snapped off and fell to the bottom of a full oxidation ditch,” he recalls. “So we put our heads together and came up with a solution where we put an empty Mountain Dew bottle tied to a string and fed through a 20-foot-long one-inch PVC pipe and pushed it around the bottom until we found the brush rotor. We then let the string go and bottle floated to the top. We were then able to hoist it up, rebuild it, and get it back into service.”

Challenge No. 2: “When the plant was built, we never really felt we were getting a good effluent flow reading. After some research, we found that the Parshall flume that was installed originally was too large. We were running around 1.2 mgd and the Parshall flume was designed for 50 mgd.”

Again, the Kill Creek team came up with an innovative solution. They jack-hammered out the old flume and replaced it with a sharp-crested stainless steel weir plate. “After that was constructed, we installed a HydroRanger (Siemens Process Instrumentation) ultrasonic open channel flow monitor up from the weir for more accurate reading. The HydroRanger measures our effluent flow as it goes over our sharp crested weir plate. This was all done in-house with a huge saving to the city, and the results were right on point.”

Moving forward, Kill Creek now has to confront a new challenge: reducing nitrogen and phosphorous outputs in line with new permit

parameters. Millholland is undaunted: “I believe with operational process adjustments, and some advice from Grant Weaver of CleanWaterOps, we can make it happen,” he says. “We started the process adjustments a few months ago, and we are already seeing some great results.”

LOOKING AHEAD

With over two decades spent in the wastewater industry, Millholland could be expected to be looking to do something else as he enters the second half of his career. Except he isn’t: “I really like what I’m doing now. There’s a lot more that I can do in this career going forward.”

In particular, Gardner’s rapid growth is driving change in the wastewater department. “There’s a real development boom going on,” says Millholland. “We’re growing fast and it looks like Gardner will be building a second wastewater plant in the future. I’d like to be part of that, and hire some more people to run it along with Kill Creek.”

In other words, don’t expect Millholland to hang up his hat anytime soon. He couldn’t imagine doing anything else: “My daily goal is to make sure all team members go home safely to their family every night. Our team goal is to build a better community today for the future generations to provide the very best service to the citizens of Gardner.” **tpo**



RELAXATION TIME

Although Scott Millholland is devoted to his wastewater career, he does have a life outside the Kill Creek treatment facility. “I do a lot of hunting and fishing when I can, and boating with my wife and kids in the summertime,” he says. “I also have a farm down south with cows, and time for Mom and Dad. I do quite a bit of golf, often with my dad, who’s 80 but still in great shape.”

Millholland’s two kids are full grown and living lives of their own: “My daughter Cailin is a teacher. My son Cian works as an operator for Johnson County Wastewater in Kansas.

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2



3



1. The M3 FLEXFLO pump is built with durability features including a heavy one-piece rotor that uses no springs.
2. The back of the pump includes six M12 connectors and connections for network protocols such as Profibus, Modbus TCP and Ethernet IP.
3. The display screen is large and intuitive.

Smarter Chemical Feed

A NEW PERISTALTIC CHEMICAL FEED PUMP OFFERS PERFORMANCE AND RELIABILITY FEATURES ALONG WITH BUILT-IN CAPABILITY TO ADVANCE THROUGH SOFTWARE UPGRADES

By Ted J. Rulseh

Accurate chemical feed is essential to cost-effective drinking water and wastewater treatment. Various companies offer peristaltic and diaphragm pumps for that purpose.

Key attributes of these pumps include reliability, precision delivery, long service life, and ease of use, especially related to the controls and display. Now Blue-White Industries has released the M3 FLEXFLO peristaltic metering pump. It's designed with new performance features, and with built-in capability for software upgrades in the future.

The pump (capacity 33.3 gph, pressures up to 125 psi) can accommodate plants' existing legacy communication connections, as well as the latest network protocols. This means it can be easily adapted when plants complete upgrades that include the latest communication systems.

The display screen is large and is designed for simplicity and intuitive pump setup, programming and operation. Patrick Murphy, director of engineering with Blue-White, talked about the new technology in an interview with *Treatment Plant Operator*.

tpo: What makes this peristaltic metering pump different?

Murphy: This pump is going to advance over time. It's not a static product. We've built in the capacity for upgrades and to take on future capabilities. For example, we plan to add features through software downloads. Sooner or later we intend to add connectivity, so that our pumps will be able to communicate with each other without wires.

tpo: Mechanically speaking, what is new in this pump?

Murphy: Self-priming is a common feature of peristaltic pumps, but this pump has Remote AutoPrime. When feeding a chemical such as sodium hypochlorite, vapor can fill up the suction line during periods of slack demand, such as overnight. With Remote AutoPrime, the operator can program the pump to prime every morning and can select the speed and time. For example, the pump can be set to run at 100% motor speed for 10 seconds every time it kicks on in the morning. That evacuates the vapor quickly, and then the pump goes into its normal run cycle.

“There is a large, colorful 5-inch touchscreen display that uses capacitive technology, very similar to a cell phone. It's bright and responsive.”

PATRICK MURPHY

tpo: Is there anything unique about the tube design?

Murphy: We offer an optional a dual-channel tube designed to overcome an industry problem. The dual channels enable high flow rates, and with smaller bore sizes in the channels we can get higher pressures. So with our tubing we're able to get high flow rates at high pressure ratings with long tube life. The pump also provides tube failure detection, which is a safety feature. In the event of a tube failure, a sensor detects the conductivity in the fluid and stops the pump.

tpo: What has been done toward enhancing durability?

Murphy: The M3 has a heavy one-piece rotor that uses no springs. Over time, springs wear out, and when that happens they lose strength for squeezing the tube; performance is reduced and the roller has to be replaced. Our rigid rotor maintains its squeeze. We also use M12 connectors that are IP67 rated, so users' connections are protected from dust, water, vibration, UV, impact and temperature cycling. This eliminates the need for a junction box. In addition we made the pump eight pounds lighter by using a durable plastic housing instead of a metal.

tpo: How do the screen and controls simplify operation?

Murphy: There is a large, colorful 5-inch touchscreen display that uses capacitive technology, very similar to a cell phone. It's bright and responsive. The on-screen buttons are large and bold for touchability even with gloves on. The text is large and easy to read. Simple, recognizable icons make operations intuitive. We use multiple colors to indicate pump status so that it's easily visible to operators. There is flexibility to populate the screen with new buttons.

“ This platform will ultimately spread throughout all of our peristaltic and diaphragm pumps.”

PATRICK MURPHY

on back of the pump at the top, by way of six M12 connectors. But at the bottom of the pump are connections for network protocols that modern plants use, such as Profibus, Modbus TCP and Ethernet IP. So if a plant is planning an upgrade to a newer protocol, this pump is ready for it. We use microchip circuits because they're not limited to one function; they can operate multiple functions.

tpo: What kinds of capabilities do you see being added via upgrades?

Murphy: This platform will ultimately spread throughout all of our peristaltic and diaphragm pumps. We plan to upgrade our pumps to be more connective. That includes adding phone applications so that the pumps can communicate with one another on the internet. Users will be able to see from anywhere in the world whether the pump is operating correctly.

tpo: What is the advantage of enabling these pumps to communicate with one another?

Murphy: It's beneficial because these pumps can be in areas of facilities where the Wi-Fi is not strong. With communication, only one pump needs to be near the Wi-Fi. A master pump that's able to see the internet can tell the other pumps what to do, or hear what those pumps are doing and relay that information to the user wirelessly.

tpo: What has been done to prove this technology in the field?

Murphy: We have done beta testing and have received great feedback. Customers like the screen and the menu structure, and the fact it's intuitive and easy to use, so they can quickly set it up and go. It's a device that can handle a lot of computational data. **tpo**



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industry news

Parker Burke named president of Industrial Scientific

Industrial Scientific announced that Parker Burke has been promoted to president. For the past two years, Parker has led the business as senior vice president and general manager. Prior to joining Industrial Scientific in 2019, Burke was vice president and general manager at Anderson-Negele in Fultonville, New York. Before leading Anderson-Negele, Parker held a number of commercial and operations roles at Gilbarco Veeder-Root.



Parker Burke

Tnemec acquires Epoxytec

Kansas City, Missouri-based Tnemec announced it has acquired Epoxytec International, which was established in 1990 by Joe Caputi. Originally an independent distributor for a specialty coatings company, Caputi eventually parted ways to form Epoxytec. In 2001, his son Michael Caputi joined the business helping expand Epoxytec to offer services worldwide from its headquarters in Hollywood, Florida.

In a press release announcing the acquisition, Michael Caputi says, "I am proud of the business my father built that has led us to where we are today, and it's a model we intend to keep. We are excited to join another family-owned business where we can continue to put customer service and quality at the forefront of everything we do, as we have done for the last 30 years."

Centrisys/CNP's MagPrex to be installed in Idaho, names new staff

The Meridian (Idaho) Wastewater Resource Recovery Facility has partnered with Centrisys/CNP to implement a MagPrex biological nutrient removal system. Meridian's WWRRF operates and maintains a centralized wastewater treatment facility and over 400 miles of sewer lines located throughout the city. Using the MagPrex system, operators can prevent crystallization in their biosolids train and reduce phosphate recycling by up to 90%. As the seventh MagPrex installation in the United States for Centrisys/CNP, the Meridian WWRRF's startup data's anticipated timeframe will begin in the summer of 2022.



Mickey Balash



Steve Brown



Drew Johnston

Centrisys/CNP also announced the growth of its sales team with the addition of three new representatives. After eight years with EU-based manufacturers, John "Mickey" Balash rejoins the U.S.-based team as industrial sales manager. Additionally, Steve Brown joins as sales manager - Southeast region, and Drew Johnston joins as aftermarket sales - Central region.

Xylem, Dragos partner to bring cybersecurity to water utilities

Xylem and Dragos announced they have partnered to bring industrial cybersecurity to critical infrastructure in the water sector. The agreement will offer co-branded incident response and incident prevention services to Xylem's water utility customers worldwide. The service, available on a retainer basis, hardens industrial control systems to prevent incidents, rapidly responds to industrial intrusions and reduces mean time to recovery.

Carboline launches CarboNext program

Carboline launched CarboNext, a program aimed to educate, connect, support and engage with the next generation of engineers and professionals. CarboNext's core audience includes professionals age 40 and under who are engineers, specifiers, inspectors, project managers, operators or anyone who desires to learn more about coatings and corrosion. In addition to training and education, the CarboNext program will include technical events and community support projects.

OCWD Director Green receives VP nomination from ACWA

The Association of California Water Agencies nominating committee has unanimously chosen Orange County Water District Director Cathy Green as the vice president candidate for ACWA's recommended slate. With this latest announcement, nearly 40 statewide organizations have expressed their support for Director Green to serve as vice president of ACWA, the nation's largest statewide coalition of public water agencies.

Tammy Blanchard named Duperon's lead sales project manager

Duperon Corp. promoted Tammy Blanchard to lead sales project manager. A Duperon veteran of seven years, Blanchard brings nearly 30 years of sales and customer support experience to the position. Prior to Duperon, Blanchard was the inside sales manager for 18 years at a company that provided audio-visual systems to schools and businesses in Michigan. She managed the company's website, pricing levels, sales and customer support, training educators on the equipment, trade shows and distribution channels, proving instrumental in the company's growth. **tpo**



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Opportunity for All

THE WATER ENVIRONMENT FEDERATION TAKES AGGRESSIVE ACTION TO PROMOTE DIVERSITY, EQUITY AND INCLUSION IN ITS OWN RANKS AND ACROSS THE INDUSTRY

By Ted J. Rulseh

Two years ago the WEFTEC general session included a major presentation on the need for diversity in the water and wastewater sectors — how workforces should look more like the communities they serve.

Now the Water Environment Federation is focusing on a broader initiative of diversity, equity and inclusion (DE&I), starting within its own ranks but also reaching out to its member associations and thereby to the industry at large.

It's a continuation of efforts that actually began several years ago. Three leaders of the DE&I initiative shared their perspectives in an interview with *Treatment Plant Operator*.

Stephen Sanders is a member of the WEF DE&I board of trustees subcommittee, a member of the New York Water Environment Association DE&I Committee, and head instructor/director of the Environmental Training Center at State University of New York Morrisville College.

Megan Yoo Schneider is co-chair of the WEF DE&I board of trustees subcommittee, client account leadership senior manager with Accenture, and vice president of the Municipal Water District of Orange County (California) board of directors.

Duncan Donnell, P.E., S.E., is co-chair of the WEF DE&I board of trustees subcommittee, speaker-elect of the WEF House of Delegates, and associate vice president of Arcadis.

tpo: How would you define and differentiate the terms: diversity, equity and inclusion?

Sanders: Diversity encompasses all the various backgrounds, cultures, experiences and perspectives. That's a good start; I can look at the numbers and check boxes and be diverse. But what happens when a person comes into an environment that's not inclusive? That person doesn't stay. Inclusion says, "Come on in, we're going to celebrate your different viewpoints." And equity means we want everybody to have not only the same opportunity but the same access to the things everyone else has, so they can reach their full potential. Sometimes equity means we have to do things to make up for disadvantages that one underrepresented group or another might have.

Yoo Schneider: Even something as simple as diversity, what does diversity mean in terms of how we measure it? We immediately think gender. Then we may think ethnicity. But when you dive into it, there's neurodiversity, relationship status, religion, hidden medical disabilities and more. And even for different ethnicities, if you were born and raised in the United States, that's a very different experience from being an immigrant. There are so many factors to consider. Open dialogue is what enables us to achieve progress.

tpo: How did you assess the state of DE&I at treatment plants and in utility organizations?



Stephen Sanders



Megan Yoo Schneider



Duncan Donnell

“The Brookings Institution study showed that the water industry as a whole is still 85% male and over two-thirds white.”

MEGAN YOO SCHNEIDER

Duncan: When we started the DE&I task force, our biggest question was where we were going to get the data. At the time most people in the water industry knew the Brookings Institution's 2018 "Renewing the Water Workforce" study. It was a study of studies, using existing data. It didn't drill down to exactly what was happening in a water plant, but they were able to get at least a high-level understanding of what kind of diversity existed in the water industry. Then we did our own survey of our membership to see what demographics we have in WEF itself. Outside of that, a lot of our data is anecdotal.

tpo: Do you have a feel for how the industry is doing in terms of DE&I?

Yoo Schneider: The Brookings Institute study showed that the water industry as a whole is still 85% male and over two-thirds white. And as we get to the operator role, it skews even more male and more predominantly white than many other positions.

tpo: Can you share any of your own experiences in this realm?

Yoo Schneider: My first job in the water industry was in operations and maintenance. I was the only woman and often one of the only Asians in the plant. I think nowadays people say "Oh, well, there are a lot more women now and a lot more people of color." But the numbers show us that while there are more than they were before, we're still a long ways from achieving parity with the communities that we serve.

tpo: Why did WEF decide to focus first on DE&I internally?

Yoo Schneider: We felt we couldn't tell utilities, "It's important to reflect the communities you serve" if we as an organization didn't reflect the communities we serve. It's a little bit of a chicken-or-egg situation. WEF members aren't going to be diverse if we ourselves don't have a diverse workforce. At the same time, our preliminary research shows WEF members are more diverse than the water industry. Diverse people seek membership in WEF to gain access to more information and to a broader network. It's a place for them to get advice and to seek input from people all over the country and the world. Often there is no safe place to address these issues in their workplaces or in their own professional associations.

“Having conversations with other people who don't look like you — that's where you really can get educated.”

STEPHEN SANDERS

tpo: What do you see as some of the key challenges to advancing DE&I?

Duncan: We've had two challenges happening at the same time. First we had the aging workforce, among operators specifically. While dealing with that, there was the lack of diversity in areas like race, ethnicity and gender. In recruiting, we've had to address those two issues at once. Before we started dealing with diversity issue, the first demographic key was age, because the workforce needed to get the work done. Now it's time to address other demographics.

Sanders: One thing I'm proud of is how everyone's awareness was heightened over the summer of George Floyd. It wasn't just a certain group of people, it was a lot of people saying things were not equitable. A reason I'm excited about our efforts is that we're moving from awareness to action. I can wear a T-shirt or fly a banner — that's awareness, but where's the action? This feels different. We're moving beyond awareness and getting into action.

tpo: Where do you see more progress being needed?

Yoo Schneider: There is a lack of awareness of water and wastewater roles period, and then even for those who go to college, a lot of freshman and sophomore women in STEM majors tend to drop out. Research shows that once they graduate with a STEM degree, men are eight times more likely than women to get a job in a STEM career. Once they enter the STEM industry, within the first 12 years of their career, the attrition rate of women leaving their jobs is 50%, versus 20% in careers outside of STEM. Literally every week I have somebody text message or email me saying, "I'm thinking of leaving the water industry; there's just not enough support, I don't see a future for myself."

tpo: What specific actions is WEF taking to further DE&I?

Duncan: We incorporated DE&I into our strategic plan, so it isn't just a high-level conversation. We put together a task force and in 2020 spun that into a board subcommittee. Because volunteers can do only so much, we hired a DE&I consultant to do this work full time. The consultants work hand in hand with our subcommittee. WEF did a member survey that drew more than 1,500 responses. We did six focus groups with participants including women operators, women scientists and people of color. And we conducted individual interviews with people from a cross section of WEF stakeholder groups. At the same time the House of Delegates created a DE&I work group to focus specifically on what is happening with our member associations.

Yoo Schneider: Several years ago we created inFLOW as a program for young people to enhance diversity, equity and inclusion in the water workforce. It has led to deep-rooted relationships with historically Black colleges and universities, enabling us to create that pipeline. There are tracks within inFLOW for STEM careers and for technical careers that don't require college degrees.

tpo: How is the House of Delegates work group reaching out into the member associations?

Duncan: The work group did a survey of member associations concerning what they are doing in DE&I. At WEFTEC 2021 we launched a toolkit that member associations can use to pursue DE&I at the local level. We've done a lot of trainings where we brought together leaders from our national organization and the member associations.

tpo: How do you see DE&I benefitting the water workforce across the board?

Yoo Schneider: To meet our need for a resilient and sustainable water workforce, we need to expand who we recruit and how we retain them. That's

Defining the Terms

The Water Environment Federation looks at diversity, equity and inclusion as intentionally connected and believes that starting with shared and clear definitions enables better understanding and promoted progress toward its goals.

Diversity encompasses the varying experiences, strengths, skills, perspectives, personal characteristics, cultures and backgrounds represented in a community or organization.

Equity means an environment where everyone has the opportunity and access to resources they need to realize their full potential; no one is disadvantaged because of group identity or any other socially determined circumstance.

Inclusion embraces and celebrates each person's perspectives, voices, values, and needs to generate a culture where all feel heard, respected, valued and included in the broader purpose.

where DE&I is important. It's hard to recruit women and people of color if they feel they don't have the same opportunity for promotions. One of the key things is that nobody is losing anything in the journey for DE&I. All the research shows that achieving equity improves conditions for all of us. A Goldman Sachs report showed that just by helping create more equity for Black women, we increase jobs in the U.S. for everyone and increase the GDP for everyone. We're not saying, "Let's take away operator jobs from white men." We're saying just the opposite. We have a workforce shortage and a need for innovation. DE&I efforts help address that.

People in the water industry often complain about being under-recognized and taken for granted. We all know what it feels like to be slighted and unappreciated and othered. We need to take that feeling and recognize that we don't want anyone to feel like that. We want the water industry to be inclusive because that helps us become more innovative, sustainable and resilient. That's the win-win situation.

tpo: What should utilities and treatment plant team members do to further DE&I?

Sanders: A lot of it has to do with education. I think it's important first of all to educate yourself. We have to see the value, because we won't do anything we don't see value in. What are you looking at in terms of underrepresented groups in your organization? Educate yourself about your own utility and see where you need to go from there. If you find that your utility, as it relates to retention and leadership responsibilities, does not represent your community, that's the definition of a problem. Your current situation doesn't meet your ideal situation — how do you build that bridge? Having these conversations with other people who don't look like you — that's where you really can get educated.

Duncan: Engaging DE&I professionals definitely helps. If you want to upgrade safety in your organization, you want to engage safety professionals. In the same way, if you want to do DE&I and you're as serious about it as you are about other things, you should engage DE&I practitioners — people who bring a level of knowledge you may not otherwise have.

Yoo Schneider: This is a journey. We're not going to magically achieve all our goals and create a diverse, equitable and inclusive water industry in the next five or ten years. It's a progressive journey. DE&I has to become embedded into how we educate, how we recruit, how we create our organizational cultures, how we lead, and how we plan for the future. **tpo**

“We incorporated DE&I into our strategic plan, so it isn't just a high-level conversation.”

DONNELL DUNCAN

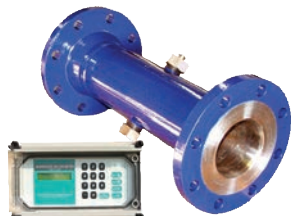
Reuse, Recovery and Energy Management

By Craig Mandli

Asset Management

MARKLAND SPECIALTY ENGINEERING SUSPENDED SOLIDS DENSITY METER

The Suspended Solids Density Meter from Markland Specialty Engineering measures, monitors and provides real-time continuous readings of total suspended solids of slurries, sludge (including return-activated and backwash sludge) and even thick biosolids concentrations. The analyzer's ultrasonic non-nuclear sensor requires no permits and no approvals, and measurements are not affected by the color of fluid or particulates. This meter is available as a non-intrusive inline spool piece transmitter or throw-in style probe. Applications include pipes, re-circulation loops, open-top tanks and clarifiers. It provides the added capability of automating pumps to help optimize dosing, sludge feed density and variables on thickening equipment for reduced material and energy costs and improved outflow available for reuse in water, wastewater and process industry settings. **855-873-7791; www.sludgecontrols.com**



Suspended Solids Density Meter from Markland Specialty Engineering



PULSAR MEASUREMENT DBI-MODBUS

Pulsar Measurement's dBi-Modbus (dBi-M) intelligent ultrasonic level sensors are suitable for remote installations. These transducers include DATEM (Digital Adaptive Tracking of Echo Movement) signal processing for precise and repeatable results in challenging applications, with measurement range options from 4.9 inches to 49.2 feet. It only takes one second to power on and make a

Pulsar Measurement's dBi-Modbus ultrasonic level sensors

measurement. When connected to a wireless telemetry device, power consumption is as little as 5 micro-amp hours. Alternatively, connect it to an existing Modbus network to take advantage of the performance full time. It is ready for challenging environments with ATEX approvals, IP68 protection and an operating temperature range of -40 to 176 degrees F. **888-473-9546; www.pulsarmeasurement.com**

YSI, A XYLEM BRAND 3017M

The 3017M analyzer from YSI, a Xylem brand continuously measures free or total chlorine in municipal drinking water or wastewater effluent using the proven DPD colorimetric method of analysis. It uses EPA-approved DPD methodology that conforms with standard method 4500-CL-G, U.S. EPA method 334.0 and ISO method 7393-2. It is compliant with U.S. EPA regulation



3017M analyzer from YSI, a Xylem brand

40 CFR 141.74 for drinking water and 40 CFR 136.3 for wastewater. The analyzer is built with Flow Injection Analysis, factory calibration and simplified tubing which lowers reagent use and maintenance requirements. It can operate as a standalone analyzer or be integrated into the IQ SensorNet system of online controllers, analyzers and sensors for better visibility and control of your process. **937-767-7241; www.ysi.com**

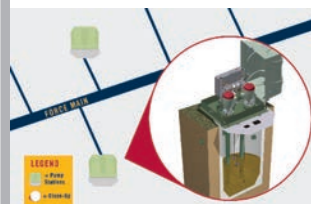
Automation/Optimization

PRIMEX ECO SMART STATION

The Eco Smart Station control system from PRIMEX provides a safe, energy-efficient solution for optimum pump control in municipal lift station applications. It uses the latest technology in VFD, micro-processor-based controller, data storage and communication capabilities available. It achieves up to 30% energy savings using an efficiency auto-tune algorithm that searches for the pump speed that will consume the least amount of energy per gallons of liquid pumped. It is housed in a multiple-compartment Arc Armor Enclosure, reducing the risk of injury resulting from electric shock and exposure to arc flash. It features the Energy View controller powered by kW Logix software, an energy-efficient solution. The color touchscreen HMI provides level control, pump alternation, flow monitoring, data logging, alarm logging, historical trending and comes equipped with a SD memory card for data storage and download. It is available in 29 models, from 10 to 100 hp. **844-477-4639; www.primexcontrols.com**



Eco Smart Station control system from PRIMEX



Force Main Sync system from Smith & Loveless

SMITH & LOVELESS FORCE MAIN SYNC

Force main pressures vary; and without accounting for the variable conditions, reduced service life and a multitude of other issues arise. These phenomena result in impeller and volute erosion, reduced bearing and seal life, excessive pump noise, and vibration. Force Main Sync from Smith & Loveless monitors hydraulics in the common force main to keep pumping at the required flow rate. Using a PLC touchscreen human-machine interface, a variable-frequency drive and a force main sensor, it constantly senses force main pressure and automatically adjusts the VFD to maintain a constant flow rate, no matter how many stations are online. **800-898-9122; www.smithandloveless.com**

Biogas

JDV EQUIPMENT DOUBLE MEMBRANE BIOGAS HOLDER

The Double Membrane Biogas Holder from JDV Equipment is easy to install, has low upfront capital costs and requires low operating capital. Its design allows for variable biogas storage within the inner membrane at constant pressure during gas production and utilization, while the air-inflated outer membrane provides gas pressure and protection. The outer membrane is constructed of a high-tech, cross-woven



Double Membrane Biogas Holder from JDV Equipment

fabric that's coated with PVC and UV-ray protection, proven to endure the weather elements. Sensors monitor the volume of gas present, giving operators full control of optimizing the utilization of biogas to feed generators and/or heating systems. Storing digester biogas can eliminate flaming from the digester, and it can help reduce or completely eliminate the need for electric grid power when generators and/or hot-water boilers are incorporated into the facility design. **973-366-6556; www.jdvequipment.com**

Heat Exchangers/ Recovery Systems

ALFA LAVAL WELDED SPIRAL HEAT EXCHANGERS

Controlling temperature and maximizing efficiency of anaerobic digesters is critical for optimal bacteria growth and stabilization of sludge. Alfa Laval spiral heat exchangers handle this tough duty with ease, with a single-channel, low-fouling design that sits in a compact footprint. They can help maximize heat transfer, save space and reduce maintenance. **866-253-2528; www.alfalaval.us**



Spiral heat exchangers from Alfa Laval

High-Efficiency Motors/Pumps/Blowers



Biogas-Rotary Lobe Pump from Boerger

BOERGER BIOGAS-ROTARY LOBE PUMP

Pumping biogas substrate from renewable resources puts heavy demands on a pump. Boerger responded to this challenge by developing the Biogas-Rotary Lobe Pump. This pump offers operators an effective and wear-resistant solution for pumping biogas substrate from renewable resources. At its core is a premium profile steel rotor. Profiles incorporated into the rotors ensure that fibers in the pumped medium actually become part of the short-term surface. They attach themselves in the grooves and are continuously renewed each time the rotor turns. This organic short-term surface provides full protection from wear, and the premium profile rotor itself shows virtually no signs of wear even when subjected to long-term exposure. Equipment is constructed using a maintenance-in-place design, which allows for all wetted parts to be replaced without the removal of pipe or drive systems. **612-435-7300; www.boerger.com**

DUPERON 5-IN-1 DUAL AUGER SYSTEM

The Duperon 5-in-1 Dual Auger System is deployed in targeted high-ragging manholes/wet wells to remove problematic debris and prevent chronic pipe and pump clogging. Removing wipes at, or near, the point they enter the sewer stops the problem where it starts without impacting downstream operations. The system captures, dewater, compacts, conveys and stores problematic debris in a below-grade discharge pipe, where it can be emptied by vacuum trucks. This creates an opportunity to transform emergency, dirty, unsafe and manual cleanouts into planned, safe and coordinated debris removal. Simply uncover, insert vacuum truck suction tube into the discharge chute, remove debris and landfill. **800-383-8479; www.duperon.com**



5-in-1 Dual Auger System from Duperon

FPS, A BRAND OF FRANKLIN ELECTRIC NCX SERIES

The NCX Series of explosion-proof submersible non-clog pumps from FPS, a brand of Franklin Electric, are certified for use in Class 1, Division 1 and Group C & D hazardous location requirements, making them suitable for a variety of applications such as lift stations; sewage systems; stormwater, flood and pollution control; industrial waste and dewatering; wastewater treatment plants; and general fluid transfer. They are available in single- and three-phase power options to accommodate flows up to 625 gpm. Each is designed for overall serviceability and reliability with durability-conscious features like a field adjustable wear plate, factory-standard dual silicon carbide mechanical seals, and chemical-resistant components. Intrinsically safe non-clog control panels are also available for complete system integration. **866-271-2859; franklinengineered.com**



NCX Series of pumps from FPS, a brand of Franklin Electric

FPZ E SERIES E11-MS

The e Series e11-MS blower from FPZ is a drop-in replacement for the K11-MS and offers increased efficiency, lower discharge temperatures and a significant reduction in perceived noise. The impeller design was developed through sound quality studies and rapid prototyping. The resulting design has a targeted reduction of the most displeasing frequencies. It is mountable in any position and offers a maintenance-free operation. Options include anodized aluminum components for corrosion resistance and increased sealing. **262-268-0180; www.fpzusa.com**



e Series e11-MS blower from FPZ



827 DVJ dry-vacuum blower from Howden

HOWDEN 827 DVJ

The 827 DVJ dry-vacuum blower from Howden is a heavy-duty unit with integral ductile iron impellers. The casing headplates, gear cover and drive-end are gray iron. Carburized and ground spur timing gears are taper-mounted on the shaft and secured with a locknut, cylindrical roller bearings, splash lubrication on both ends and easy-to-read sight glasses for maintenance. The blower is capable of handling high inlet temperatures for rough applications. An efficient discharge jet plenum design allows cool atmospheric air to flow into the cylinder, so the blower continues to run under blank-off conditions. It comes in a compact, lightweight package and delivers more than 5,700 cfm in an 8-inch gear diameter frame, as well as 28 inches Hg. **800-557-6687; www.howdenroots.com**

HYDRA-TECH PUMPS S3SHR

The S3SHR 3-inch hydraulic-drive submersible shredder pump from Hydra-Tech Pumps continuously rips and shears solids with 360-degree shredding action. It uses an open-vane shredder impeller with tungsten carbide cutting tip. Compact size allows it to fit in tight spaces. A guide rail assembly is available for stationary applications. Combined with HT11 to HT20 power units, it handles



S3SHR shredder pump from Hydra-Tech Pumps

flows up to 450 gpm. The safe and variable-speed hydraulic drive can be used where electric power is hazardous or impractical. **570-645-3779; www.hydra-tech.com**

JFH DISTRIBUTING SWAM PNEUMATICS BLOWERS

SWAM Pneumatics blowers, distributed by JFH Distributing, have large bearings (SKF or FAG-Schaeffler) and large shaft diameters for longer life in rugged applications, with reduced maintenance. They promise suitable volumetric efficiency at high speed and pressure. Drop-in replacement blowers are available for Robuschi, Hibon, Roots and other brands. Horizontal-flow (or vertical-flow) blowers are available up to 6,600 cfm and vacuum up to 28 inches Hg. Blowers can be made with either mechanical seals or labyrinth/piston-ring seals. **303-279-7797; www.swam-usa.com**



SWAM Pneumatics blowers, distributed by JFH Distributing



KPI turbo blowers from Kaeser Compressors

KAESER COMPRESSORS KPI TURBO BLOWERS

KPI turbo blowers with magnetic bearing technology from Kaeser Compressors have a direct-drive, active magnetic bearing motor and intelligent control system to provide energy savings over conventional rotary blowers up to 25%. They are available in two model ranges with three designs within each. For flow rates up to 4,700 cfm, there is the 200 hp series, and the 400 hp series for flow rates up to 9,400 cfm. Each impeller design delivers different pressures and flow rates. Pressures are available from 4.4 to 20.3 psig. They have gas-tight, permanent magnet motors with active magnetic bearings, integrated frequency converters and closed-loop water cooling. Units are compact and quiet, plus advanced controls offer full interoperability with SCADA systems. Predictive maintenance enables monitoring, error reading and even remote control; and this can be performed on a running system. **866-516-6888; www.us.kaeser.com**

VAUGHAN SELF-PRIMING CHOPPER PUMP

Self-priming Chopper Pumps from Vaughan are designed to be easily accessed outside of the wet well while pumping waste solids at heavy consistencies, without plugging or dewatering of the solids. They eliminate the loss in production and mess, along with making it easy to service the pump to get it back in operation. **888-249-2467; www.chopperpumps.com**



Chopper Pumps from Vaughan

Water/Wastewater Reuse

EVOQUA WATER TECHNOLOGIES OSTARA PEARL

The Ostara Pearl system from Evoqua Water Technologies is a fluidized bed reactor that harvests nutrients from wastewater and transforms them into an eco-friendly fertilizer. This nutrient recovery solution converts wastewater treatment plants into true resource recovery facilities. The system is a fully customizable and modular treatment solution designed to recover phosphorus from pre- and post-digestion liquors, as well as industrial streams, through the controlled precipitation of crystalline struvite. Within the system reactor, the growth of struvite (magnesium ammonium phosphate) is facilitated by the addition of magnesium in a controlled pH setting. This allows nutrients to crystallize into highly pure fertilizer granules, which are harvested, dried and then distributed and sold as Crystal Green Fertilizer. Treated effluent is then discharged from the top of the reactor and returned to the plant with significantly reduced nutrient content. **800-466-7873; www.evoqua.com**



Ostara Pearl system from Evoqua Water Technologies



AdvanTex AX-Max wastewater treatment systems from Orenco Systems

ORENCO SYSTEMS ADVANTEX AX-MAX

AdvanTex AX-Max wastewater treatment systems from Orenco Systems are containerized, fully plumbed plug-and-play units sized for larger commercial and municipal applications. Units come in a variety of configurations, measuring up to 42 feet long by 8.5 feet wide. They can be installed as a single unit or in multi-unit arrays, either above ground or buried to grade. Systems use an attached-growth treatment method to produce clear, odorless effluent with significant nutrient reduction, suitable for subsurface irrigation or surface discharge after disinfection. One unit can process up to 5,000 gpd of raw sewage or 15,000 gpd of primary-treated effluent. Units reduce nitrogen up to 90%, depending on configuration, and can be operated with a part-time operator. They are easy to ship and set and can be installed in a variety of soils and climates. **800-348-9843; www.orenco.com tpo**

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PROUD MEMBER OF:



Treatment plant expands biogas cogeneration system

Problem

The outdated wastewater treatment plant of Oneida, New York, needed an overhaul. In 2019, the city began a multiyear project of designing and implementing energy efficiency improvements.

Solution

Plant operators turned to **Capstone Green Energy distributor RSP Systems**. They initially installed a five-bay microturbine cogeneration system with three bays in operation. And since the enclosure can expand to accommodate larger loads in the same footprint, an upgrade added two more 200 kW microturbines, expanding capacity from 600 to 1,000 kW. Minimally processed biogas fuels the microturbines to produce electricity and thermal energy for digester heating.



RESULT:

The system gave the city more control over its energy use and improved plant energy efficiency, energy and water security, and carbon emissions. **800-422-7786; www.capstonegreenenergy.com**

Centrifuge helps municipality make consistent cake solids

Problem

The Wastewater Treatment Division in Middletown, Ohio, operates a 26 mgd water reclamation facility. In 2018, the utility removed an underperforming belt press that was difficult to operate and produced no better than 15-18% solids. A centrifuge produced 30% solids.

Solution

In 2018, the facility installed a **Flottweg XelletoR centrifuge**, reducing production time from five days a week to three days a week (8-10 hours per day). The older centrifuge was kept as a backup. The city saved money by installing the machine in-house. The facility cut the use of ferric chloride in half and also cut polymer usage significantly.



RESULT:

The city realized cost savings and consistently produced cake at 28-30% solids. "We had to ask ourselves if we really needed the 32% solids," says Gerry Burris, wastewater manager. "We are now averaging between 28 to 30% solids on a consistent basis. For the extra 1.5% solids we couldn't justify the extra expense in chemicals. Flottweg was very responsive to our needs. They will send a tech out whenever we need one, and they stay until they get it right." **859-448-2331; www.flottweg.com**

Pioneering farmer shows the benefits of renewables

Problem

Pig farmer Tom Butler wanted to reduce impact on the environment and increase biogas production at Butler Farms in North Carolina. The farm takes 20,000 hogs per year from their arrival weight of 40 pounds up to about 290 pounds. Manure at up to 10,000 gpd is fed to an anaerobic digester (60 by 180 by 18 feet deep).

Solution

Butler replaced his old small mixers with two **Landia chopper pumps**. Landia also helped optimize the system, which due to unsuitable pressure ratios and varying diameters of pipework put a strain on the biogas-fueled engine.



RESULT:

The upgrade from 10 hp to 60 hp means a million gallons of manure slurry can be moved whenever required. The setup uses the chopper pumps the start of the process; one is enough to keep everything moving. With two nozzles per pump, everything is mixed properly, increasing in methane production by 10%. **919-466-0603; www.landiainc.com**

Coast Guard deploys a rainwater collection and treatment system

Problem

The U.S. Coast Guard needed a new sector headquarters at Ellington Field in Houston, Texas. The 117,000-square-foot facility was required to achieve LEED Silver status. ParkUSA assisted with the design.

Solution

A **RainTrooper Rainwater Collection and Treatment System** from **Park USA** includes a pretreatment filter, 50,000-gallon cistern, cistern pumps, rainwater treatment system, dye and chlorine dosing, a 900-gallon day tank, and re-pressurization booster pumps. A Rainwater Management Panel with a digital touchscreen display monitors cistern and day tank levels, filter system water pressure, building water pressure, and usage of city water and rainwater from the cistern. The panel displays a visual alarm when tank water levels fall below preset levels.



RESULT:

The system has performed as expected, helping the facility to achieve LEED Silver status. **888-611-7275; www.parkusa.com**

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1.866.643.1010

Project uses BAE and existing infrastructure to stabilize food waste and increase biogas production

Problem

A 6 mgd wastewater treatment facility located in a region with multiple food processors needed to stabilize food wastes coming into its receiving station before sending it to the digesters. The facility also could also benefit from the addition of Biological Activity Enhancer (Prodex) to increase gas production and revenue.

Solution

Prodex assistance and the use of existing infrastructure negated a \$3 million to 5 million investment to construct a farm digester from the ground up. The project helped demonstrate that food waste, manure and municipal waste can efficiently mixed to create biogas for a co-generation unit.



RESULT:

The addition of BAE stabilized the materials being treated, increasing biogas output by 37%. The now generates \$150,000 per year in revenue and growing. The plant receives and process effortlessly due to increased buffering capacity and throughput. 856-234-4540; www.prodexproducts.com tpo

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HOERBIGER Safety Solutions
www.ieptechnologies.com/engine



Blue-White FLEXFLO M4 peristaltic metering pump

The FLEXFLO M4 peristaltic metering pump for water and wastewater treatment applications has a large 5-inch display for easy viewing and intuitive touchscreen controls. It also has new, advanced communication protocols including Modbus TCP, EtherNet IP, ProfiBus and is simple to connect M12 connectors for fast, clean and watertight connections. The M4 has remote prime capability so there is no need to manually prime the pump.

714-893-8529; www.blue-white.com



Vertiflo Series 700, 800 and 900 immersion sump pumps

Vertiflo Pump's Series 700, 800 and 900 immersion sump pumps are available with variable frequency drive motors. The pumps are built for sump drainage, flood control and process drainage and meet EPA and OSHA requirements. Depending on the rpm selected, the VFDs provide the capability of varying flow and head performance from a vertical pump. The Series 800 specs include heads to 230 feet, temperatures to 350 degrees F, pit depths to 26 feet and up to 3,000 gpm. Select from cast iron, 316 stainless steel or alloy 20 construction. Series 700 sewage ejector pump specs include heads to 100 feet, pit depths to 26 feet and up to 1,500 gpm. The Series 700 pumps are available only in cast iron construction. The Series 900 has heads to 170 feet, pit depths to 26 feet and up to 1,600 gpm.

513-530-0888;
www.vertiflopump.com

product spotlight

wastewater

Cloth media filter designed for primary treatment

By Craig Mandli

Primary clarification is often one of the most expensive and space-consuming portions of the wastewater treatment process. But there are efficient alternatives starting to hit the market.

Building on the success of their AquaDisk platform, **Aqua-Aerobic Systems** developed the **AquaPrime filter** as an economical and efficient alternative to conventional primary clarification. Taking up only 15% of the footprint of conventional primary clarification, the removal efficiencies of this filter exceed 80% of influent TSS with a corresponding 45% removal of BOD. The greater BOD removal lessens the organic load to the secondary process and can be used to divert influent carbon to energy producing anaerobic digestion processes.

"AquaPrime achieves the carbon diversion without chemical addition and physical removal of solids by three methods within one technology – including settling, filtration and floatable/scum removal," says AquaPrime Product Manager John Dyson. "No other technology utilizes three methods to removal solids/carbon. In addition, it provides TSS and BOD removal without chemical addition and the cost of the chemical and additional solids handling."

The AquaPrime system is designed for the treatment of primary wastewater and wet weather applications. This system utilizes a disk configuration and the OptiFiber PF-14 pile cloth filtration media to effectively filter high solids waste streams without the use of chemicals. The system's high solids removal in comparison to conventional treatment



AquaPrime from Aqua-Aerobic Systems

puts the technology in the advanced primary treatment category, according to Dyson.

"AquaPrime is designed for advanced primary treatment applications. The technology can be used for peak wet weather flow treatment, high solids industrial applications, and tertiary filtration," he says. "Depending on the application, the technology can be located in different parts of a wastewater facility, including after filtration/grit removal only or dual treatment after the secondary treatment process receiving secondary clarified effluent and excess peak wet weather flow over the biological treatment train capacity."

AquaPrime provides reduced carbon loads to downstream secondary treatment process, resulting in aeration energy savings of approximately 20 to 30%, increased capacity in existing secondary treatment processes, reduced basin size for the secondary process, and increased primary solids for anaerobic digestion for increase biogas production (by up to 30 to 40%) to be used for energy production or heating within the facility. "AquaPrime technology meets the needs of the industry because we are providing advance treatment resulting in savings in footprint, construction costs and making wastewater facilities more self-sustaining and efficient," says Dyson.

800-940-5008; www.aqua-aerobic.com



Val-Matic valves for wastewater

Val-Matic offers a wide range of valves for the wastewater industry. Quarter-turn valves have flow path geometries that are optimized to provide exceptional flow control characteristics, ultra-low headloss and energy conservation. Wastewater air valves are designed with a 2-inch clean-out connection to facilitate the passage of solids. Val-Matic check valves are suitable for abrasive slur-

ries and corrosive chemicals with a wide range of metallurgies, seating materials and accessories available.

630-941-7600; www.valmatic.com

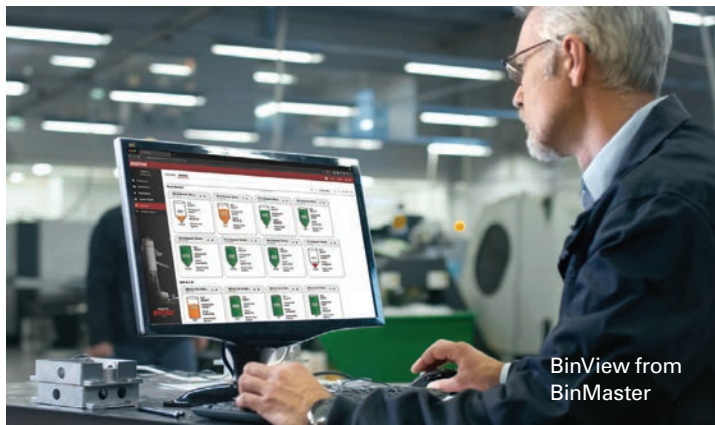


OZ Lifting Products Tele-Pro davit crane

OZ Lifting Products' patented Tele-Pro davit crane features an industry-first telescoping boom adjustment that can be moved in and out while under load. A ratchet screw

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

800-749-1064;
www.ozliftingproducts.com tpo



product spotlight

water

Sensor platform enables inventory monitoring anytime, anywhere

By Craig Mandli

In municipal water treatment applications, there is a constant need to accurately monitor levels in open channels, lagoons, canals, lift stations, sediment tanks, clarifiers and chemical feeding tanks. To make that task easy and relatively hands-off, **BinMaster** offers **BinView**, an internet-based application for remote inventory monitoring of solids or liquids contained in tanks, bins or silos.

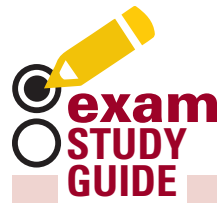
“What’s unique about BinView is it’s not really a product, but a problem solver,” says Jenny Christensen, vice president of marketing for BinMaster. “It addresses the issues associated with measuring levels in tanks, storage vessels or open-air basins or channels, not with just a single product, but a customizable solution. A lot of suppliers offer level sensors, but not everyone has all the components to build a system specifically to the needs of each treatment plant.”

BinView is compatible with many of BinMaster’s sensors as well as other sensors that have a 4-20 mA analog output or Modbus RTU. It can be used to manage multiple vessels at multiple locations. Real-time inventory management and automated alerts can be accessed on site or remotely from a smartphone, tablet or PC with a connection to the internet. That allows it to offer both security and control over assets and users of the application, according to Christensen.

Automation brings centralized digital control, minimal human intervention, and faster and timelier responses,” she says. “That means less time on the phone, managing spreadsheets, fewer trips to the control room, and less time doing routine or redundant tasks.”

Administrative users can have the ability to set up and manage locations, gateways and vessels, while other users may have view-only or receive alerts-only privileges. The system can be set up so that some users have access to all sites, while others may only be able to access data for a single location. That simplicity has been a game-changer for users, according to Christensen.

“People like that it’s easy-to-use and you don’t need to have an IT person on your staff to use the system,” she says. “The fact that it’s portable on a phone or tablet doesn’t keep people tied down to an office or control room staring at a screen. Plants are leanly staffed, and they can be on top of what’s going on without a lot of running around. The system tells them where they might have a problem, so they can focus on known issues versus checking up on the status quo.” **800-278-4241; www.binmaster.com**



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

When conducting a sludge settleometer test, what does the first 5 minutes of the test indicate?

- A. Presence of filaments
- B. Particle collision rate
- C. Presence of zoogloal matter
- D. No useful indication

ANSWER: D. The settled sludge volume after 5 minutes of settling in the settleometer is an indication of how fast the sludge is settling. The first 5 minutes the sludge is in a free-fall state, with only a few collisions of floc particles to slow it down (Eckenfelder and Melbinger, 1957). This is in a typical settleometer analysis, and there may be a few exceptions. This will help operators or lab personnel understand the process and how to read the results. More information may be found in the WEF Manual, Activated Sludge and Nutrient Removal, Third Edition, Chapter 4.

DRINKING WATER

By Drew Hoelscher

What public notification is triggered if a water system exceeds the nitrate MCL

- A. Tier 1
- B. Tier 2
- C. Tier 3
- D. Tier 4

ANSWER: A. The public notification rule is intended to keep customers informed about the safety of their water in a timely manner. Depending on the severity of the issue, a system is legally responsible to notify customers within certain time periods. A Tier 1 notification is considered the highest threat and must be delivered within 24 hours. A few examples of a Tier 1 occurrence would be fecal/*E. coli* contamination, chlorine dioxide MRDL violation, and/or exceedance of the maximum allowable turbidity level resulting, in an MCL violation.

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

people/awards

The Water Environment Federation announced 15 members as its 2021 class of WEF Fellows. They include:

- **Janet Hurley Cann**, Water Environment Association of South Carolina
- **Peter Cavagnaro**, Michigan Water Environment Association
- **Sylvan Coles**, Kansas Water Environment Association
- **Marlo R. Davis**, Water Environment Association of Utah
- **Francis De Los Reyes III**, North Carolina Water Environment Association
- **Jennifer Hartfelder** and **Sidney Innerebner**, Rocky Mountain Water Environment Association
- **Jacqueline Jarrell**, North Carolina Water Environment Association
- **Chris Johnston**, British Columbia Water and Waste Association
- **Raynetta Curry Marshall**, Florida Water Environment Association
- **Kristin Morico**, New England Water Environment Association
- **Erin Mosley**, Louisiana Water Environment Association
- **Aisha Niang**, Water Environment Association of Texas
- **Christopher Peot**, Chesapeake Water Environment Association
- **Prakasam Tata**, Illinois Water Environment Association

Wastewater technician **Todd Jennings** completed his 35th year as operator at the Town of Hillsville (Virginia) Wastewater Treatment Plant.

Three members of the Town of Purcellville wastewater treatment staff were recognized by the Virginia Rural Water Association: **Adam Bailey**, Wastewater Rookie of the Year; **Jason Chapman**, System Operator Specialist of the Year; and **Kristen Muller**, Lab Technician of the Year.

The **Lincoln Transportation and Utilities Wastewater System** in Nebraska received the Engineering News Record Regional Best Projects 2021 Water Award of Merit, the third award the organization has won for its project to turn biogas into renewable natural gas for vehicle fuel.

The Water Environment Federation announced recipients of its 2021 Awards for Operational and Design Excellence:

- Collection Systems Award: **Angela Charles**, Charlotte, North Carolina; and **George Kurz**, Chattanooga, Tennessee
- Morgan Operational Solutions Award: **Michael Parsons**, Hampton Roads Sanitation District
- Project Excellence Award: **Longmont (Colorado) Biogas Treatment and RNG Fueling Station; Metro Wastewater Reclamation District** (Denver), Nuisance Struvite and Dewaterability Improvements; and **Pierce Island Wastewater Treatment** (Portsmouth, New Hampshire), Facility Upgrade
- Safety Award: **Duck Creek Wastewater Treatment Plant**, Garland, Texas
- Industrial Water Quality Achievement Award: **Bongards Creameries**, Perham, Minnesota

Yvonne Bolton, bureau chief of materials management for the Connecticut Department of Energy and Environmental Protection, received a 2021 Environmental Merit Award for Lifetime Achievement from the U.S. EPA.

Tanner Hanson, Yankton Wastewater Treatment Plant superintendent, received the South Dakota Water Environment Association's Select Society of Sanitary Sludge Shovelers (5S) Award after two years as the group's president.

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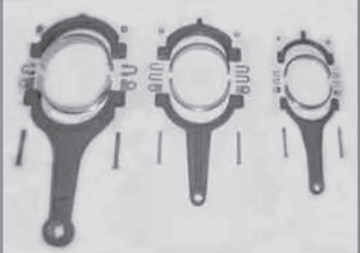
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Dr. Z. Jason Ren, a professor in the Department of Civil and Environmental Engineering at Princeton University, received the 2021 Paul L. Busch Award from the Water Research Foundation. The \$100,000 prize will go toward his development of an inventory and digital tools to measure and track greenhouse gas emissions from the wastewater sector.

After 45 years of service **Jamie Stone**, wastewater treatment plant supervisor, retired from the Western Clinton County (Pennsylvania) Municipal Authority.

Clinton Farley was named superintendent of the Almont (Michigan) Wastewater Treatment Plant, succeeding his father, Mark Farley, who retired after serving 32 years at the plant, 29 as superintendent.

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

events

Jan. 10-12

WEF Forum 2022 – Particles and Colloids – the Next Frontier in Intensifying Water Resource Recovery, Embassy Suites, Fort Lauderdale, Florida. Visit www.wef.org/Forum.

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