TREATMENT PLANT OPERATOR
tpo™
DEDICATED TO WASTEWATER & WATER TREATMENT PROF
tpomag.com
JUNE 2023

Home Sweet Plant

THE FAIR OAKS RANCH TEAM EARNS PLAUDITS FOR DEDICATION AND EFFLUENT QUALITY

Brandon Garrettson
Plant Supervisor
Fair Oaks Ranch, Texas

Brushing away algae so you don't have to.

REMOVING STUBBORN ALGAE IS AS EASY AS...

Algae Brush Cleaning

Learn how an Algae Brush Cleaning System can improve your wastewater treatment system today!

Benefits to clarifiers and thickeners:

- ✓ Labor Saving Solutions
- ✓ Maintenance & Service contracts available
- ✓ Parts are interchangeable with all brands
- ✓ Real breakaway protection
- ✓ No field welding required
- ✓ Self-install kits and factory-install available

ENVIRODYNE SYSTEMS INC.

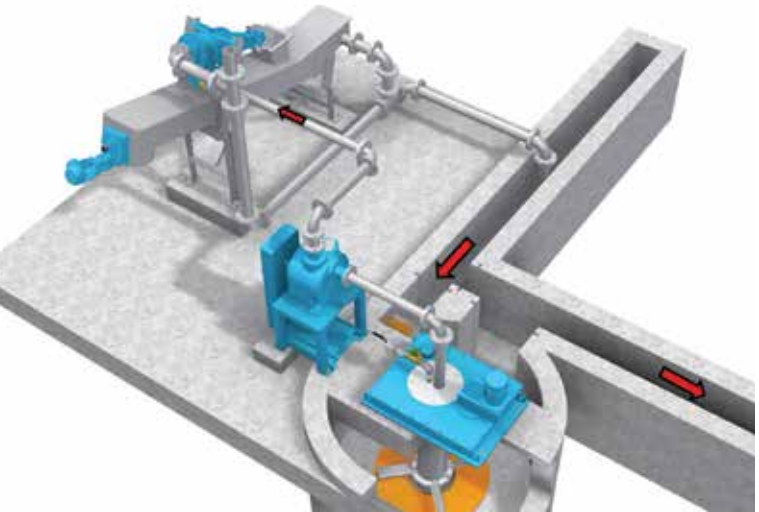
Custom Water & Wastewater Treatment Equipment - Since 1971

Call us at 717.763.0500
or visit www.envirodynesystems.com
for more information.

IMPROVE PLANT PERFORMANCE WITH THE HIGHLY EFFICIENT SPIRAGRIT® VORTEX GRIT REMOVAL SYSTEM

All grit removal systems are NOT created equal.

Speak to one of our experts at **630.837.5640**, email us at **sales@lakeside-equipment.com,** or visit **www.lakeside-equipment.com** for more product information.



THE PROBLEM: Grit accumulation reduces tank and channel volumes and causes abrasive wear on equipment.

THE SOLUTION: Lakeside's SpiraGrit® Vortex Grit Removal System

The Lakeside SpiraGrit® Vortex Grit Removal System is a flexible solution for removing grit from the wastewater treatment process. Its proven design features a relatively small footprint and provides efficient grit removal over a large flow range in both concrete structures and standalone stainless steel tanks.

Various grit pumping options — from flooded suction to top-mounted self-priming — are available to meet your design requirements. We also offer a range of grit classifiers for grit dewatering and grit washers when additional organic removal for cleaner drier grit is required.

LAKESIDE
EQUIPMENT CORPORATION
Water Purification Since 1928

Cleaner Water for a Brighter Future®

contents June 2023

top performers

ON THE COVER: When a wastewater treatment staff literally lives at the plant for five straight days during an ice storm, you'd expect them to win an award. That's exactly what happened at the Fair Oaks Ranch Wastewater Treatment Plant, a few miles west of San Antonio. The 0.5 mgd (design) operation won the 2021 Water Environment Association of Texas Small Plant of the Year award, for operator dedication but also for a superior record in water quality and safety. (Photography by Ethan Rocke)

coming next month: July 2023 FOCUS: Conveyance and Distribution Systems

» Let's Be Clear: What's in a Name for the Ops Challenge? » TOP PERFORMERS – Water Plant: Peace River Authority, Arcadia, Florida | Wastewater Operator: Amanda Martin Akins, Sparta, Georgia | Wastewater Plant: South Austin (Texas) Regional WWTP » How We Do It: Flexible clarifier cover in Rochester, Minnesota » In My Words: Improving utility energy profiles » Sustainable Operations: Boosting biogas at Washington State University » Hearts and Minds: Diverse public outreach in Georgia's Cherokee County » Technology Deep Dive: PISTA INVORSOR process from Smith & Loveless

THERE IS NO EQUAL

JWC's Wastewater Solutions are Unparalleled Since 1973

- Specified nearly three to one over the next two competitors combined
- Thirteen patents and counting
- End-to-end solids reduction and removal equipment offering

There's Only One Monster Family of Wastewater Solutions

Customize a Solution to Fit Your Waste Stream
800.331.2277 | jwce@jwce.com | jwce.com/tpop-there-is-no-equal

JWC Environmental®
A Sulzer Brand

50 Years

advertiser index June 2023

KELLER

WE MEASURE PRESSURE

- OUTSTANDING TOTAL ERROR BAND ACCURACY
- CUSTOM RANGES AND CABLE LENGTHS
- NSF/ANSI 61 & 372 APPROVED FOR DRINKING WATER
- GUARANTEED LIGHTNING PROTECTION
- ANALOG AND DIGITAL OUTPUT OPTIONS
- 2-YEAR WARRANTY
- 3 DAY LEAD TIME

ACCULEVEL - HIGH ACCURACY LEVEL TRANSMITTER

American Water Works Association
ACE23
BOOTH 618
Co-hosted By Ontario Water Works Association

877-2-KELLER
KELLERAMERICA.COM
SALES@KELLERAMERICA.COM

TREATMENT PLANT OPERATOR tpo

DEDICATED TO WASTEWATER & WATER TREATMENT PROFESSIONALS

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

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

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

SUBSCRIPTION INFORMATION: A one year (12 issues) subscription to TPO™ in the United States and Canada is FREE to qualified subscribers. A qualified subscriber is any individual or company in the United States or Canada that partakes in the consulting, design, installation, manufacture, management or operation of wastewater and water treatment facilities. To subscribe, visit tpomag.com or call 800-257-7222.

Nonqualified subscriptions are available at a cost of $60 per year in the United States and Canada/Mexico and $150 per year to all other foreign countries. To subscribe, visit tpomag.com or send company name, mailing address, phone number and check or money order (U.S. funds payable to COLE Publishing Inc.) to the address above. MasterCard, VISA and Discover are also accepted. Include credit card information with your order.

ADDRESS CHANGES: Submit to TPO, P.O. Box 220, Three Lakes, WI 54562; call 800-257-7222; or email holly.gensler@colepublishing.com. Include both old and new addresses.

Our subscriber list is occasionally made available to carefully selected companies whose products or services may be of interest to you. Your privacy is important to us. If you prefer not to be a part of these lists, please contact Holly at holly.gensler@colepublishing.com.

ADVERTISING RATES: Call Kim Bruss at 715-891-0404 or email kim.bruss@colepublishing.com, or call Phil Hahn at 715-493-9913 or email phil.hahn@colepublishing.com. Publisher reserves the right to reject advertising which in its opinion is misleading, unfair or incompatible with the character of the publication.

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

DIGITAL REPRINTS AND BACK ISSUES: Visit www.tpomag.com for digital reprint options and pricing. To order back issues, call Holly at 800-257-7222 or email holly.gensler@colepublishing.com.

CONTROLLED CIRCULATION: 60,500 per month

Are You Better Than You Think You Are?

SOMETIMES WE ARE NOT THE BEST JUDGES OF OUR OWN CAPABILITIES. SOMETIMES WE GIVE OURSELVES LESS CREDIT THAN WE DESERVE, WHILE OTHERS SEE OUR REAL WORTH.

By Ted J. Rulseh, Editor

Several years ago I helped judge a high school public speaking competition. One student, clearly nervous and flustered, had some trouble with her talk and while leaving the podium remarked, half out loud, "That was horrible."

I thought she was much too hard on herself, and so on her evaluation I wrote in part, "That was not horrible. This student is better than she thinks she is." I hope she got to read that because to me it seemed what this girl needed above all was an extra dose of confidence.

And isn't that true about many of us? I'll cite a few examples from my own life where I underestimated myself. I do this not to boast, since I have plenty of shortcomings, but to illustrate how we can limit ourselves by having the wrong self-perceptions.

THE CLASS AND THE COURT

While a sophomore in college I took a first-semester creative writing course. I did well but didn't consider my work to be anything special. Toward the end of the school year there was an annual awards assembly, which I didn't attend.

To my great surprise, I found out afterward that one of the stories I wrote for the course was to appear in the once-a-year campus literary magazine, and had earned second prize in the prose division. Here I was, a lowly underclassman, winning out over the juniors and seniors whose work dominated the publication.

For several years after college I played on a basketball team that was part of an inter-city league. Some of the teams had guys who had played in college; I had only played in high school. During the second season I remarked to a friend about what an excellent player my team's captain and point guard was. He responded, "Geez, what about you?" And, lo and behold, for that and the next two seasons, I was the one voted onto the all-league team.

How much more good could we do if we gave ourselves the credit we deserved; if we carried the appropriate level of self-confidence?

THE BAD BOSS

At a couple of points in my early career I was promoted into supervisory roles. The first was as editor of a twice-weekly newspaper and two weeklies serving suburban communities. I would describe my work personality back then as an odd combination of insecure and bossy. Upon leaving three years later for a career change, I thought I had ill-served the reporters who had been on my team.

Just a few months ago I had occasion to talk with one of those reporters, who had gone on to a long and successful newspaper career. During a lengthy

and pleasant phone call he mentioned how much he had enjoyed working with me, and allowed that I was the editor who really taught him how to write well: "My time with you was when things fell into place."

Who knew? My perception was that I had made excessive changes to his stories without bothering to explain what I was doing and why. He saw things in a completely different light and felt I had helped put his career on track.

SERIOUS STRUGGLES

Later, after a promotion to account supervisor at an advertising and public relations agency, I was so sure I was failing that I asked my boss to demote me to a role as a copywriter or editor. He refused, and I floundered on.

Well, over the years, three of the people who worked with me back then made a point to reach out. One who had gone on to a career in business communication overseas called me on a visit back to the states and invited me to lunch.

Another, just a few years ago, mentioned me in a blog post as someone who had been a good influence in his early career. And the third, after an exchange of messages on LinkedIn, which he initiated, said he still remembered a two-minute lesson I gave him on parallelism in writing sentences.

If asked, I would have guessed all three of those men would give me at best neutral and more likely negative evaluations as a boss. What did they see in me that I failed to see in myself?

FALSE LIMITATIONS

I would suggest based on experience and observation that self-deprecation is a more common trait than arrogance. How much more fulfilling would our careers and lives be if we could look with fairness at our abilities. How much more good could we do if we gave ourselves the credit we deserved; if we carried the appropriate level of self-confidence?

A quote attributed to Henry Ford provides a good note on which to end: "Whether you think you can't or think you can, you're right." **tpo**

@tpomag.com

Visit the site daily for new, exclusive content. Read our blogs, find resources and get the most out of *TPO* magazine.

GREAT LAKES MICROPLASTICS

Breaking Down the Problem

A big challenge to the health of the Great Lakes takes a tiny form: microplastics. In a study of microplastics on 37 National Park beaches, microfibers were found at every site and made up 97% of the microplastic debris. The highest concentration of microplastics in this national study was found at the Apostle Islands National Seashore in Wisconsin.

tpomag.com/featured

OVERHEARD ONLINE

"Our study has shown that only 10 daily samples from 10 wastewater treatment plants are needed to provide anonymous and unbiased information on the health of 7 million people."

How Wastewater-Based Epidemiology Can Catch Outbreaks Early and Save Lives

tpomag.com/featured

WORKPLACE SAFETY

A Shared Responsibility

Since workers spend an average of eight-plus hours a day with each other, they have to be able to depend on each other, going the extra mile to look out for one another and speaking up when something isn't safe. Learn about OSHA's regulations that require workers to keep a watchful eye on each other in this online article.

tpomag.com/featured

Join the Discussion

Facebook.com/tpomag
Instagram.com/tpomag
Twitter.com/tpomag

Emails & Alerts

Visit **tpomag.com** and sign up for newsletters and alerts. You'll get exclusive content delivered right to your inbox, and you'll stay in the loop on topics important to you.

AWARD-WINNING PROJECT

Safeguarding a Trout Fishery

Upgraded with an E.A. Aerotor Plant from Lakeside Equipment Corporation, a water and wastewater treatment plant that sits right next to one of the world's best trout fisheries has won the coveted Top Project award in the Water and Wastewater category of the American Council of Engineering Companies Arkansas Engineering Excellence Awards.

tpomag.com/featured

MEASURING WHAT MATTERS

pipe::scan

This multiparameter system analyzes drinking water quality in network pipes under pressure, monitoring up to 10 parameters online—ranging from TOC to chlorine—in a single compact integrated device.

To learn more visit us at booth #1219 during ACE23 or at s-can.at/InNetwork

Pressure
UV254
Color
Temperature
NTU
FCI
EC
UVT
pH
TOC
DOC
ORP

s::can
A Badger Meter® Brand

A secondary clarifier and the centrifuge facility at the Tres Rios Water Reclamation Facility in Pima County, Arizona.

Out With Struvite

A NUTRIENT RECOVERY TECHNOLOGY HELPS THE TRES RIOS WATER RECLAMATION FACILITY END PIPING BLOCKAGES, SAVE MONEY AND REDUCE PHOSPHORUS RETURN TO THE HEADWORKS

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Mark Henle**

Struvite had become a serious problem for the Tres Rios Water Reclamation Facility in Arizona's Pima County.

The buildup of struvite occurred downstream of the anaerobic digesters and especially in the centrifuge facility where biosolids are dewatered from 2.5% to 18-20% solids. "We'd see it form especially in the centrate lines because the centrate was so phosphorus-laden," says Steven Richey, plant manager.

"Struvite is kind of like kidney stones. It's made up of the same material. With the amount of phosphorus we had in the system, we were almost totally occluding pipes. It was almost like the formation of concrete on the pipe walls. We started seeing high pressure on the discharge side of pumps. Eventually you have a 10-inch pipe with only a 3-inch hole down the middle, if that."

Jason Hartman, assistant plant manager for operations, adds, "The main centrate header coming off the centrifuges is an 18-inch line, and it was almost completely occluded when we got in there and cleaned it out."

To solve the problem, the Tres Rios team worked with the HDR engineering firm and Schwing Bioset to implement North America's first installation of the NuReSys nutrient recovery technology. The $6 million system precipitates the struvite within the digestate stream so that it can be removed with the biosolids.

The system converts more than 85% of the orthophosphate in the centrate to struvite crystals, resolving the buildup. It also greatly reduces the phosphorus recycled back to the treatment plant headworks, leaving no more than 50 mg/L of orthophosphate in the return stream.

AN ESSENTIAL FACILITY

The Tres Rios plant (50 mgd design, 30 mgd average) serves the Tucson metropolitan area and is the central biosolids treatment site for all eight of Pima County's clean-water facilities. It is permitted for A+ reclaimed water through the Arizona Department of Environmental Quality. Some of the reclaimed water is used on site and for irrigation at a neighboring park, but most of the effluent discharges to the Santa Cruz River.

Biosolids cake is hauled from the site, land-applied and incorporated into the soil by Synagro. The Tres Rios facility produces 180 wet tons per day of dewatered biosolids from its own operations and the other Pima County plants.

The plant was built in the early 1970s with a high-purity oxygen activated sludge process. In 2006 a mixed liquor extended aeration process came online with the high-purity oxygen still in service. In 2014, as part of a Regional Optimization Master Plan, the five-stage Bardenpho process for ammonia and total nitrogen removal was brought online.

"We started having the struvite problem when the mixed liquor extended aeration process was added, but we really saw it when we

Plant manager Steven Richey with the NuReSys nutrient recovery system (Schwing Bioset).

> “Our NuReSys facility is helping us get the phosphorus out in the biosolids, so it can go into the field for land application.”
> **STEVEN RICHEY**

Tres Rios Water Reclamation Facility

Pima County, Arizona
www.pima.gov

BUILT:
1972 (latest upgrade completed 2020)

FLOWS:
50 mgd design, 30 mgd average

TREATMENT PROCESS:
Activated sludge (five-stage Bardenpho for biological nutrient removal)

TREATMENT:
Secondary

RECEIVING WATER:
Santa Cruz River

BIOSOLIDS PROCESS:
Anaerobic digestion, dewatering

BIOSOLIDS VOLUME:
180 wet tons/day

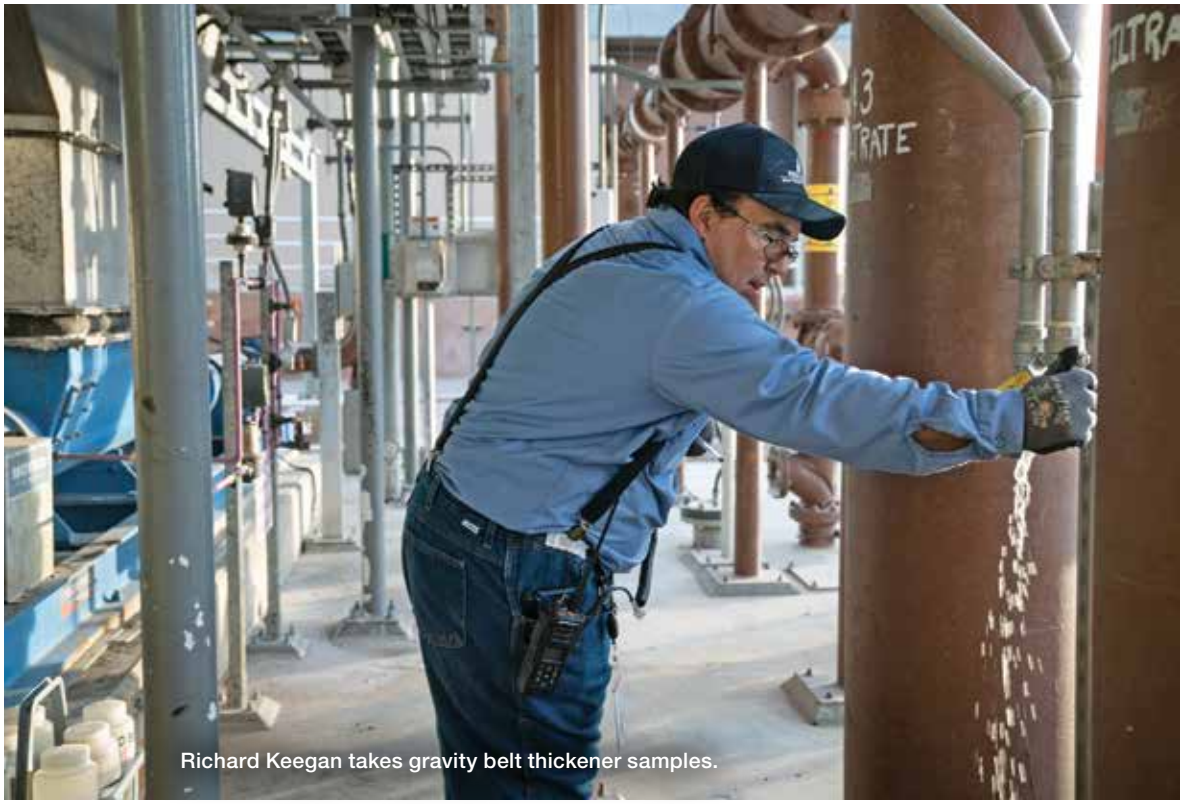
BIOSOLIDS USE:
Land application by contractor

put in the five-stage Bardenpho," Richey recalls. To slow struvite buildup, the plant team added ferric chloride to the process stream to change the pH of the biosolids, and added dilution water in the centrate return lines.

"But then we still had all that phosphorus going back to the plant in the centrate," Richey says. "Now our NuReSys facility is helping us get the phosphorus out in the biosolids, so it can go into the field for land application."

CHOOSING A REMEDY

In exploring potential remedies for the struvite buildup, HDR worked with the county to establish a set of performance specifications, including at least 85% reduction in orthophosphate and an electrical demand less than 10 kWh per kilogram of phosphorus removed. The specifications were then shared with two technology vendors for cost proposals.



Richard Keegan takes gravity belt thickener samples.

Steven Richey, shown checking the gravity belt thickener, reports on a good working relationship with Schwing Bioset on design modifications to the nutrient recovery process.

One technology was pilot-tested. The NuReSys process, although not pilot-tested at Tres Rios, had been proven in numerous installations in Europe. It was ultimately chosen in 2018 based on a financial evaluation. In addition, the Tres Rios plant had experience with Schwing Bioset, having used the company's positive displacement piston pumps to lift dewatered biosolids into the elevated silo from which the material is dispensed into trucks.

"We've had a good relationship with Schwing Bioset," says Richey. "We had confidence in them, and they were willing to work with us on design modifications going forward."

CREATING CRYSTALS

Struvite control starts with managing the pH of the feed streams to influence the reaction of magnesium with the phosphorus in solution. This happens in an air stripper. Once an ideal pH condition is created, magnesium precipitates the soluble orthophosphate ions as struvite.

The addition of magnesium chloride enables continual precipitation of struvite from the waste stream. For every one pound of orthophosphate removed, an additional half-pound of ammonia nitrogen is also captured.

In the process at Tres Rios, the three Westfalia centrifuges (GEA Group) are downstream from the NuReSys process. Digestate is pumped into the NuReSys CO_2 release tanks (air strippers). There, carbon dioxide is released via coarse-bubble aeration, raising the pH to the desired condition. Overflow from the air stripper proceeds to a crystallizer, where magnesium chloride is added in proportion with the orthophosphate concentration and stream's solids content.

SOMETHING TO SELL?

While the NuReSys process can include the separation and harvest of the struvite crystals as a marketable fertilizer product, the Tres Rios team did not see an adequate return on investment from that step and so opted to leave the crystals in the biosolids for land application.

"We still have the option to capture the struvite," says Steven Richey, plant manager. "It's a question of whether we'll be able to find a market for it. Down the road, if we find a market, we have the ability to add a harvest package."

Harvest would be accomplished by replumbing and redirecting flow from the centrate lines (after centrifuge dewatering) to the crystallization tank. That change would enable the system to recover up to 90% of the struvite produced.

The Tres Rios nutrient recovery project has been recognized with several awards for excellence. It received the Grand Award in the Clifford S. Sawyer Award for Innovation Program, sponsored by the American Council of Engineering Companies.

It also was the award winner for Technology Innovation in Arizona Forward's 40th Annual Environmental Excellence Awards presented by SRP, a community-based public power utility serving the greater Phoenix metropolitan area.

In the crystallizer, a continuously stirred tank reactor, the magnesium reacts with the soluble orthophosphate ions and nitrogen, allowing the struvite crystals to form and grow. The process yields 1-3 mm struvite crystals. "You can definitely see them in the cake biosolids," Hartman says. "They almost look like rhinestones in the sunlight."

FINE-TUNING

The NuReSys process was commissioned in November 2020. It has functioned well, although some midstream adjustments have been made. A significant challenge was in constructing and integrating the technology while keeping the Tres Rios biosolids process operating without interruption. "We are an end-of-the-line facility," Hartman observes. "We don't have the ability to close the gates and stop the flow.

"We're processing all of Pima County's biosolids, so our centrifuge building is in operation 24 hours a day, seven days a week. The integration and the ability to bring this new process online, while still producing biosolids and sending it offsite, required awesome coordination by our staff and our contractors."

> "We've reduced the ferric chloride by about 75%. Now we just add a small amount to the digesters, mainly for H_2S control."
> **JASON HARTMAN**

Richey adds, "We've had to do some workarounds and some modifications. Schwing Bioset has been very accommodating, especially during the first year, in allowing us to make those modifications without voiding our warranties."

One issue involved the process overflow from the air stripper tanks to the crystallization reactor, as struvite constricted the lines, and cleaning them was labor-intensive. That was corrected by a plumbing change that made it possible to waterjet the lines.

Another adjustment involved the addition of polymer ahead of the centrifuges. "We expected to use an amount of polymer comparable to what we used before," says Richey. "But we found the dry polymer we were batching and mixing on site didn't have a high enough molecular weight to process the biosolids without the ferric chloride and the same amount of phosphorus in the system. We had changed the consistency of our material, so we had to switch to an emulsion polymer that is considerably more expensive."

KEEPING IT RUNNING

Tres Rios operation and maintenance technicians operate the system 24/7 and collect the process control samples required for troubleshooting and process decision-making. During startup and commissioning, daily orthophosphate testing was performed on site to fine tune the magnesium chloride feed rate.

Central maintenance heavy-duty mechanics remove and clean struvite-laden piping during process upsets. Especially before piping modifications for CO_2 tank overflow pipe cleaning, maintenance also incorporated weekly flushing of the piping with plant process water to help keep the formation of struvite from starting.

Instrumentation technicians clean and calibrate the system's pH and level control instruments. Quarterly tank cleanings are ongoing. A contracted combination truck service (Vactor) clears debris from the tanks being cleaned and jets the struvite formation from overflow piping between the CO_2 stripper tanks and crystallization reactor. Buildup of rags and hair in the reactor after startup has decreased with a prescreening size change from 5 mm to 2 mm.

CLOSE COLLABORATION

A residual benefit of the NuReSys process is substantial savings on ferric chloride. "We've reduced ferric chloride addition by about 75%," Hartman says. "Now we just add a small amount to the digesters, mainly for H_2S control. We were pumping more than 360,000 gallons a year, and now we're down to less than 100,000 gallons a year." A chemical that once cost nearly $1 million per year now costs about $300,000.

Steven Richey, plant manager

Frank Sanchez unloads sodium hypochlorite at the Tres Rios Water Reclamation Facility.

Hartman cites close relationships among the plant team, HDR and Schwing Bioset as important to the project's success. The work was complicated by the onset of the COVID pandemic, as a slowdown in supply chains caused delays in receiving some equipment. That aside, "Between HDR and Schwing Bioset we always had good response. People were professional in helping the work move forward." tpo

featured products from:

GEA Group
800-722-6622
www.gea.com

HDR
800-366-4411
www.hdrinc.com

Schwing Bioset, Inc.
715-247-3433
www.schwingbioset.com

Synagro Technologies, Inc.
800-370-0035
www.synagro.com

Vactor Manufacturing
815-672-3171
www.vactor.com

Examples of winning entries in the calendar art contest in Florida's Polk County.

Art by the Month

A FLORIDA UTILITY'S K-12 STUDENT ART CALENDAR ENGAGES YOUNG PEOPLE ON WATER CONSERVATION — AND IN THE BARGAIN EVEN REACHES TOURISTS

By Sandra Buettner

An annual art calendar contest in Florida's Polk County gets students and teachers thinking about water and its importance in their lives.

The contest was started in 2003 by Jacqueline Hollister, environmental specialist for the utility, who recognized a need for water conservation education in the Polk County schools.

The county, in Central Florida, serves 755,000 residents in a 2,000-square-mile area, and more people move in every day. The Southwest Regional Wastewater Treatment facility in the county uses a 41-mile piping system to distribute recycled wastewater for irrigation at more than 1,800 homes, two golf courses, a park and Tampa Electric Company cooling tower.

BROAD PARTICIPATION

The contest starts shortly after the first of the year and ends in April, giving utility staff time to collect submissions, have them judged, and put the winning entries in the next year's calendar.

An email goes out to educators and principals in all of the county's schools, covering grades K-12. Public, private and charter schools and home-schooled children can enter.

Some teachers use the contest as a way to interest students in water conservation. Although any teacher can participate, art teachers send the most student submissions — from 100 to 300 in any given year.

Grade school teachers like to announce the contest before spring break so that the students can work on their art and messaging while they're off from school. Once the 3,000 calendars are printed, they are available to residents, schools, and the general public. The calendar is also available in digital format.

PROMOTING THE CONTEST

The contest is promoted through the utility's newsletter and social media. In addition, school boards send an email blast to all educators. Usually about 100 schools take part, and Hollister has worked with many of the teachers for the contest's entire 20-year history. New teachers are added every year.

The utility tells residents about the contest at public events throughout the year, such as the 7 Rivers Water Festival. Winning entries have been printed on banners that hang at the events, and county staff members have discussed putting them on T-shirts and county vehicles to create more awareness and recognition.

CHOOSING THE BEST

The utility has tried different judging ideas. At first, utility employees voted for their favorite submissions. Later, county residents judged the art and the themes at utility-sponsored events. Now, entries are posted on the utility's conservation website, and residents vote online.

"This way, we are promoting the water-saving message not just to the students and educators, but also the public," says Hollister. "It is important they conserve water as well. It is important for all ages to do their part in being good water stewards."

"With the combination of outstanding artistry and emotion that is evident in the students' submissions, it really makes for a powerful message."
JACQUELINE HOLLISTER

Hollister is always amazed at the creativity and thought children put into their submissions. Many focus on wildlife and what could happen to creatures if the well were to run dry. They look to their community's future needs and the importance of a clean water supply.

"With the combination of outstanding artistry and emotion that is evident in the students' submissions, it really makes for a powerful message," says Hollister.

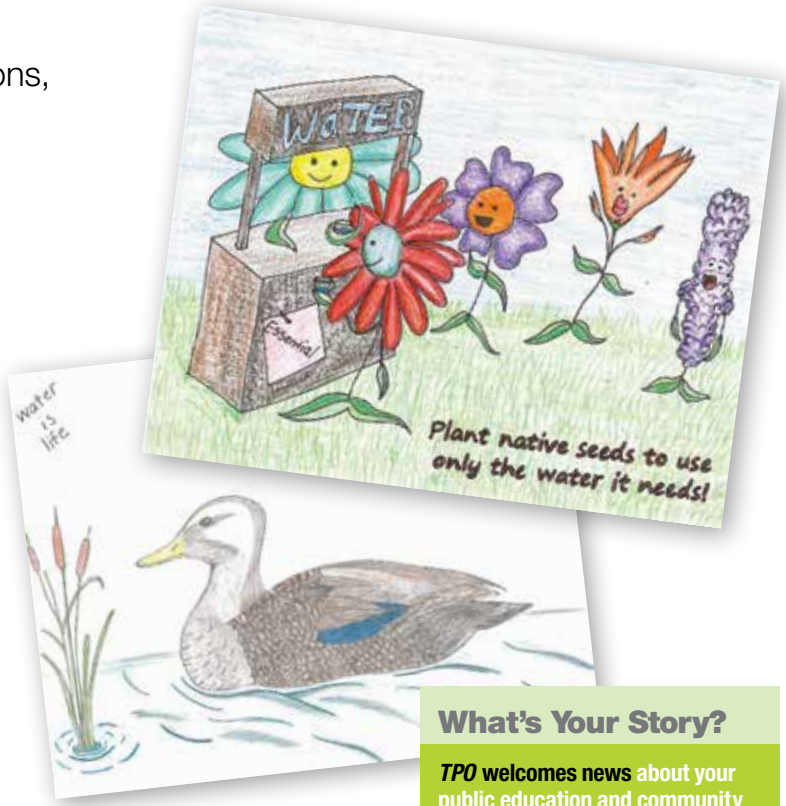
PUBLIC EDUCATION

The calendars are available free to anyone who asks and are available for pick up at the utility's offices. Requests come in from all over the state, and from visitors outside the state and around the world.

People also pick them up at utility events; by looking at the artwork, they learn what they can do to preserve water. Staff members have been surprised at how popular the calendars are with visitors and tourists.

Because so much of the state relies on tourism, property owners put the calendars in their rental units. The artwork reminds guests to practice good conservation habits, such as taking a short shower or turning off the faucet when brushing their teeth.

"It's also a boost for the children to take part even if they don't win," says Hollister. "For the children who do win, it gives them the confidence and reassurance that they have artistic talent." Hollister notes that one student went on to major in art in college because of the contest. **tpo**



What's Your Story?

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

Supplying Water in Oil Country

IN THE VAST OPEN SPACES OF NORTH DAKOTA, GRACE RIXEN LEADS A TEAM PRODUCING HIGH-QUALITY WATER PRIZED BY RURAL RESIDENTS

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

North Dakota isn't just a windswept place haunted only by antelope and jackrabbits.

From 2010 to 2021, the state's population grew by just over 15%, driven largely by an oil drilling boom. That growth brought increasing demand for the Southwest Water Authority, based in Dickinson.

As water treatment manager for the authority, Grace Rixen oversees three plants that treat water pumped from Lake Sakakawea, a flowage of the Missouri River. The water is distributed over a large section of southwestern North Dakota.

The high-quality surface water treated by the three plants is in demand among rural residents in an area where underground sources are generally poor.

Grace Rixen is well served by experience in a variety of settings. She has observed different processes and how many kinds of equipment work.

DISTANCE PUMPING

Two of the plants are in Dickinson, about 100 miles south of the lake. The Dickinson Water Treatment Plant (12 mgd) was put into service in 2018, and the Southwest Water Treatment Plant (6 mgd) plant was built in 1951. The Oliver, Mercer, North Dunn plant at Lake Sakakawea (5.5 mgd) serves the northern part of the authority's territory.

The Dickinson plant is the first phase of creating a new plant to completely replace the Southwest plant; design is underway on phases two and three of the replacement. "So I'm hoping within four or five years we might have a new 18 mgd plant," Rixen says.

The authority is also expanding its pipeline network with intent to increase plant run time. At present the plants run 16 to 20 hours per day. An operator is always on site at the plants when they are running.

At both Dickinson plants, raw water is softened with lime. The Southwest plant uses conventional filtration with sand-anthracite beds; the Dickinson plant uses ultrafiltration (Tonka Water). The OMND plant uses ultrafiltration followed by reverse osmosis (Toray). Concentrated brine from the RO membranes is pumped to the lake, and sludge from the backwash system flows to a pond.

At all three plants, ozone is added for taste and odor control. Chloramine is added before distribution to boost the chlorine residual in the system's 5,260 miles of pipe. The aging Southwest plant is still the workhorse of the system. There have been no major breakdowns, only a continuing drip of problems.

Some days have brought heavy demand for water, but never in excess of the system's design capacity. "At

A SPRAWLING TERRITORY

Demand for water from the Southwest Water Authority continues to grow, in part because of growing population and industry, but also because of poor groundwater.

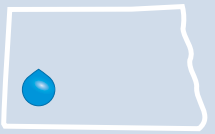
"It's why so many rural people want to come on to the system," says Grace Rixen, water treatment manager. "I live rural, and I would like to get on Southwest Water."

The authority serves 33 communities and 7,450 customers with 5,260 miles of pipe: "We go all the way into Perkins County in South Dakota," says Rixen. "That is more than 150 miles from the source to our farthest tap." The state line is about 65 miles south of Dickinson. Another pipe heads west about 65 miles to Beach, North Dakota, at the Montana border.

Dickinson is in southwestern North Dakota, about 500 miles northwest of Minneapolis and the same distance northeast of Denver. Pipes to a community also serve farms and ranches along the route. Water is used for people, livestock, machinery such as sprayers, and for industries such as the Red Trail Ethanol Plant and Baker Boy, which makes bakery goods for convenience stores and other customers.

The system came about because the towns in the area are too small to finance their own water treatment plants. "You have to keep upgrading, because there's so much new technology today," Rixen says. "Then you have to find people to run the facilities."

Construction of the pipeline system started in 1986, and the first community went online in 1991. Rixen observes, "The first rural areas we went through, the pipe is now maxed out. So we're having to go back in and do sign-ups and put more pipe in the ground as well."



Grace Rixen, Southwest Water Authority

Dickinson, North Dakota

POSITION:
Water Treatment Manager

EXPERIENCE:
35 years in the industry

DUTIES:
Manage three water treatment plants and one residuals management facility

EDUCATION:
Associate degree, water quality and environmental health, Montana State University - Northern

CERTIFICATION:
Level IV Water Treatment, Level III Wastewater Treatment, Level I Distribution

GOAL:
Provide safe and good quality drinking water

one time the oil drillers were using a lot of finished water for fracking," Rixen says. Then the authority built a raw water filling station, which the oil companies then used because it was less expensive.

In addition to the treatment plants, Rixen manages a plant to handle waste slurry from the lime-softening process. Previously that waste flowed into a pond. Now about 50% of the water is removed with a filter press (Evoqua Water Technologies), leaving lime cake, which a farmer under contract with the authority uses for soil pH adjustment. "It's pretty awesome instead of landfilling all that," Rixen says. In 2021, the residuals plant pressed 7.5 million gallons of slurry.

HOME AGAIN

Rixen grew up in Richardton, 26 miles east of Dickinson. Newly out of high school in the 1980s, she went to work in home construction doing rough carpentry and roofing. "We had that recession, and housing just stopped."

She worked odd jobs for a while, and at age 23 enrolled at Montana State University Northern in a program focused on water and wastewater treatment. She chose the water industry for the work environment: "I didn't want to work behind a desk. I like working outside, and I did it for many, many years."

Grace Rixen's key challenge in the past few years has been bringing new facilities online and training operators to run them at peak efficiency. She is shown testing the air valve for a membrane filtration system (Tonka Water).

> "You're only as good as the team you have with you. My job is to help them do their job."
>
> **GRACE RIXEN**

Her first job was operating a wastewater treatment plant in Hamilton, Montana. She was there for 14 years and also worked in the certified lab doing BOD, coliform and related tests. Then she moved to a wastewater plant in Cheyenne, Wyoming. Her next stop was in Lafayette, Louisiana, where she switched to the drinking water side, working about five years as operations supervisor for the two treatment plants.

"I made a conscious choice," Rixen says. "I'd been in wastewater for so long, and I wanted to see what the water side was about." She joined the Southwest Water Authority in 2012: "I always wanted to move back home. Now I live only two miles from the ranch I grew up on."

She worked at returning home for several years. While living in Cheyenne she bought a one-room country schoolhouse on 10 acres. "I gutted the whole thing and turned it into what they call a tiny home now," she says. "It's cute as a bug."

She spent years on the project, driving eight hours back to Dickinson to work on the house. While working in Louisiana, she spent vacation time at the home working on the first-floor living space. Now her home is 1,200 square feet evenly split between the main floor and the basement. She kept the south-facing window framing but installed high-efficiency windows.

When she moved back in 2012, she lived on the main floor, which she likens to a studio apartment. Friends and family helped her remake the basement into a master suite. The well on the property delivers good water — unusual for the area. Still, she wants to connect to a water authority main: "We could get into a drought. A lot of wells do dry up."

IT'S A TEAM THING

In 2021, Rixen received the Outstanding Water Works Employee Award from the North Dakota Rural Water Systems Association. "Grace's hard work, knowledge and dedication made her an excellent candidate for the award," says Jen Murray, Southwest Water CEO. "Grace has gone above and beyond to ensure our customers receive quality water."

Rixen was modest. "I don't talk well about all this," she says. "The operators are the reason for my award. That's how I see it. You're only as good as the team you have with you. My job is to help them do their job. I talk to the operators at all four facilities every day."

The team includes Jeff Altringer, Kyle Price, and Brad Stieg, Level I certification; Jesse Penor, Level II certification; AJ Sokolofsky, Joe Froelich, and Perry Grammond, Level IV certification; Janel Tomanek, maintenance worker; and Steve Fetsch, Lawrence Dunn, Tim Froemke and Robert Zastoupil, operators in training.

Rixen's experience in different places serves her well. She has seen different processes and how the equipment works. Hamilton, for example, was a mechanical plant with an oxidation ditch and clarifiers. Cheyenne used activated sludge, but was interested in a moving bed biofilm reactor, which she had the chance to run on a trailer-mounted pilot plant.

The team at the Southwest Water Authority includes, from left, Jeff Altringer and Kyle Price, operators; Perry Grammond, senior operator; Tim Froemke, operator; Joe Froelich, senior operator; Grace Rixen, water treatment manager; Brad Stieg and Robert Zastoupil, operators; AJ Sokolofsky, senior operator; and Mitch Caudle and Jesse Penor, operators. They are shown with the ultrafiltration membranes (Tonka Water) at the treatment plant.

CERTIFIED REFERENCE MATERIALS + PROFICIENCY TESTING

spex certiprep | nsi | hps

CLEARLY THE WISEST DECISION YOU WILL MAKE.

Choose NSI's **Certified Reference Materials** (CRMs) to monitor analytical performance of your wastewater testing with **full confidence**.

- Unique, pre-measured, single use reference materials that **prevent laboratory errors and re-work.**
- Ready-to-use CRMs require **no preparatory steps to save time and effort.**
- Offering scheduled **Proficiency Testing, on-demand PT Express™ and custom standards**.
- Quality assured **ISO 17025**, **ISO 17034** and **ISO 17043** accredited.
- **Sign-up today for DMRQA-43**

ORDER | SIGN-UP TODAY
@ WWW.NSILABSOLUTIONS.COM

LEARN MORE

Rixen (shown checking the open/close limits on a Sharpe air-actuated valve from ASC Engineered Solutions), reaches out to potential recruits in part by teaching career day classes for schools.

> "I didn't want to work behind a desk. I like working outside, and I did it for many, many years."
> **GRACE RIXEN**

NEW CHALLENGES

Her biggest challenge during the past few years has been bringing new facilities online: it takes time for operators to learn how a plant runs most efficiently. Her days are typically spent troubleshooting, dealing with equipment, and/or finding parts. Operators handle chemical inventory and ordering.

Her routine is to stop at the Southwest plant in the morning, talk to operators, see what issues they are having, and look at the SCADA system. The next stop is her office at the Dickinson plant. The SCADA system there tells her what is happening at the residuals facility.

"Because OMND plant is 100-plus miles away, I call them every day," she says. "I don't go up there every day. They let me know what they're having problems with, what they need. If it's a mechanical problem, I can pretty much give them suggestions to look at certain things." When the OMND plant was new, she visited weekly. Now she visits about once a month.

YOUNG TEAM

As with many water utilities, finding workers is difficult. Rixen has a young crew: "When I started, there were five main operators, and they were running just one plant at that time. I now have 12 operators, and they're all new."

The longest-term team member has been on staff for 10 years; all are in their 30s and younger. Some have had experience elsewhere, and others not. Recruiting is still tough because Dickinson has to compete with better-paying systems, and with the oil fields.

At the same time, some people on her team left oil field work: "The deciding factor for some was that they were working so much, and they didn't have time to spend with their families."

People coming from petroleum companies have two advantages: mechanical aptitude and a good work ethic. "Our work isn't just operations," Rixen says. "I don't have a maintenance crew. The operators are it. If they're not operating a plant, then they're doing maintenance."

To build a pool of potential recruits, Rixen regularly teaches career day classes for schools. One point she emphasizes is stability. "You might have a job for a couple of years in the oil fields, and then you're laid off," she says. "I'm trying to get the younger generation more interested in utilities. It's a job that'll never go anywhere."

So far the career day classes have not yielded new team members. "I have a position open right now that I'm having a hard time filling," she says. Her team can train almost anyone, but a potential operator needs to be curious, ask questions, and be invested in the work: "It's not just a job."

Her own work is far from where she started. She's behind that desk she wanted to avoid, but it's a good place for where she is in life.

"I can't crawl inside tanks," says Rixen. "I can't crawl under equipment. So I'm right where I should be." When managing four facilities becomes overwhelming, "I have to stop and say, 'That's today. Tomorrow will be different.' There's always a solution to a problem, and we always figure it out." tpo

Jesse Penor (left) and Rixen calibrate a Hach turbidity meter.

featured products from:

ASC Engineered Solutions
800-301-2701
www.asc-es.com

Evoqua Water Technologies LLC
800-466-7873
www.evoqua.com

Hach
800-227-4224
www.hach.com

Tonka Water, a Kurita Brand
866-663-7633
www.kuritaamerica.com

Toray Membrane USA
858-218-2390
www.toraywater.com

RADAR
IS THE BETTER ULTRASONIC

$765
VEGAPULS C 11

80 GHz level sensor with fixed cable connection (IP68)

- Accuracy and reliability meet affordability
- Easy Bluetooth setup via the VEGA Tools app for smart devices
- Optional remote display available

All advantages of the radar technology:
www.vega.com/vegapuls

Home Sweet Plant

THE FAIR OAKS RANCH TREATMENT TEAM HAS EARNED RECOGNITION FOR EXCEPTIONAL DEDICATION AND A RECORD OF EXCELLENCE IN EFFLUENT QUALITY

STORY: **Jim Force** | PHOTOGRAPHY: **Ethan Rocke**

The team at the Fair Oaks Ranch Wastewater Treatment Plant includes, from left, Roland Rios, utility operator; Brandon Garrettson, plant supervisor; and Bill Champion and Juan Ramirez, utility operators.

When a wastewater treatment staff literally lives at the plant for five straight days during an ice storm, you'd expect them to win an award.

That's exactly what happened at the Fair Oaks Ranch Wastewater Treatment Plant, a few miles west of San Antonio. The 0.5 mgd (design) operation won the 2022 Water Environment Association of Texas Small Plant of the Year award, for operator dedication but also for a superior record in water quality and safety.

"We've had no compliance issues for the past two years," reports Brandon Garrettson, plant supervisor. And he has nothing but praise for the staff: "During the 2021 winter storm, everything was iced over. But the plant and collection system continued to operate without service interruption. Staff stayed and lived on site Feb. 14-19. They caught problems before they became significant issues."

EFFECTIVE OPERATION

The Fair Oaks Ranch treatment plant used to be run by a private company. Operations returned to the utility in 1998. The transfer has proved beneficial in many ways. Besides the absence of permit violations, the plant

Fair Oaks Ranch (Texas) Wastewater Treatment Plant

www.fairoaksranchtx.org

BUILT:
1978

POPULATION SERVED:
12,000

FLOWS:
500,000 gpd design, 200,000 gpd average

TREATMENT LEVEL:
Secondary

TREATMENT PROCESS:
Activated sludge

EFFLUENT:
Golf course irrigation

BIOSOLIDS:
Cake to landfill

AWARDS:
2022 WEA of Texas Small Plant of the Year

ANNUAL BUDGET:
$2.3 million (operations)

employs a multistep safety program that includes weekly safety meetings; facility, equipment and vehicle safety inspections; and third-party training. As of last September, the wastewater department had seen no lost-time incidents for a year.

Garrettson points out that although the plant only requires Class C operators, the utility encourages team members to pursue the highest level of licensing.

Wastewater is collected from 2,100 residential connections and is fed to the plant via gravity and six lift stations. Treatment begins with an influent bar screen (Vulcan Industries). The flow continues to an in-yard lift station and then to a 350,000-gallon-capacity continuous-loop reactor, aerated with two Eimco turbo blowers (Ovivo).

Two circular secondary clarifiers (Envirodyne) follow, and the overflow is disinfected with chlorine gas. The purified effluent is pumped to the Fair Oaks Ranch Golf Course to irrigate the grounds and fairways. A SCADA system for automation and control was added in 2012.

Biosolids management was one of the Fair Oaks Ranch plant's biggest challenges. Biosolids used to be spread on drying beds next to the plant, after which the dried cake was hauled to a landfill. But since the plant is close to a residential neighborhood, the beds caused odor complaints.

To address that, the plant turned to wet hauling, but that is expensive: Garrettson estimates annual hauling costs and landfill tipping fees at more than $300,000. Now the team is installing an Amcon dewatering press using volute technology from PWTech.

Selected after a study by staff and consultants, the press produces cake that Garrettson says is "like Play-Doh" and emits no odors. Cake hauling costs to landfill are expected to be far less than with wet material. The press promises to pay for itself in about three years and is designed to handle all current and projected volume.

PROCESS IMPROVEMENTS

Since the city took over operations, the plant has passed all Texas Council on Environmental Quality inspections and has received just one notice of violation, that due to odor complaints. "Under the city's ownership, the plant has also gone through multiple upgrades to improve its operation," says Garrettson. "However, we are still playing catch-up."

Along the way, the plant staff has confronted several issues. Fair Oaks Ranch recently implemented a new camera inspection and jetting program for the collection system to identify any infiltration areas that could affect plant operations. The program aims to reduce infiltration and help identify needs for future collection system improvements.

> "During the 2021 winter storm, everything was iced over. But the plant and collection system continued to operate without service interruption."
> **BRANDON GARRETTSON**

As in most wastewater operations, clogs in lift stations have been an issue, especially from wipes flushed during the COVID pandemic. The collections staff developed a monthly cleaning program that has helped greatly. The utility is also using an enzyme block quarterly to reduce grease at six specific lift station locations.

The wastewater treatment plant also went through its first significant repair to its in-yard lift station. "It required the lift station to be taken out of service," Garrettson says. "That had never been done or attempted before due to the complexity."

The staff installed a bypass line from the force main, allowing half the flow of the in-yard station to be redirected. Then they created a bypass for the gravity line to enable operations to continue uninterrupted during the repair project.

Garrettson reports, "The bypass required plugging the inlet pipe to the in-yard lift station. Blocking the line backed up the flow into a small splitter box, where the staff set two diesel-driven pumps operating on floats."

Fair Oaks Ranch Wastewater Treatment Plant
PERMIT AND PERFORMANCE

	INFLUENT	EFFLUENT	PERMIT
BOD	227 mg/L	2 mg/L	20 mg/L
TSS	282 mg/L	2 mg/L	20 mg/L

The Fair Oaks Ranch plant's record of excellence stems from process improvements and a dedicated staff (secondary clarifier from Envirodyne).

> “Under the city’s ownership, the plant has also gone through multiple upgrades to improve its operation. However, we are still playing catch-up.” **BRANDON GARRETTSON**

STAFFING UP

The Fair Oaks Ranch plant is staffed from 7:30 a.m. to 4:30 p.m. daily, and one operator is on call at other times. Besides Garrettson, the staff includes Steven Fried, water quality supervisor; Roland Rios, lead wastewater operator; Bill Champion, William Poole, Eddie Merrill and Jarrett Lee, operators; and Juan Ramirez and Garrett Sharp, utility technician.

Tobin Maples is city manager. Grant Watanabe is director of public works, and Julio Colunga is assistant director. Sandra Gorski is public works administrative assistant, and Katherine Schweitzer is city engineer.

As of September, one operator slot at the treatment plant remained open, and the utility was on the lookout for a suitable candidate. “It’s hard to find people interested in this field,’” says Garrettson. Texas may have a partial solution: the WEAT is launching an apprentice program using state and federal funding to help pay for training new people.

According to the association’s website, the program supports employers by helping identify apprenticeship candidates and providing funds for training on the job and in the classroom. Financial assistance flows directly to the participating utility.

The apprenticeship provides access to additional benefits for veterans to support their entry into the workforce. The program also seeks to benefit high school students and educators by bringing awareness to the field and enabling students to experience their career via internships and tours.

Garrettson also works with the city’s human resources department to fill open positions.

EXPANSION AND GROWTH

Fair Oaks Ranch faces future growth. Its population, now 12,000, is expected to reach 16,000 in the years ahead. Garrettson says his utility is faced with aging infrastructure and has initiated a master plan. Expansion or new construction is on the horizon.

“Our average flow is around 240,000 gpd,” he says. “As it increases, we will need to have a plan in place to handle the additional flow. Right now, we are doing an engineering study to determine what we will need to do.” The master plan identified a financial gap with future funding, leading to the utility’s first-ever rate study.

Weather remains an uncontrollable challenge. Summers can become unbearably hot, causing some outside motors to overheat and trip out. To keep them cooler and ensure continuous operation, the Fair Oaks Ranch staff uses canopies to provide shade.

Winter can be even worse. Ice storms and unusually cold temperatures can severely hamper operations. The storm of 2021 sent temperatures plum-

Bill Champion, nearly 50-year industry veteran, fell in love with the profession and the challenges of working with wastewater.

A CLEAN-WATER CHAMP

Bill Champion truly lives up to his last name. A veteran of nearly 50 years in the clean-water profession, he was recently named Operator of the Year by the Water Environment Association of Texas.

His wastewater experience goes back to the 1970s when he served as a water plant operator in Florida and then at the Air Force Academy in Colorado. “He has truly dedicated his life to this field,” says Brandon Garrettson, Fair Oaks Ranch treatment plant supervisor. “I believe he has set the bar, passed along the knowledge, and served his time well. I am honored to have worked beside him all these years.”

Champion got into the water profession quite by accident, but once in it, he wouldn’t do anything else. “In 1970, I was looking for a job, and the water plant position happened to open up for me,” he recalls. “I fell in love with it and still am. I like meeting the challenges that wastewater can throw at you.”

He especially likes the laboratory work, where he gets a microscopic view of what’s happening in the plant. He also likes working with younger operators, especially newcomers: “I prefer the hands-on method of teaching. Not that books are bad, but it’s better if you let people make mistakes, figure it out, and go from there.”

It’s a skill Garrettson appreciates. “In an industry struggling to find experienced wastewater operators, he has made himself available,” he says.

Champion has had a big impact in the success of the plant, too. “Since his hiring our overall operation has improved dramatically despite numerous challenges,” says Garrettson. “Aging infrastructure, odor complaints, high solids, budget restraints.

“He took on the challenges, using his experience and making adjustments with what resources were available. If a new challenge presents itself and he is unsure of the solution, he hits the books and finds one.” As a result, “The plant is running better than I have ever seen in my 18 years of employment.”

Champion passes the credit around: “I’m just doing my job. Nothing is accomplished by one person. It takes a team, and we have a pretty good team here at Fair Oaks Ranch.”

With so many years of experience, what does he envision? He says the technologies have stayed pretty much the way they are, but the culture is changing with the concept of One Water. “I like the combination of wastewater with water and water reuse,” he says “We’re moving in that direction, and I like that.”

Retirement didn’t come up in this interview, but Champion wanted to “thank everybody in my career life, plus my family — wife and daughter, brothers and sisters, a son-in-law, and grandchildren.”

Even though he moved around a lot as the son of a U.S. service member, he sees travel in the future: “We like to travel around and see things. Twice a year we take off and visit Florida, Colorado, Vegas, Reno, California.” As we signed off, he was making plans to return to his native Alabama and take in a football game.

Installation of an Amcon dewatering press using volute technology from PWTech is underway. The cake it produces will emit no odors and reduce hauling costs.

meting to depths seldom seen in south Texas. The staff had to deal with freezing pumps, loss of power, setting up backup generators and emergency pumps when needed, and salting driveways and walkways.

The workload was so great, and travel around town so hazardous, that staff bunked in at the plant for several days. "Our flows got up to around a million gallons a day," Garrettson recalls. "With lift stations and pumps freezing up and power outages, it was a big juggling act. None of our lift stations have emergency generators. The roads were sheets of ice."

It was a weeklong serious freeze during which thermometers hit single digits. Garrettson recalls, "The sacrifice of being away from family was not easy. However, the city and its residents greatly appreciated it." he says of his staff. There's an extra measure of satisfaction in the award plaque that now hangs on the wall. **tpo**

featured products from:

Envirodyne Systems, Inc.
717-763-0500
www.envirodynesystems.com
(See ad on page 2)

Ovivo USA, LLC
855-466-8486
www.ovivowater.com

Process Wastewater Technologies LLC (PWTech)
410-238-7977
www.pwtech.us

Vulcan Industries, Inc.
712-642-2755
www.vulcanindustries.com

Truly Heroic

OPERATORS PUT THEMSELVES IN DANGER TO KEEP WATER FLOWING DURING THE DEVASTATING MARSHAL FIRE IN COLORADO IN DECEMBER 2021

By Ted J. Rulseh

The Marshal Fire of December 2021 was the most destructive in the history of Colorado. The calamity might have been worse if not for the bravery of team members at the two water treatment plants in Louisville.

As it was, the wind-driven wildfire burned through subdivisions, destroying 1,084 homes in all, 550 in Louisville (pronounced Lewis-ville), 378 in neighboring Superior and 156 in unincorporated Boulder County. Total damage to those homes was $513 million. In addition, seven commercial buildings were destroyed and 30 damaged.

The fire started on the morning of Dec. 30 and burned 6,080 acres before it was extinguished with help from multiple fire departments. The suspected cause of the blaze was a coal seam fire in the area that had been smoldering for decades.

In the middle of the fight were Greg Venette, water treatment superintendent in Louisville, and his team of operators. They worked around the clock, some risking serious injury or worse, to keep water for drinking and fire suppression flowing to the two cities.

Louisville (population 21,000) and Superior (13,300) lie about 10 minutes west of Boulder in a scenic area against the Rocky Mountain foothills. Venette, a fifth-generation Colorado native who has worked for Louisville for six years, described his team's experience in an interview with *Treatment Plant Operator.*

The team at Louisville includes, back row, from left, Greg Venette, water treatment superintendent; Glen Siedenburg, Matt Fromandi and Vinnie Wray, water plant operators; Ben Francisco, assistant operations superintendent; and Brian Schmid, operations technician. Front row, Trevor DePew, Chris DePalma, Thoa Pham and Jeff Owens, water plant operators; and Tom Czajka and Shane Mahan, operations technicians.

PHOTO BY GREG VENETTE

PHOTO BY JEFF OWENS

FAR LEFT: The fire seen from about 25 miles away from Louisville just a short time after it started. LEFT: The last picture taken by operators as they evacuated the South Plant. A few minutes later the fire rushed through the grounds.

TPO: What were conditions like on the day the fire started?

Venette: Colorado had been through one of the longest periods without any snow or moisture between the fall and winter. The weather was sunny, not a cloud in the sky, but it was especially windy. The wind was peaking out at 115 mph, and it was almost knocking me and some of our staff members off our feet.

TPO: What is the nature of the city's two water plants?

Venette: We have two conventional water plants on opposite sides of town. The North Plant is the main plant with 8 mgd capacity. The South Plant was built in the 1990s with 5 mgd capacity as a peaking plant normally used only in summer.

TPO: How did you and your team notice the fire?

Venette: Operators Jeff Owens and Matt Fromandi were at the South Plant doing maintenance; the plant was offline. They texted and said they saw smoke from a little grass fire west of the plant and had called 911. About 10 minutes later they let me know they were going to evacuate the plant because the smoke had gotten considerably worse. Within a few minutes the fire had just exploded and was out of control.

TPO: What did you do in response to the information?

Venette: I was working from home that day. I left home about 10 minutes after they said they were evacuating. When I turned onto the highway, from about 20 miles away, it looked like a volcano had gone off. The fire was moving so fast that it passed through our South Plant site in a little over a minute and then started into some of the homes in Superior before moving into Louisville. When I got to the North Plant, operator Glen Siedenburg was already turning the plant up to full capacity.

tpo: What was happening in the rest of the city?

Venette: There was a lot of chaos. We had no idea where the fire was. The smoke would shift and change with the wind. A text went out to start evacuating city facilities. Treatment plant staff made the personal decision to stay, knowing that water would be a huge factor in fighting the fire. Then I got a call that Superior's water plant had burned down. Later I found out that what really happened is their backup generator caught on fire, taking the plant offline.

tpo: With that plant offline, how was Superior supplied with water?

Venette: We have an emergency interconnect with Superior, and we had to open it. The interconnect is manually operated and is located at the South Plant. The only way to get water to Superior was to drive into the fire zone and open the interconnect. I asked operator Jeff Owens to go with me. He didn't hesitate. We jumped into the truck and headed straight into chaos, because the entire city was evacuating.

tpo: How difficult was it to get to the interconnect site?

Venette: Everywhere we went there was traffic. We circled through neighborhoods and saw large numbers of houses in flames. We drove on medians, sidewalks and ditches to get around the traffic. Eventually we arranged a police escort. Multiple trees and power lines were down in the roads. There were so many poles down on Marshall Road where the plant is that we had to cut a barbed wire fence and four-wheel across open space until we got close to the plant.

tpo: What did you discover when you arrived?

Venette: We did a quick assessment and realized we had no power. With the main power down we were relying on our backup generator. Unfortunately, it's a natural-gas-powered generator and because homes right across the street were on fire, the utility had shut the natural gas grid off. The South Plant was dead in the water. We made our way to the interconnect. The wind was brutal, and dust and ash were in the air beating on us. It was a bit like being sandblasted. Jeff and I had brought full-face respirators. We had to scream at each other to be heard through the wind and the masks.

tpo: Were you able to open the interconnect?

Venette: Most of the valving is in an underground vault. Jeff stayed up top and held onto the lid so I could climb down. The wind was pushing so hard we were afraid the lid was going to close on me. I got the valves open, but there was one more gate valve we needed to operate, and it was close to the road. About 15 feet away a power pole was on fire and was burned away at the base. The poles on either side were holding it up, but it was swinging in the wind. Jeff put the key on the valve. I put my hand on his shoulder and told him that if I saw that pole coming down, we would have to run from it. We got the valve open and got out of there.

tpo: How was the water supply holding up?

Venette: We checked a storage tank at the South Plant. It's a 17-foot-deep tank that usually has 8 to 10 feet of water. It was down to one or two feet. From there we had to get back to the North Plant and make sure everything was OK, so we drove through that disaster area again. At the North Plant, the operators were all-stars. They had the plant at full capacity, pumping as much water as we could to the different zones of the distribution system to keep the supply up. We knew firefighting efforts would be huge.

tpo: Did it become an all hands on deck situation?

Venette: We have eight full-time operators, and I asked them all to come if they felt it was safe. Almost all of them were available. Steven Daniels, Vinnie Wray, and Chris DePalma drove through the fire zone in their personal vehicles to get to the plant. It was pretty brave of them to do that. Next we had to get an assessment on a tank up in the highest zone of town. Jeff Owens and I arranged for a police escort. It's a 25-foot-tall tank on top of a mesa, so you can imagine the wind force up there. In an incredible act of bravery, Jeff volunteered to climb up on the tank. He belly-crawled across the top surface to open the hatch and look inside. There was only about a foot of water left in it.

tpo: What did you need to do to bolster the water supply?

Venette: I had a conversation with my boss Cory Peterson, the deputy director of utilities and Kurt Kowar, the director of public works. We decided to open the valves manually from the reservoir and run raw water through the plant and into the distribution system, so we at least had some water supply. At that point we knew we would be on boil advisory anyway because of the fire. It was incredibly difficult to make that decision, to intentionally send raw water into the system.

tpo: Was the North Plant producing water effectively?

Venette: Everything was running smoothly. The guys were doing a

PHOTO BY JEFF OWENS

The site of the interconnect between the Louisville and Superior water systems, showing the swinging and flaming power pole nearby.

good job keeping the plant going at high flow. Usually the high-zone pumps are pumping into the distribution system at about 110 psi. That night it was down to 70-75 psi. That's how much water was flowing.

tpo: Were you able to get the South Plant back into operation?

Venette: By about 8 p.m. the electric utility had arranged to bring natural gas tankers through the fire zone to the South Plant so we could temporarily hook up the generator. At about 11 p.m. we got the power back on, and by 5:30 the next morning we had the plant back in compliance, putting out fully treated, drinkable water.

tpo: Was the water mainly being used for firefighting?

Venette: Definitely. About 10 fire companies came in. At any given point there were a dozen or more fire trucks trying to put houses out. As structures burned to the ground, their water services were destroyed and were flowing wide open, so we were essentially bleeding by 550 cuts. When we realized the magnitude and impact of this water loss, Ben Francisco, Shane Mahan, and Tom Czajka with the operations crew entered the fire zone and started shutting off curb stops, and shutting off mains where they could, working with the fire departments.

tpo: Once the fire had been suppressed, what was done to return the system to normal?

Venette: We met with representatives from the state Department of Health and figured out a plan to remove the boil order. Basically, we ran the plants at a higher chlorine residual. Once that was done, distribution crews flushed the entire system from top to bottom. Crews from about a dozen cities came to help with that. They flushed the entire system in four days, which is an incredible feat. Of course we had to do a lot of sampling on the system to ensure that it was all safe. At the South Plant, we called diving crews to inspect and clean the tanks and used temporary pumping to help flush the tanks out.

tpo: How did the Superior water system fare?

Venette: When we opened up the raw water through the South Plant, we closed the Superior interconnect. About the time we got the natural gas tankers in, the power company brought Superior an emergency generator so they could get their plant up and running. They started making water that night.

tpo: Were there any complications after the fire?

Venette: On Jan. 1, we got a foot of snow. That complicated everything. Public Works had to plow snow, taking time away from restoring the water system and making repairs. The National Guard was called in to put a boundary around the city so that people weren't coming into dangerous areas and to prevent unauthorized access. This also made it hard to receive deliveries and get contractors in to make repairs. It took about a week to get the South Plant back on utility power because we had to replace so much infrastructure (power line and power poles) had to be reinstalled.

tpo: How would you assess the performance of your team during the emergency?

Venette: Our operators were extremely brave. They were willing to put themselves in danger to protect the community. They really went above and beyond! tpo

Lessons Learned

The events surrounding the Marshal Fire had lessons for the Louisville water team, and for utilities in general in a time of climate change.

"This was an urban interface wildfire," says Greg Venette, water treatment superintendent. "It's the first time we've seen in Colorado where a wildfire of this size wasn't just in a mountainous area where there are some scattered homes. This was a suburban area that got destroyed because of its interface with a wild open space area. A lot of communities, not just in Colorado, could be susceptible to something like this, because the climate now is so dry."

For Louisville specifically, Venette points to a number of lessons. They include:

- Run annual full-scale testing and training on interconnects, plant capacity tests, and test standard operating procedures to run the plant in a manual mode. "This proved invaluable when disaster struck," says Venette.
- Understand the functions of the incident command and local or regional disaster chain of command and support system structures.
- Plan for travel. Traffic from evacuations, roadblocks, downed power lines and structure or brush fires made it difficult to get to critical infrastructure. "Plan ahead with alternate routes and access points," Venette says.
- Prepare for backup power resiliency and have solid relationships with the electric utility and temporary power suppliers.
- Prepare team members to understand the risks involved in the response. Have the difficult conversations and amend administrative structures to allow for quick, decisive action.
- Isolate the system in fire-damaged areas as soon as possible to keep contamination from affecting the entire system and to help restore normal operation.
- Foster good relationships with other utilities and use local Wide Area Response Network systems when possible: "You can't do this alone, and recovery will require help from many sources."

And finally, says Venette, "Look out for the mental health of your staff. This was a tragic and intense event that none of us were prepared for or ever thought would happen. The immediate shock is real. The recovery is slow, and seeing the effects of the disaster on a regular basis for a long time can really wear on people. Make sure your staff members have the time off they need, safe places to talk about their experiences, and mental health resources available to them."

Visit us at AWWA ACE23

Toronto, Canada | June 11-14
Booth #1531

Reliable Chloramination Monitoring Made Easy

MCX™ Monochloramine Analyzer

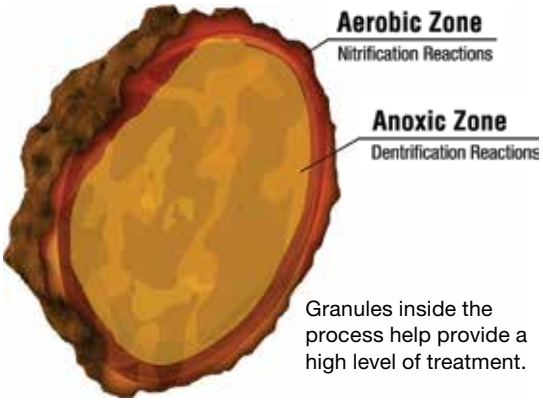
1. Measures monochloramine & total ammonia to calculate free ammonia
2. Accurate readings every 15 to 20 minutes
3. Simple fluidics
4. Easy, 30-day reagent replacement for smooth, continuous operation
5. Lower total cost of ownership for reagents & maintainance

For Total Process Confidence

Try a Free, 2-Month Demo Today!

HFscientific.com | (888) 534-4708

HF scientific
A **WATTS** *Brand*



Granules inside the process help provide a high level of treatment.

"Millions of Tiny Treatment Plants"

A KANSAS UTILITY ACHIEVES HIGH TREATMENT PERFORMANCE IN A COMPACT FOOTPRINT WITH AN INNOVATIVE AEROBIC GRANULAR SLUDGE PROCESS

By Ted J. Rulseh

The AquaNereda process met a requirement for high treatment capacity on a compact footprint (Aqua-Aerobic).

The process requires low long-term maintenance, and the installation provides flexibility to add another treatment train.

The Unified Government of Wyandotte County and Kansas City needed a cost-effective and compact wastewater treatment process to replace an aging package plant.

Space was at a premium because the plant site had to be elevated significantly with fill to lift it above the 500-year floodplain. The new facility was needed to accommodate growth but also to comply with a consent decree.

Today the treatment plant (2 mgd design, 1 mgd average) serving what is known as the Wolcott area uses the AquaNereda aerobic granular sludge process (Aqua-Aerobic Systems). The highly automated facility yields effluent that easily meets permit limits for BOD and TSS and is low in total nitrogen and total phosphorus, which do not yet have discharge permit limits.

ABOVE THE FLOOD

The unified government faced a consent decree to correct sanitary and combined sewer overflows. At the same time, projected growth made it necessary to change the flow direction of a pump station that had fed another treatment plant and sent it to the new Wolcott facility.

A 200,000 gpd activated sludge package plant was decommissioned, and the new plant was built on a low-lying 36-acre city-owned property. To remove the plant from the flood plain, about 10 acres had to be built up to an elevation about 15 feet higher.

"One of the drivers for going with the AquaNereda process was the compact footprint that enabled us to build it on a smaller area while leaving room for expansion," says Rick Bird, a wastewater and collection systems manager who oversees four treatment plants. Future plans call for adding a second AquaNereda plant on the same site. The receiving stream is Connor Creek, a Missouri River tributary.

BEING INNOVATIVE

In planning the new facility, agency staff investigated conventional activated sludge treatment and a couple of sequencing batch reactors. Before settling on the AquaNereda process, team members visited installations in Ireland and England, and in Foley, Alabama.

"Ultimately based on our research we thought, 'Let's be trailblazers,'" Bird recalls. "The process was just basically hands down what we wanted."

The plant was a design-build project with HDR as the consulting engineer and Garney Construction as general contractor. It went online in January 2022. "The compact footprint reduced the capital cost in elevating the site," notes Paula Dorn, a process engineer with Aqua-Aerobic Systems.

"They were also interested in the low long-term maintenance and the flexibility to add another treatment train in the future. The AquaNereda process had the lowest life cycle cost among the alternatives considered, including capital, energy, maintenance and chemicals additions."

The process provides biological removal of nitrogen and phosphorus, which at present are simply monitored but are likely to receive effluent limits in a new discharge permit to be issued in 2024, Bird observes.

ACTIVE GRANULES

Aerobic granular sludge is the key to the AquaNereda process. As Dorn describes the process, in a fill phase, influent enters the reactor at a controlled rate through a distribution grid on the floor; treated water is displaced over the top of the reactor through a series of effluent weirs.

While influent is fed to the system, the aeration is off, and therefore the influent immediately contacts the settled sludge blanket and the biology it contains. The anaerobic environment optimizes the conversion of readily biodegradable substrate into storage polymers by slow-growing bacteria, resulting in release of phosphorus.

In the subsequent react phase, during which the aerators operate, phosphorus is taken up by polyphosphate-accumulating organisms. A

> "Ultimately based on our research we thought, 'Let's be trailblazers.' The process was just basically hands down what we wanted."
> **RICK BIRD**

byproduct of the phosphorus release is a naturally produced extracellular polymeric substance that becomes the substrate for formation of granules. "We don't add any chemical or carrier to get the granules to develop," Dorn says. Microorganisms in turn attach to the granules, providing a measure of fixed-film treatment.

During the settle phase, the aeration is turned off. A valve on the side of the reactors opens, and the lighter and more flocculant fraction of sludge is wasted from the system. The heavier and denser particles remain to aid in the formation of granules, which ultimately can grow to 4-5 millimeters in size.

"As the granules grow, they develop an oxygen gradient, with aerobic conditions on the outside and anoxic conditions toward the center," says Dorn. "The granules are large enough so that oxygen can't penetrate deeper into the interior."

PUTTING IT TO WORK

The Wolcott plant was started up by seeding it with 180,000 gallons of conventional activated sludge from another treatment facility. "Within two weeks we were already at a sludge volume index of less than 100 mg/L," says Bird. "We were settling in five minutes. The simultaneous nitrification-denitrification process created conditions for the sludge to want to settle.

"We were starting to grow granules within a couple of months. The way I look at it, we've got millions and millions of tiny little treatment plants doing the work. Every granule is its own treatment plant. It does phosphorus removal. It does ammonia uptake. It does everything for you."

The Wolcott treatment plant rests on land that had to be filled and elevated to be above the 500-year flood plain.

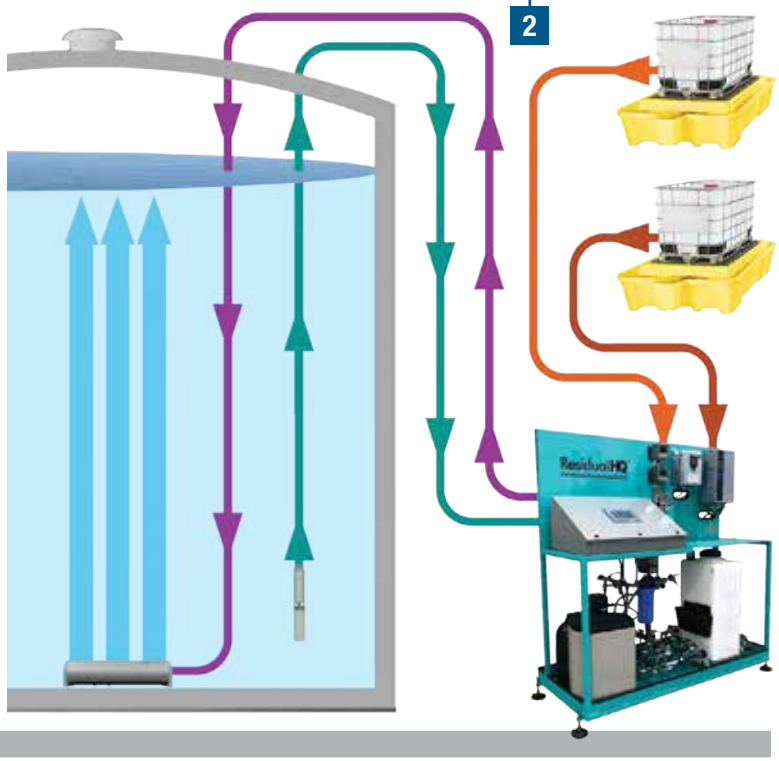
The aeration process is controlled automatically using ammonia analyzers. Operators monitor the system by taking and analyzing process samples and assessing the mixed liquor. They can easily adjust parameters such as settling and wasting rates as process conditions change. The three reactor tanks operate alternately in the fill, react and settle phases.

SOLID PERFORMANCE

Bird notes that the process consistently yields effluent with BOD and TSS well below 10 mg/L, total nitrogen less than 3 mg/L, and total phosphorus less than 1 mg/L. That is upstream of the plant's AquaDisk tertiary filters.

Assessing the system's performance, Bird observes, "On a scale from 1 to 10, as long as we effectively maintain the ammonia analyzers, I would call it a 10. It's such an intuitive process. It's very exciting." **tpo**

1



2

1. The ResidualHQ technology continuously samples and measures the chlorine and uses a feedback loop to add disinfectant as required.
2. A process diagram shows the basic functioning of the ResidualHQ system. Orange represents the chlorine feed; dark orange, optional ammonia feed for chloramine systems; teal, a sample pump delivers water to the unit for monitoring and to prepare disinfectant dosing if needed; purple, water returned to an in-tank active mixer to complete the sampling and disinfectant distribution loop.

Keeping Residuals on Track

A CONTINUOUS MONITORING AND DELIVERY PLATFORM AUTOMATICALLY MAINTAINS A PRESET DISINFECTANT LEVEL WHILE SAVING ON CHEMICALS AND MINIMIZING DBPS

By Ted J. Rulseh

Chlorine residual is a critical variable in water distribution systems that often is monitored and controlled less than optimally.

Chlorine-based disinfectants degrade over time, and in areas of the system with low-volume usage, or at the end of long distribution lines, the residual can fall below the required level.

Now Ixom Watercare offers the ResidualHQ continuous residual monitoring and disinfectant delivery platform for chlorine or chloramine systems. When added to elevated or ground-level water storage tanks, it automatically maintains a preset level of disinfectant residual, saving on chemicals and minimizing disinfection byproducts.

The system continuously samples and measures the chlorine and uses a feedback loop to add disinfectant as required. Active mixing ensures that disinfectant is uniformly distributed throughout the tank contents.

The technology tracks disinfectant residual levels and trends and enables users to easily adjust parameters such as action thresholds, feed concentrations and feed ratios. The system is designed to be easy to maintain and to require infrequent system checks and calibrations.

It comes with tiered-access security and can be controlled on site or remotely. Emil Anheluk, marketing manager with Ixom Watercare, John Zent, innovation manager and Doug Kadrmas, electrical engineer, talked about the technology in an interview with *Treatment Plant Operator.*

tpo: What was the impetus behind bringing this technology to the market?

Anheluk: When water leaves the treatment plant and enters the distribution system, the disinfectant residuals started to degrade. Especially where customers have long distribution lines and dead ends in the system, it can be a real challenge to keep the disinfectant residual up to the legal limit. To compensate, they may increase the disinfectant dosage at the plant in hopes that the residual makes it to the end of the line.

Zent: To deal with that, a number of utilities will flush the system, opening hydrants to get more freshwater coming through and increase the residual at those locations. So a lot of water is wasted to get the residuals up. ResidualHQ was born as a solution to problems like those.

tpo: Where in the water system does this device operate?

Zent: Our equipment is most often installed at storage tank locations. There we can get the residual boosted back up and maintained at the level the customer needs, and from there feed into the distribution network. When a tank isn't an option, the ResidualHQ can also be configured for use most anywhere along the pipe.

tpo: What parameter triggers the system to feed disinfectant into the tank?

Zent: The system monitors the chlorine level. A continuous circulation loop delivers water from the tank to the ResidualHQ unit. From there a pump returns the water to the tank. Off that circulation loop we sample the water by passing it over a reagentless sensor that monitors total and free chlorine. If the residual falls below the preset level, the unit automatically switches over to dosing chlorine into that circulation loop.

(continued)

IT'S HAPPENING.

AquaNereda® Installation:
Wolcott Wastewater Treatment Plant
Kansas City, KS

AquaNereda®

AEROBIC GRANULAR SLUDGE TECHNOLOGY

Following its recent introduction to North America, AquaNereda® Aerobic Granular Sludge Technology is quickly becoming the most sought-after wastewater treatment system in the U.S. and Canada with many plants in design and several plants currently under construction.

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

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

SVI_5 comparison of aerobic granular sludge (left) and conventional activated sludge (right)

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

www.AquaNereda.com | 815-654-2501

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

> "When dosing chlorine we do not deliver what one would call a hot dose. We are very measured and stair-stepped as we achieve the setpoint the customer has chosen."
> **EMIL ANHELUK**

tpo: What hardware is included in order to dose the chlorine or chloramine?

Zent: There are basically three items. One is a submersible sample pump that takes the water from the tank and delivers it to the ResidualHQ. Then the ResidualHQ has its own pump that delivers water back to the tank. We also have a mixer that blends the entire tank to keep the contents homogeneous.

Anheluk: It's important to note that when dosing chlorine we do not deliver what one would call a hot dose. We are very measured and stair-stepped as we achieve the setpoint the customer has chosen. We bring the chlorine into a pre-mix tank to dilute the disinfectant, be it chlorine or chloramine, to desired strength parameters. We use soft water to eliminate scaling issues.

tpo: How is the disinfectant actually delivered into the circulation loop?

Zent: There is no metering pump. The constant circulation loop provides a motive flow through a venturi to create a vacuum, which is then connected to the chemical source. We control that through a solenoid valve. The valve opens to allow the chemical in and is closed when dosing is not required.

tpo: What are the benefits of the technology beyond maintaining the required residual?

Anheluk: If you're able to manage residuals throughout the system, you use less disinfectant. That saves money on chemicals and also reduces DBP formation.

tpo: What is involved in operating the system?

Zent: It's an automated system, so once they determine the target residual and select a setpoint, it's almost as simple as that. Based on our testing and field startups, there is a factory setting that largely works almost everywhere we go. There is some fine-tuning, and then they basically operate it from there.

tpo: What regular maintenance is required?

Zent: All they really have to do is check the calibration. They may take a sample every month to verify that the sensors are on track. After three to six months the sensors should be calibrated. Other than that, the system pretty much operates itself.

tpo: How do operators observe and control the system?

Zent: The main control console has an HMI. One of the main screens is a dashboard of the entire system, and other windows enable users to look at the process in more detail.

Kadrmas: ResidualHQ is intended to function like a headquarters. It is SCADA-compatible, but if the operators don't have a SCADA system, it works as a stand-alone unit. It has trend lines and error logging, and other sensor inputs such as tank water level can be fed into the system. Remote monitoring is an option, so that from anywhere they have an internet connection they can log in, see their residuals or remotely control their unit.

Anheluk: The system is built with safety in mind. Many failsafes are built in to make sure it does exactly what it's supposed to do. If the system gets a hint that something is off, it shuts down and triggers an alarm. tpo

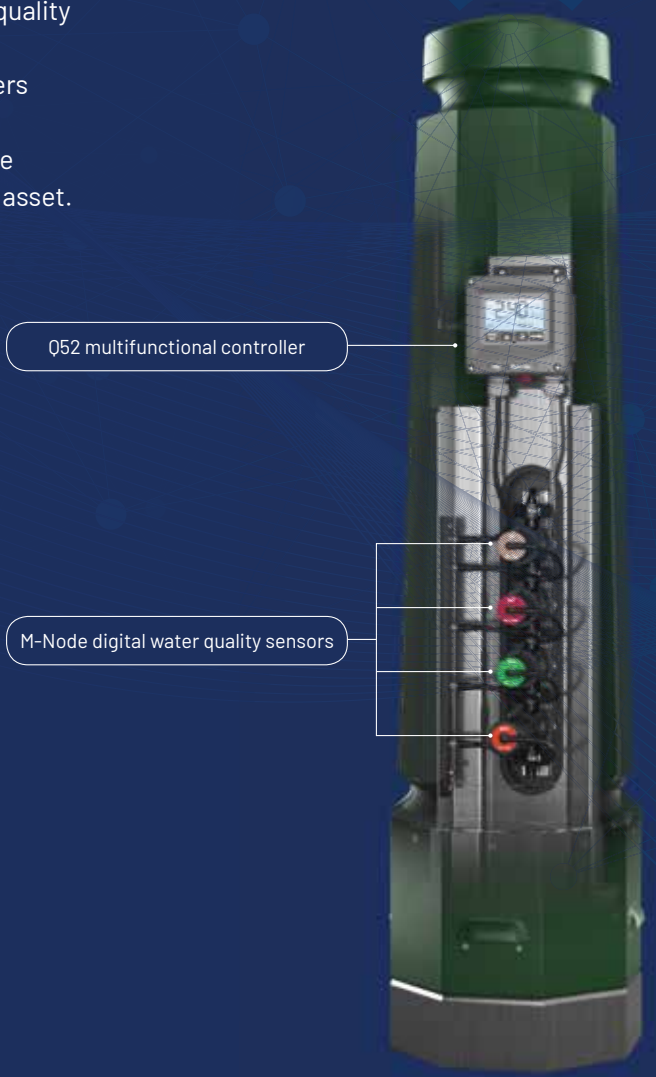
Get street smart.

The MetriNet telemetry bollard provides street level water quality monitoring for distribution networks.

Our ultra low powered, multi-parameter, MetriNet smart water quality monitor delivers a modular solution for generating reliable and continuous data within distribution networks. With 16 parameters to choose from, the MetriNet telemetry bollard offers a secure and serviceable street level monitoring solution with less hostile environmental conditions, prolonging the life of the monitoring asset.

Creating intelligent, optimized, smart water networks of the future with MetriNet.

To learn more visit us at booth #1219 during ACE23 or at analyticaltechnology.com/Telemetry



ATi
A Badger Meter® Brand

Odor Control and Disinfection

By Craig Mandli

Biofiltration

BYO-GON PX-109

Byo-Gon PX-109 compound

Byo-Gon PX-109 is a nontoxic, noncorrosive and 100% organic and biodegradable alkaloid compound used for eliminating grease, sewage odor and hydrogen sulfide from restaurant grease traps, lagoons and municipal sewage systems. As a stimulant to enzymatic activity at the cellular level, it promotes more rapid cell growth and consumption of organic material, overcoming limiting environmental factors to stabilize wastewater systems. Its use promotes healthy biological systems, preventing the need for large capital expenditures, as well as reducing costs. It is organically certified by OMRI. **888-296-4661; www.byogon.com**

PRODEX BAE

BAE, or Biological Activity Enhancer, from Prodex

BAE, or Biological Activity Enhancer, from Prodex is an organic liquid formula for use in aerobic and anaerobic environments to improve operational efficiency and maximize renewable energy production. As the green component to the engineered infrastructure, it provides plants with a low-cost biostimulant for existing microbes, increasing activity and populations to give the plant the best biology possible. Wastewater treatment plants can use it to boost biogas production, convert food waste to energy, help remove nitrogen, in maintenance dosage/emergency use, to reduce operational costs such as hauling, chemicals and energy, enhance plant operational efficiency and stability, improve solids handling and sludge settling, and accelerate recovery after plant upsets. By maximizing the microbial workforce, it helps the industry work toward cleaner water resources and a greener energy supply. **856-234-4540; www.prodexproducts.com**

SURCO PORTABLE SANITATION PRODUCTS ENZ-O-MATIC

Enz-O-Matic biological organic waste degrader and odor eliminator from Surco Portable Sanitation Products

The Enz-O-Matic biological organic waste degrader and odor eliminator from Surco Portable Sanitation Products includes a high concentration of nonpathogenic, live bacteria cultures designed to rapidly degrade organic wastes with a blend of surfactants and odor counteractant fragrance. It is nonpolluting, contains no acids or toxins and is certified *Salmonella*-free. It contains over 200 billion live bacteria cultures per gallon. The bacteria count doubles every 20 to 30 minutes to provide continuous enzyme production. Enzymes digest and liquefy grease, blood, urine, vomit, feces, sewage and other organic substances, neutralizing odors on contact, according to the maker. It can be used for drainlines, septic tanks, grease traps and septic spills. **412-789-8683; www.surco.com**

Chlorination/Dechlorination

HALOGEN VALVE SYSTEMS TERMINATOR ACTUATOR

Terminator Actuator from Halogen Valve Systems

The Terminator Actuator from Halogen Valve Systems can be used on chlorine ton containers as well 150-pound cylinders to instantly stop the flow of chlorine in case of an emergency. The clamp mount version incorporates the same mounting clamp design as the Eclipse Actuator, allowing it to quickly and securely be installed on ton container valves without the use of any tools. It can be used on containers feeding through a pressure manifold or can be installed side by side with tank-mounted vacuum regulators. The Gemini controller provides DC power and control to one or two Terminators and can be combined for systems with larger quantities of containers. Emergency chlorine shutoff is initiated when the controller receives a close contact signal from a leak detector or included emergency shutoff switch and a relay output provides remote indication that an emergency close sequence has been performed. **949-261-5030; www.halogenvalve.com**

Covers/Domes/Infrastructure

Launder Cover from Industrial and Environmental Concepts

INDUSTRIAL AND ENVIRONMENTAL CONCEPTS LAUNDER COVER

The Launder Cover from Industrial and Environmental Concepts gives the wastewater industry an affordable, long-lasting cover. Each cover section enables operational personnel quick access to the launder channel. The cover incorporates a tensioning system that provides versatility and access virtually anywhere around the tank. It has proven effective in reducing and eliminating algae to reduce TSS and improve effluent clarity. Each cover is designed for local environmental conditions. Its use can also reduce daily/weekly/monthly and annual clarifier cleaning requirements. **952-829-0731; www.ieccovers.com**

INDUSTRIAL FLOW SOLUTIONS OVERWATCH

OverWatch pump system from Industrial Flow Solutions

Industrial Flow Solutions' OverWatch pump system lifts influent at the point of entry, eliminating the wet well. Effluent is contained, eliminating odors and reducing maintenance. The stainless steel body is designed to withstand the effects of corrosion from harsh materials and solutions, making OverWatch an ideal solution for the municipal, industrial and commercial industries. In addition, the system has HMI touchscreen controls to further simplify operations. **860-631-3618; www.flowsolutions.com**

JDV EQUIPMENT LEVEL LODOR

The Level Lodor from JDV Equipment provides water quality professionals a means to dispose of processed waste, control odors and limit waste exposure to operators. It uses auto-leveling technology to level the waste material. This increases the fill percentage of a dumpster without operator intervention, slide gates or extensive control strategies, while limiting exposure to potentially hazardous material and working conditions. Made for indoor or outdoor use, it can save valuable indoor

square footage or eliminate the need for additional building space by installing the system outdoors. The covers are custom made to cover standard 20-, 30- and 40-yard dumpsters, with an overall footprint barely larger than a standard dumpster. The shaftless option uses replaceable ultra-high molecular weight liners that will reduce screw wear. The shafted option can be used for increased efficiency and has easily accessible grease points. **973-366-6556; www.jdvequipment.com**

Level Lodor from JDV Equipment

Longopac Fill continuous bag system from Paxxo

PAXXO LONGOPAC FILL

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

Detection Equipment

OdaLog G20 Gas Detection Logger from CAS DataLoggers

CAS DATALOGGERS ODALOG G20 H_2S GAS DETECTION LOGGER

The OdaLog G20 H_2S gas detection logger from CAS DataLoggers enables predictive maintenance and a long in-field deployment of up to 90 days. These increase the uptime of the logger, reducing maintenance costs. The gas logger is IP68 rated for use in harsh wastewater applications and ATEX IECEx certified for hazardous environments. Bluetooth, USB and Modbus are standard — making data easy to access, manually or via an integrated system. Typical areas of use are monitoring the gas level in treatment plants, sewers, collection lines, pumping stations for odor control, hydrogen sulfide remediation, and troubleshooting problems such as corrosion. **800-956-4437; www.dataloggerinc.com**

EAGLE MICROSYSTEMS GD-4000 MULTI-CHANNEL GAS DETECTOR

The Eagle Microsystems GD-4000 Multi-Channel Gas Detector monitors and detects the hazardous gases often found in water and wastewater treatment environments. This high-performance detector is designed to provide accurate and reliable readings of gas concentrations, ensuring the safety of workers and the public. Featuring NEMA 4X enclosures, it is built to withstand harsh environments and is resistant to dust, water and extreme temperatures. Its user-friendly, color touch-screen interface and field-programmable alarms and settings make it easy to use. Calibration is accomplished through the same menu drive touch screen interface. It has four 4-20 mA DC outputs and is capable of housing up to four precision sensors for common gases like chlorine and sulfur dioxide. Its sensor technology can detect gas concentrations as low as 0.1 ppm, ensuring maximum protection against potential leaks or other hazardous situations. **610-323-2250; www.eaglemicrosystems.com**

Eagle Microsystems GD-4000 Multi-Channel Gas Detector

Distillation/Fluoridation Equipment and Microbiological Control

MicroChem 450 controller from De Nora Water Technologies

DE NORA WATER TECHNOLOGIES MICROCHEM 450

The MicroChem 450 controller from De Nora Water Technologies was designed with decades of chlorine management and analysis experience. Easily tailored to meet unique instrumentation needs, process input signals like water flow and residual concentration are applied to user-adjustable preprogrammed control strategies to automatically adjust disinfection feed rates. Automatic process control with the ability to fine-tune to site conditions assures the process remains in control as water conditions change. It is compatible with De Nora gas feed equipment or other systems that utilize a mA control output signal. Its large color LCD shows process inputs at a glance. It gives fingertip access to most common controller settings of ratio and setpoint. Smart software only shows tuning parameters related to the selected control scheme. It has an intuitive software layout and touchscreen display, with 28-day internal datalogging built in, along with six language options. **215-997-4000; www.denora.com**

(continued)

IXOM WATERCARE GRIDBEE AND SOLARBEE FLOATING WASTEWATER MIXERS

GridBee and SolarBee mixers from Ixom Watercare

GridBee and SolarBee Floating Wastewater Mixers from Ixom Watercare are designed to solve a variety of municipal and industrial wastewater quality problems including high energy costs, EPA discharge permit violations and odor control. Not only can these powerful mixers operate 24/7 to improve overall treatment, they can also supply most of the mixing energy required in any treatment pond, which in turn can reduce the operational hours of the existing aeration/mixing system. Available power options include fully grid, fully solar and combined grid-solar. Applications include wastewater ponds, activated sludge, water reuse/effluent storage ponds, and anaerobic ponds. **866-437-8076; www.ixom.com**

LUTZ-JESCO AMERICA TOPAX MC

TOPAX MC multichannel controller from Lutz-JESCO America

The TOPAX MC multichannel controller from Lutz-JESCO America has a modular design that makes it an adaptable and effective solution for all measurement and control technology requirements. It offers automated efficiency — freedom from repetitive control tasks while providing accuracy and reliability. Users can actuate the dosing pumps using an optocoupler or relay and servomotors by using a relay or a 20mA output. The high-resolution, 5-inch color display offers a user-friendly operating interface with a simple touch-control and intuitive navigation menu that can be set to multiple languages. Use four analog outputs (0/4-20 mA) or the network capability to transfer measured values to a web browser or a telemaintenance point. A programmable interval timer can be used to set automatic alerts for wear-related sensor change. **800-554-2762; www.lutzjescoamerica.com**

PULSAFEEDER PULSATRON MP SERIES

Pulsatron MP Series from Pulsafeeder

Pulsafeeder's Pulsatron MP Series features an optional 4-20mA output signal that provides a remote indication of pump speed to remotely confirm the pump's speed is adjusting to process parameters, and more accurately estimate chemical usage over time. The pump transmits a 4-20mA signal proportional to the actual speed of the unit and is factory-calibrated for easy installation in the field. It is a true microprocessor-controlled instrument delivering precise and accurate metering control. Packed with standard features, it includes automatic control via 4-20mA or 20-4 mA inputs, an external pace function with a stop feature, and a graphical LCD display with support for English, French, German and Spanish languages. Models are capable of flows ranging between 3 and 504 gpd and pressure ranges from 20 to 300 psig with a turndown ratio of 1,000-1. **800-333-6677; www.pulsafeeder.com**

YSI, A XYLEM BRAND 9220 ONLINE TOC ANALYZER

The 9220 Online TOC Analyzer from YSI, a Xylem brand continuously measures TOC and provides stable, accurate data for water quality monitoring, water treatment, and other applications. With heated persulfate and NDIR detection technology, the unit provides performance, reliability and ease of use, with capabilities such as multistream analysis and onboard gas generation. It is compliant with EPA-approved methods 415.3 and SM 5310C, and provides water and wastewater facilities with a dynamic, real-time view of Natural Organic Matter levels in influent and effluent streams, enabling them to easily adjust and more precisely control the coagulation, flocculation, and disinfection steps to minimize formation of disinfection byproducts. It directly measures TOC in a wide variety of complex and ever-changing matrices. **937-767-7241; www.ysi.com**

9220 Online TOC Analyzer from YSI, a Xylem brand

Scrubbers

SIMPLE SOLUTIONS DISTRIBUTING INDUSTRIAL ODOR CONTROL PCB-170

Industrial Odor Control PCB-170 pollution control barrel from Simple Solutions Distributing

The Industrial Odor Control PCB-170 pollution control barrel from Simple Solutions Distributing is an economical solution for active ventilation odor control. It provides 170 to 200 cfm of airflow (depending upon static pressure of piping.) It can provide eight air exchanges per hour in a 1,500-cubic-foot space. This scrubber is built on an HDPE barrel with a 304 stainless steel manifold and an American Fan AF-9 pressure blower mounted directly on the lid, providing for a small footprint. It is easily installed and can be customized for any given environment or situation. It is paired with Norit Darco's H2S Sulfursorb Plus, a high-performance activated carbon developed specifically for removing hydrogen sulfide from biogas streams. Applications include lift station wet wells where it helps prevent concrete erosion due to sewer gas. **973-846-7817; www.industrialodorcontrol.com**

UV Disinfection Equipment

VEOLIA WATER TECHNOLOGIES & SOLUTIONS AQUARAY S

Aquaray S disinfection equipment from Veolia Water Technologies & Solutions

Aquaray S horizontal UV disinfection equipment from Veolia Water Technologies & Solutions incorporates the latest electronic ballast and communication technology with powerful long-lasting low-pressure high-output UV lamps. The power supplies for the lamps are located inside a sealed aluminum extrusion directly on top of the module. This power bar also handles all the lamp controls and data exchange with the power distribution and data center. The self-supporting modular units are placed into a flowing channel (concrete or stainless steel) in multiple combinations to provide the required level of disinfection. Quartz sleeves protect the lamps, and as with any UV system can gradually accumulate a coating operating in challenging water quality. The system offers a fully automatic, in-channel cleaning system to remove this fouling. **866-439-2837; www.watertechnologies.com** tpo

A GridBee mixer floats in the middle of the secondary lagoon at the Slayton Wastewater Treatment Facility.

Stirring With the Sun

SOLAR-POWERED MIXERS PROVIDE IMPROVED AERATION PERFORMANCE FOR A MINNESOTA LAGOON SYSTEM WHILE DELIVERING SAVINGS ON ELECTRICITY

By Steve Lund

Officials in Slayton had three reasons to look at a new aeration system for the city's wastewater treatment lagoons.

The first reason was the cost of electricity. The second was the expectation that phosphorus reduction might be added as a permit requirement. The third was the aeration effectiveness was sometimes hindered by weather.

"The old aerators drew from a pipe in the lagoon and sprayed it back on the surface," says Josh Malchow, city clerk/administrator in Slayton (population 2,000) in southwest Minnesota. "That's what they are supposed to do, but they were not very effective."

If the wind was blowing at the pumps, for example, the aerated water would stay at that end of the lagoon instead of mixing throughout the pond. In winter, the lagoons would freeze, slowing down the natural treatment process.

The treatment facility needed an aeration system that could also be used to distribute chemicals into the pond, should that become necessary. In the end, city leaders settled on a mixing solution system from Ixom Watercare that includes two solar-powered units.

TWO-LAGOON SYSTEM

The Slayton wastewater treatment facility consists of two lagoons: a 28-acre primary pond with two aerators and a 13-acre secondary pond with one aerator. Effluent is discharged from the secondary pond once in spring and once in fall to Beaver Creek, a Des Moines River tributary. The facility (250,000 to 350,000 gpd average) serves about 1,100 households.

To improve aeration, the city chose two floating SolarBee mixers in the primary pond to replace the old shore-based aerators, and a floating GridBee mixer on the secondary pond, where the old shoreline-mounted aerator remains but is used only occasionally.

The SolarBee mixers operate entirely on solar power. Batteries store power during the day so that the units can operate around the clock. The GridBee mixer is connected to electrical power, but it uses far less energy than the old aerator. A tank with a pump can be attached to the GridBee mixer for feeding chemicals into the pond if necessary.

ELECTRICITY SAVINGS

The new mixers significantly reduced electricity costs for aeration. "We were spending roughly $12,000 a year to power the three surface aerators, and that doesn't even include the mechanical issues and parts," says Weston Mahon, public works director. "That's just for the electricity.

"Now we're spending probably $30 a month. Basically, from electricity savings alone, the two solar mixers and the shore-based mixer will pay for themselves in about eight years." The mixers also made the ponds more efficient.

For one thing, the pond surfaces don't completely freeze the way they did in the past. Since the mixers were installed in November 2020, there has always been some open water. There has also been a slight decrease in duckweed on the secondary pond.

"Before we put in the new mixers, we'd sometimes get to the point where we had a little too much duckweed," Mahon says. "On days when there's no wind, it covers a lot of that secondary pond and the sunlight can't get to the vegetation on the bottom.

"We definitely noticed an improvement on that. It's been small, but last year, especially on still days, the duckweed was not covering the entire secondary pond, whereas it did in previous years. Is that from the aerators? Well, that's the only thing that's really changed out there."

> "When we looked at the electricity savings and the effectiveness, it became a bit of a no-brainer to spend a little bit more money up front."
> **WESTON MAHON**

ODOR REDUCTION

A bonus effect is less odor. When the ponds froze, the spring thaw often brought some odor problems. Now, with the ponds always at least partially open, the odor problems have diminished. "We definitely did not have a year-round issue with odor," Mahon says. "It was really just the spring thaw. That wasn't why we were seeking new mixers, but it has been a positive."

The old aerators, installed in 2004 had maintenance issues. "They were just in terrible shape," Mahon says. "We were lucky to have one going at a time the last couple years. We were constantly buying parts and spending days at a time with new seal kits or bearings."

Mahon's research led him to conclude that spending more for a different type of equipment would be more cost-effective than simply replacing the old aerators. "The initial purchase is expensive, but the return on investment, assuming you have no issues, is so quick.

"With some of the other aerators we looked at, we felt like we would have to deal with a lot of the same maintenance issues we're already experiencing," Mahon says. "Then when we looked at the electricity savings and

the effectiveness, it became a bit of a no-brainer to spend a little bit more money up front."

HELP WITH THE COST

A rebate for solar mixers from the local power company, Nobles Cooperative Electric, helped offset the cost. The mixers work by slowly drawing water from below the surface up to the top. The depth of the intake can be adjusted.

"The impeller is actually underwater," Mahon says. "It brings water to the top and then it disperses. You can watch it. You can see how far it goes. It brings water from below that doesn't ever get much sunlight back to the surface."

In the past Slayton occasionally had problems with dead spots in the ponds, but since the new mixers were installed, there haven't been any. What the city does have are smaller electricity bills and more efficient lagoons. tpo

A SolarBee mixer sits on the shore before being floated onto the primary lagoon.

TOP: Commercial laboratories can offer test methods designed to meet a wastewater treatment facility's unique needs. LOWER LEFT: A new U.S. EPA program requires public water systems serving 3,300 people or more, and 800 other smaller systems, to test for 29 PFAS compounds in 2023. LOWER RIGHT: The EPA is working on several testing methods for use in future PFAS-related regulations.

Pinpointing PFAS

TESTING OF WASTEWATER FOR "FOREVER CHEMICALS" MAY SOON BECOME A NECESSITY. HERE'S SOME ADVICE ON LOCATING PFAS SOURCES AND THE TEST METHODS AVAILABLE.

By Lindsay Boone

Drinking water professionals are familiar with PFAS, but in many cases these synthetic chemicals have not been on wastewater treatment operators' radar.

That may change in the near future. The U.S. EPA is set to propose the first enforceable limits on PFAS in drinking water, and that has potential to change daily life for many operators of wastewater treatment plants across the country.

PFAS are a diverse group of synthetic compounds used in multiple products for their inherent properties, such as a resistance to heat, water and oil. For decades, they have been used to produce industrial and consumer products such as carpeting, clothing, upholstery, food packaging, cosmetics, firefighting foams and metal plating.

Today as many as 5,000 to 12,000 compounds can be classified as PFAS. These chemicals bioaccumulate, meaning they build up in the blood and tissue of organisms. Since at least the 1980s, research has linked two types of common PFAS compounds — PFOS and PFOA — to health issues including chronic kidney disease, thyroid issues and some cancers.

TOWARD ENFORCEMENT

The EPA and others continue to research the thousands of widely used PFAS compounds, but most of the EPA's recent regulatory efforts have focused on PFOA and PFOS.

Last year, the EPA issued revised health advisories for PFOA and PFOS, lowering the lifetime dose deemed safe from 70 parts per trillion to 0.004 ppt for PFOA and 0.02 ppt for PFOS. These are interim advisories, so they are subject to change.

However, by issuing advisories this low, the EPA is essentially saying any detectable PFOA or PFOS in drinking water is unsafe. The agency also plans to issue the first Maximum Contaminant Levels — enforceable limits on PFOA and PFOS in drinking water.

The problem of PFAS in the drinking water will be brought to a head by another EPA program, the Fifth Unregulated Contaminant Monitoring Rule. This program requires public water systems serving 3,300 people or more, plus 800 randomly selected smaller systems, to test for 29 PFAS compounds, including PFOA and PFOS, in 2023.

COMING FROM WHERE?

Communities that detect PFOA and PFOS in their drinking water will need to look for a source, especially if the MCLs have been published. That's where wastewater treatment operators enter the picture.

To understand the role of wastewater treatment, it helps to consider inputs and outputs. PFAS in influent can come from a variety of sources, most commonly discharges from industries that produce or use PFAS. Chemical companies are the most obvious source, but PFAS are also used in industries such as plastics, synthetic fibers, textiles, metal finishing, electroplating, electrical components, construction, leather processing and more.

Runoff is another pathway for PFAS to enter wastewater treatment processes, especially if a community has combined storm and sanitary sewers. Aqueous film-forming foam, used to fight Class B chemical fires, often contains PFAS. Drainage from sites where this foam has been used can reach the treatment plant by way of the sewer system. Landfill leachate, typically sent to treatment plants, also can contain PFAS.

Traditional wastewater treatment does not remove PFAS. In fact, it can convert a class of compounds called PFAS precursors into actual PFAS. This is why operators may see higher levels of PFAS in effluent than in influent. This can lead to PFAS cycling back into the drinking water supply.

For example, when wastewater effluent containing PFAS is discharged to waterways, it can contaminate the local drinking water supply. If biosolids containing PFAS are applied to farmland, the compounds can seep into surface and groundwater.

Some municipalities are installing filtration systems using media such as granular activated carbon to remove PFAS. While this method may be effective, filters can't destroy but only capture the chemicals. Proper disposal of the filters then becomes a concern.

TESTING FOR PFAS

Wastewater treatment operators often ask whether they should test both influent and effluent for PFAS. In general, the answer is yes. Testing influent can help identify the source of PFAS in their system, while testing effluent testing can determine whether PFAS are continuing to cycle through the system. The EPA's Effluent Guidelines Program Plan 15 calls for more study into the PFAS in wastewater discharges sent to publicly owned treatment works.

Testing wastewater is a bit more challenging than testing drinking water. For that reason, the EPA-validated methods for drinking water (Methods 537.1 and 533) are not suitable. The EPA is working on several testing methods for use in future regulations designed to monitor and control PFAS in wastewater.

EPA Method 8327: This method recently developed by the EPA is designed for nonpotable water, including surface water, groundwater and wastewater.

EPA Draft Method 1633: This method can quantify 40 PFAS compounds across a wide range of solid and nonpotable aqueous matrices. Once finalized, Method 1633 will likely replace laboratory-specific standard operating procedures as well as state and Department of Defense guidance and methods. It will also play a vital role in EPA efforts to study, monitor and regulate PFAS in nearly all matrices and regulatory programs except drinking water. In early 2022, the EPA issued a memo making Draft Method 1633 the required method for NPDES permitting.

EPA Draft Method 1621/Adsorbable Organic Fluorine: This method is described by the EPA Office of Water as a Screening Method for the Determination of Adsorbable Organic Fluorine in Aqueous Matrices by Combustion Ion Chromatography. As drafted, it can quantify total organic fluorine at the parts-per-billion level in all aqueous matrices. It may also be used to supplement Draft Method 1633 for NPDES permitting.

Total Oxidizable Precursors: This method oxidizes PFAS precursors, turning them into PFAS compounds that can then be measured. The increase in PFAS measured after the TOP Assay oxidation relative to pre-oxidation levels is a maximum estimate of the total concentration of PFAS precursors present in a sample.

A commercial laboratory may offer other test methods designed to meet a treatment facility's unique needs. One example is low-volume test that measures total organic fluorine in a liquid sample without extraction to a carbon media. Without the need for extraction, this method can deliver more reliable results than other TOF methods. A qualified PFAS lab should be able to help determine which test method is most appropriate for a given project.

This is a rapidly changing landscape. Please visit www.pfas.com for the latest updates.

ABOUT THE AUTHOR

Lindsay Boone (lindsay.boone@pacelabs.com) is a technical specialist with PACE Analytical, a company based in Minneapolis that provides a wide range of analytical, testing and scientific services. tpo

exam STUDY GUIDE

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

WASTEWATER

By Rick Lallish

When referring to odors and odor control in wastewater treatment, what is the definition of odor threshold?

A. When the odor has reached a point where a person can no longer tolerate it
B. The highest concentration at which the compound can be detected by human smell
C. The lowest concentration at which the compound can be detected by human smell
D. When the concentration meets the point of olfactory deprivation

ANSWER: C. Odor control has become an important topic in many wastewater treatment facilities due to surrounding community growth. The lowest concentration at which a compound can be detected by human smell is known as the odor threshold. Odors in wastewater treatment may be from anaerobic decay (fermentation) or the production of sulfides. More information may be found in the WEF textbook: *Wastewater Treatment Fundamentals III: Advanced Treatment,* Chapter 11.

DRINKING WATER

By Drew Hoelscher

For bacteria contamination, repeat samples are required to be collected:

A. Within 24 hours of being notified
B. Within 30 hours of being notified
C. Within 48 hours of being notified
D. Anytime, as long as it is within the same monitoring month

ANSWER: A. Bacteriological samples are collected from potable water distribution systems every month. These samples help ensure that the water is safe to drink. Occasionally, a system will have a sample test positive for total coliform and will be required to collect repeat samples. The repeat sample must be collected within 24 hours of being notified from the certified laboratory.

ABOUT THE AUTHORS

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

By Craig Mandli

Geomembrane covers solve odor issue in wastewater plants

Problem

Laguna Madre Water District in Port Isabel, Texas, sought to eliminate odor complaints after a high-end housing development was built next to the primary treatment plant. "We had all this new construction getting closer and closer to the plant, and we were concerned about keeping the nuisance odors within our buffer zone," says Charles Ortiz, district engineer. Offsite odors at the worst point averaged above 88 ppm just above the channel surface; peak spikes registered above 860 ppm.

Solution

Anue Water Technologies provided a **breathable geomembrane solution,** enabling effective treatment without changing the plant footprints or operations. The flexible geomembrane system has a breathable design where pockets in the material contain replaceable carbon-infused filters that allow water and air to pass through, but trap the odorous compounds. No special equipment was needed to install the customized solution.

RESULT:

The membranes lowered odor levels to an average of 1.2 ppm; all off-site odors were eliminated. "We still have a little tweaking to do here and there — nothing is perfect, but as odor controls go, I would say that the system has done its job," says Ortiz. **760-727-2683; www.anuewater.com**

Treatment plant expansion addresses multiple contaminants

Problem

The City of Tucson water treatment plant was treating 1,4-dioxane using a UV advanced oxidation process with eight granular activated carbon vessels for peroxide quenching. Water quality testing revealed significant PFAS contamination, requiring the plant to expand capacity for the longer empty-bed contact time PFAS removal requires.

Solution

AqueoUS Vets provided the **treatment and delivery systems,** which included two 12-foot-diameter lead-lag granular activated carbon systems, with two pressure vessels per system. The systems have an empty bed contact time at 930 gpm of 5 minutes per vessel, and 10 minutes per system.

RESULT:

While there are no state regulatory limits for PFAS in Arizona, the EPA issued interim updated health advisory levels for PFOA and PFOS in June 2022, with updates expected in early 2023. The health advisories are currently 0.004 parts per trillion for PFOA and 0.02 ppt for PFOS. Since July 2020, the city has been removing PFAS to nondetectable levels. **925-331-0573; www.aqueousvets.com**

Mini analyzer helps plant fine tune sodium bisulfite use

Problem

Dechlorination equipment at the South San Francisco – San Bruno Water Quality Control Plant required frequent maintenance and experienced drift and persistent fouling. Plant operators overfed sodium bisulfite to ensure that treated water was thoroughly dechlorinated before release into San Francisco Bay, making bulk chemicals one of the plant's top five expenses.=

Solution

Plant leaders chose the **ChemScan mini Sulfite Analyzer** for its large blockage-resistant sample tubing, internal self-cleaning, simple field-adjustable calibration and low cost of ownership.

RESULT:

The analyzer's reliability took the guesswork out of dechlorination and reduced sodium bisulfite usage, saving $53,000 per year. **800-446-7488; www.in-situ.com/us/chemscan-mini-analyzer**

Injection system solves algal toxins issue at plant

Problem

The source water for Collins Park Water Treatment Plant in Toledo, Ohio, comes from the western basin of Lake Erie. In 2014 the lake experienced seasonal toxic algal blooms.

Solution

The city chose a multibarrier approach with powdered activated carbon, ozone, and chlorine. The 40 mgd plant expansion included two identical ozone contactor buildings each with two dissolution basins. To introduce and mix ozone, **venturi sidestream injection and pipeline flash reactors** from **Mazzei Injector** were chosen. Together they deliver at least 95% mass transfer efficiency. The reactors require just a few feet of pipeline for mixing and were sited in a three-story stack that minimized the footprint.

RESULT:

The multibarrier system removes 99.7% of the toxins while controlling taste and odor; removing endocrine-disrupting compounds, pharmaceuticals and personal-care products; reducing disinfection byproducts; minimizing polyaluminium chloride usage. Lower PAC usage for taste and odor control reduced operating costs. **661-363-6500; www.mazzei.net**

Chemical treatment plan aids facility's optimization needs

Problem

A customer of Operators Unlimited in the aerospace, building technology and performance materials industries faced challenges with system efficiency and wastewater regulation compliance in a newly upgraded facility. The upgrade added two cooling towers. The customer needed chemical treatment to accommodate increased capacity and optimize chemical usage while optimizing efficiency, cost-effectiveness and microbiological control.

Solution

Operators Unlimited prescribed a microbiological control chemical **treatment plan** to optimize cooling tower operation. The plan alternates oxidizing and a non-oxidizing biocide, providing greater microbiological control than common oxidizing treatment products alone, while maintaining industry standards for biological protection. Removal of the microbiological impurities limits damage they could cause to the cooling tower system.

RESULT:

The plan helped the facility comply with permit requirements while tailoring chemical treatment to the application. **864-228-1131; www.operatorsunlimited.net**

Emergency gas scrubber used to rectify chlorine gas leak

Problem

An alarm that went off at O.B. Curtis Water Treatment Plant in Ridgeland, Mississippi, indicating a chlorine gas leak. All personnel were evacuated and multiple agencies responded. First responders along with plant maintenance staff identified three leaking valves and secured the area.

Solution

The plant installed a **FOC-1 Fiberglass Emergency Gas Scrubber** from **Purafil** with Chlorosorb dry-scrubbing media next to the chemical building. It is designed to contain the entire contents of a fully loaded 1-ton chlorine cylinder in a worst-case release. This outperforms the requirements of the Uniform Fire Code. The building has air scrubbers to keep chlorine from escaping the building.

RESULT:

Instead of toxic liquid caustic to neutralize gases, the EGS uses nontoxic, dry-scrubbing media. The process removes chlorine by adsorption, absorption and chemical reaction. Chlorine gas is trapped within pellets where an irreversible chemical reaction changes it into a harmless solid. During the chlorine leak the EGS immediately began to remove the chlorine gas, minimizing the risk to employees and the community. No injuries were reported, and no other evacuations of the surrounding area were needed. **800-222-6367; www.purafil.com**

County treats disinfection byproducts with ion exchange treatment

Problem

The construction of a new well prompted Seminole County to address hydrogen sulfide regulations by the Florida Department of Environmental Protection. Struggling with disinfection byproducts from TOC and bromide in the water, the county began a pilot study using ozone oxidation to address the hydrogen sulfide and reduce disinfection byproducts. The county partnered with Tonka Water to develop an anion exchange system to treat groundwater.

Solution

The county chose an **Organix ion exchange treatment system** from **Tonka Water, a Kurita America Brand,** to address TOC. The process consists of six 12-foot-diameter ion exchange vessels containing anion exchange resin and support gravel. Water is pumped directly from the wells through the ion exchange system to storage and the distribution system. The fully optimized system closely matches resin capacity with control of brining and regeneration of the media. This enables reduction of brine waste and backwash water.

RESULT:

The plant is meeting expectations since its commissioning. **866-663-7633; www.kuritaamerica.com** tpo

Lovibond TB350 turbidimeter

Lovibond puts world-class turbidity expertise right in your hands. Ideal for field and environmental testing, the TB350 turbidimeter delivers reliable measurements for low range to high range samples without sacrificing accuracy. It is designed to eliminate the complexities of turbidity measurement and provide users with an opportunity for operational and regulatory efficiencies, no matter one's experience level. On the surface, turbidity analysis is a simple measurement. However, there are many factors that can affect the accuracy of readings or the dependability of an instrument. Lovibond obsesses about turbidity measurement so you don't have to. Lovibond's team of globally recognized turbidity experts work to anticipate and solve operators' struggles with turbidity measurement.
941-756-6410; www.lovibond.com

Evoqua's ballasted clarification technologies

Ballasted clarification dramatically increases biological treatment capacity, helping meet ENR limits, and produces effluent quality far superior than conventional alternatives, and at lower life cycle costs. Evoqua's BioMag and CoMag systems use magnetite — fully inert iron ore particles — to ballast biological floc or conventional chemical floc, enhancing settling rates and increasing the performance of wastewater and water treatment facilities, while substantially reducing costs to upgrade process performance. Both systems easily integrate with existing or planned facilities and are simple, reliable and proven.
262-547-0141; http://lp.evoqua.com/Ballasted-Clarification.html

product spotlight
water

Air release valves available in AIS-compliant models

By Craig Mandli

MAXIAIR from Flomatic Valves

Air release valves are among the most important ones in the water supply lines. That's because the formation of air and vacuum in your water pipelines can lead to serious operating problems and even some dramatic consequences, such as reduced pumping efficiency, pipeline corrosion, faulty metering and instrumentation devices, air hammer or even full pipe failure. If there is a substantial vacuum, the pipe can collapse inwards due to the pressure difference on both sides of the pipe's walls.

Air gets into piping systems typically through empty pipelines, air in the fluid, or through mechanical systems like pumps, pipe joints, and valves. Leaks or faulty seals in these components can lead to air infiltrating the piping system. Products like the new American Iron and Steel compliant Air and Vacuum MAXIAIR model from **Flomatic Valves** can help eliminate the problem.

MAXIAIR Air/Vacuum valves are designed to exhaust large quantities of air at system startup and admit large quantities of air to provide pipeline vacuum protection when negative pressure develops during power failures or pipeline breaks. They release air from the system while filling and allow air to enter the system during shut down or if there is a break in the line. Basically, when water enters, the valve the float rises and closes the orifice. When the fluid level drops the float drops away from the orifice and allows air to enter the system to prevent possible damage.

Models are engineered to meet AWWA Standard C512 for clean water pumping applications and feature a two-bolt Quick Access cover, corrosion-resistant 316 stainless steel float and trim, resilient Buna-N seating, and full nominal pipe size threaded female inlet and outlet ports. In order to ensure proper function, MAXIAIR valves should be installed at the high points in the system in a vertical position above the water main. They are available in 1/2- and 1-inch outlet sizes.

"In stock and ready to ship, our new AWWA C512 and AIS compliant MAXIAIR Air/Vacuum valves are ideal for clean water applications that require air release and vacuum pipeline protection," says Brian Allen, engineering manager at Flomatic Valves. "Featuring a strong fusion-bonded, epoxy-coated ductile iron body and cover (including internal surfaces) with 316 stainless steel internals, the MAXIAIR is designed with the operator in mind for ease of maintenance." **800-833-2040; www.flomatic.com**

Flowserve Worcester 51/52 Series flanged ball valves

Flowserve Corp.'s Worcester 51/52 Series reduced port flanged ball valves have been reengineered by standardizing design, materials, construction and product certifications. Target applications for the quarter-turn, floating ball valves include controlling the flow of liquids or gasses in the following industries: chemical processing, petrochemicals, energy, defense, food and beverage, industrial gasses, pharmaceuticals and water. The bubble-tight shut-off design and robust, live-loading packing in the valves minimize fugitive emissions, enhance safety and maximize regulatory and standards compliance. Featuring a redesigned end plug, the valves ensure positive retention and greatly reduce blowout risk.
972-443-6500; www.flowserve.com

Shimadzu Scientific AIRsight microscope

The AIRsight infrared/Raman microscope from Shimadzu Scientific Instruments provides a two-in-one solution for molecular analysis. The unique system is equipped with a Raman unit available on Shimadzu's AIMsight infrared microscope and is compatible with the IRTracer-100, IRXross and IRAffinity-1 series Fourier transform infrared spectrometers. AIRsight improves analytical efficiency by making it easy to perform all process steps, from sample observation to data analysis. The instrument also increases accuracy because users can obtain qualitative infrared and Raman spectra at the same position without moving samples on the same stage by simply switching lenses. The system incorporates Shimadzu's proprietary wide-view camera and microscope camera for infrared measurements and objective lens for Raman measurements. The wide-view camera shares positional information with the microscope camera and objective lenses.
800-477-1227; www.ssi.shimadzu.com

QED Environmental Systems Eliminator bladder pump

QED Environmental Systems' Eliminator high-capacity bladder pump is designed to handle light nonaqueous phase liquids and dense nonaqueous phase liquids, and viscous contaminants, including crude oil. Available for 2-inch or 4-inch wells or larger, the pump offers 100% air-powered operation and simple flow optimization. The Eliminator uses a bladder made of PTFE or elastomer to isolate the pump air supply from pumped liquid, so there is no contact between the air and the contaminated fluids inside the bladder. Featuring reliable top-inlet skimming or bottom-inlet pumping, the pump is powered by compressed air that requires an external timer-based controller to control the air cycling on and off switch to the bladder pump.
800-810-9908; www.qedenv.com

Fluoramics Chain Wire and Cable lubricant

Chain Wire and Cable rust-stopping lubricant from Fluoramics penetrates wire rope and the pins/bushings within chains. It can be used on pulleys, gears, forklifts, dock or garage door cables, conveyor belts, elevator cables, hoists, chain saws, forklifts and link/roller assemblies. Chain Wire and Cable is engineered using HinderRUST technology. The lubricant applies as a mobile liquid that wets surfaces and creeps into seams. It starts protecting and lubricating surfaces upon application, and keeps chains and cables supple. Solvent-free, Chain Wire and Cable is nontoxic, nonflammable, plus is manufactured with EU Regulatory Compliant PTFE.
800-922-0075;
www.fluoramics.com

OZ Lifting XR Series davit cranes

OZ Lifting Products has launched its XR Series of davit cranes for wastewater and water operators. The Winona, Minnesota-based manufacturer has released the model in 500- and 1,000-pound capacities, but the long reach of the range is a standout benefit for operators. Where other davit cranes typically have reduced capacity when it is in the longest reaching position, this series maintains its maximum capacity rating in all configurations. This means wastewater and water professionals can lift more weight, further out, which presents many benefits for numerous lifting and material handling applications. The smaller crane weighs only 57 pounds and the larger crane weighs 95 pounds. Both have a maximum 62-inch reach and maximum hook height of 87 inches.
800-749-1064;
www.ozliftingproducts.com tpo

product spotlight wastewater

Mobile disinfection units designed for industrial and municipal applications

By Craig Mandli

Mobile water disinfection platforms have long been utilized in the oil and gas sector. Now **De Nora Water Technologies** has identified a need for such technology in the industrial and municipal wastewater treatment markets, especially during natural disasters or large-scale treatment plant maintenance and upgrade projects.

"To my knowledge, other water disinfection units are designed as short-term pilot units and are focused on the municipal market, less on the industrial side," says Bob Newton, director, Business Development Global for De Nora. "What sets our mobile assets apart is the flexibility to be deployed quickly for short- or long-term needs, either filling a gap while more permanent disinfection systems are shut down for upgrading, maintenance or stationed more permanently with flexible service-based rental agreements."

De Nora mobile units are compact, plug-and-play, and don't require construction, saving users two critical resources — time and money, according to Newton. They can make a difference in ensuring plants stay online and in compliance. De Nora's fleet of mobile units employ a variety of the company's core water treatment technologies, including ClorTec units that provide sodium hypochlorite generation capabilities and MIOX units that produce chemistry with unique advantages over straight sodium hypochlorite. Also available are Capital Controls Ozone trailers, the MIOX BOSS trailer that produces bromine for cooling water applications, and a UV-based Advanced Oxidation trailer for piloting purposes.

Mobile water disinfection units from De Nora Water Technologies

"While our mobile assets are new to this market, we've been developing mobile platforms for our technology for over a decade in the oil and gas market," says Newton. "Our experience in deploying our technology into the unforgiving oilfield environment has resulted in substantial improvements in fundamental design of mobile platforms to make these systems some of the most reliable and easy to deploy units on the market today."

According to Newton, both ClorTec and MIOX assets have been used for "frac on the fly" in oil and natural gas fracking operations where mobility was key and have also been utilized in produced water recycling operations where long-term deployment and reliable operations are critical.

"Safety, timing and economic advantages are relevant to the industrial and municipal markets, so transferring the technology — and value to customers — just made sense," he says. "Finally, saving time has been critical for our customers. When a situation arises that can't wait 26 weeks for a new system installation, we can be there fast, keeping your team safe and in compliance." **215-997-4000; www.denora.com**

events

June 6-9
WEF/IWA Innovations in Process Engineering Conference 2023, Hyatt Regency Portland, Oregon. Visit www.wef.org.

June 11-14
AWWA ACE23, Enercare Center, Toronto, Ontario. Visit www.awwa.org.

June 18-21
Michigan Water Environment Association Annual Conference, Amway Grand Plaza Hotel and DeVos Place, Grand Rapids. Visit www.mi-wea.org.

June 18-21
Pennsylvania Water Environment Association PennTec 2023 Annual Technical Conference and Exhibition, Hershey Lodge. Visit www.pwea.org.

June 27-29
WEF Stormwater Summit 2023, Kansas City (Missouri) Convention Center. Visit www.wef.org.

June 27-30
WEF Collection Systems Conference 2023, Kansas City (Missouri) Convention Center. Visit www.wef.org.

exam STUDY GUIDE

Get help on sticky questions.
In this issue and at tpomag.com

worth noting

people/awards

Derek Albertson was named superintendent and administrator for the Town of Montville (Connecticut) Water Pollution Control Authority.

The **King County (Washington) Wastewater Treatment Division** Operator-in-Training program received a 2023 National Environmental Achievement Award from the National Association of Clean Water Agencies.

Rome Norman and **Akin Babatola** of Santa Cruz received Quarter Century awards for their commitment to environmental protection and quality of life from the California Water Environment Association-Monterey Bay Section. Norman is wastewater treatment system collections and flood control manager, and Babatola is environmental compliance and laboratory manager. **Armando Deloera** was named Supervisor of the Year for mentoring of team members, professional development and effective communication.

The U.S. Department of Energy's **Argonne National Laboratory** received a 2022 Chicago Innovation Award for its work on a COVID wastewater surveillance system.

The **Eastern Municipal Water District** received a 2022 National Environmental Achievement Award in public information and education from the National Association of Clean Water Agencies for its wastewater mascot Patrick the Poo.

The **Chicopee (Massachusetts) Industrial Pretreatment Program** staff, led by **Laurie Goff,** received a U.S. EPA Regional Industrial Pretreatment Program Excellence Award,

Dr. Detlef R. U. Knappe, a professor at North Carolina State University, received an A.P. Black Research Award from the AWWA. Knappe has established an internationally recognized research program on adsorption for the removal of organic compounds in drinking water.

Jeff Cattaneo, operations manager with the San Benito County (California) Water District, retired after more than 20 years of service.

David Brown, water and irrigation specialist in Yakima, Washington, retired as assistant director of public works after 39 years with the city.

Alan King retired after 11 years as director of public works and utilities in Wichita, Kansas. His full career with the utility spanned 47 years.

Khristopher A. Dodson was named executive director of the New York Water Environment Association.

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

WE STIR UP EVERYTHING BUT TROUBLE.

Rotamix®

For hydraulic mixing without headaches, choose the reliable Vaughan Rotamix System. Blend lower operating and maintenance costs with a more efficient breakdown of solids. Your digesters, sludge storage tanks, and equalization basins won't know what hit them.

Choose the unmatched reliability of Vaughan. Free sample CFD's upon request.

Vaughan
Unmatched Reliability

SEE ROTAMIX IN ACTION

GUARANTEED PERFORMANCE | NO MOVING PARTS IN THE TANK | FOCUSED MIXING

888-249-CHOP | CHOPPERPUMPS.COM

VISIT US AT ACE23
June 11-14
BOOTH 2330

Blue-White®

Simple, Dependable and Precise
Chemical Dosing & Water Analysis

FLEXFLO® M4
For Accurate Chemical Dosing with No Vapor Lock and No Lost Prime.

APNTU ONLINE TURBIDITY ANALYZER
Ultra-Low Turbidity Range, Touch Screen Display and Data-Logging Terminal.

Fluid Metering Solutions Made Simple.

Learn more about the M4 and Analyzer at www.blue-white.com

Made in USA