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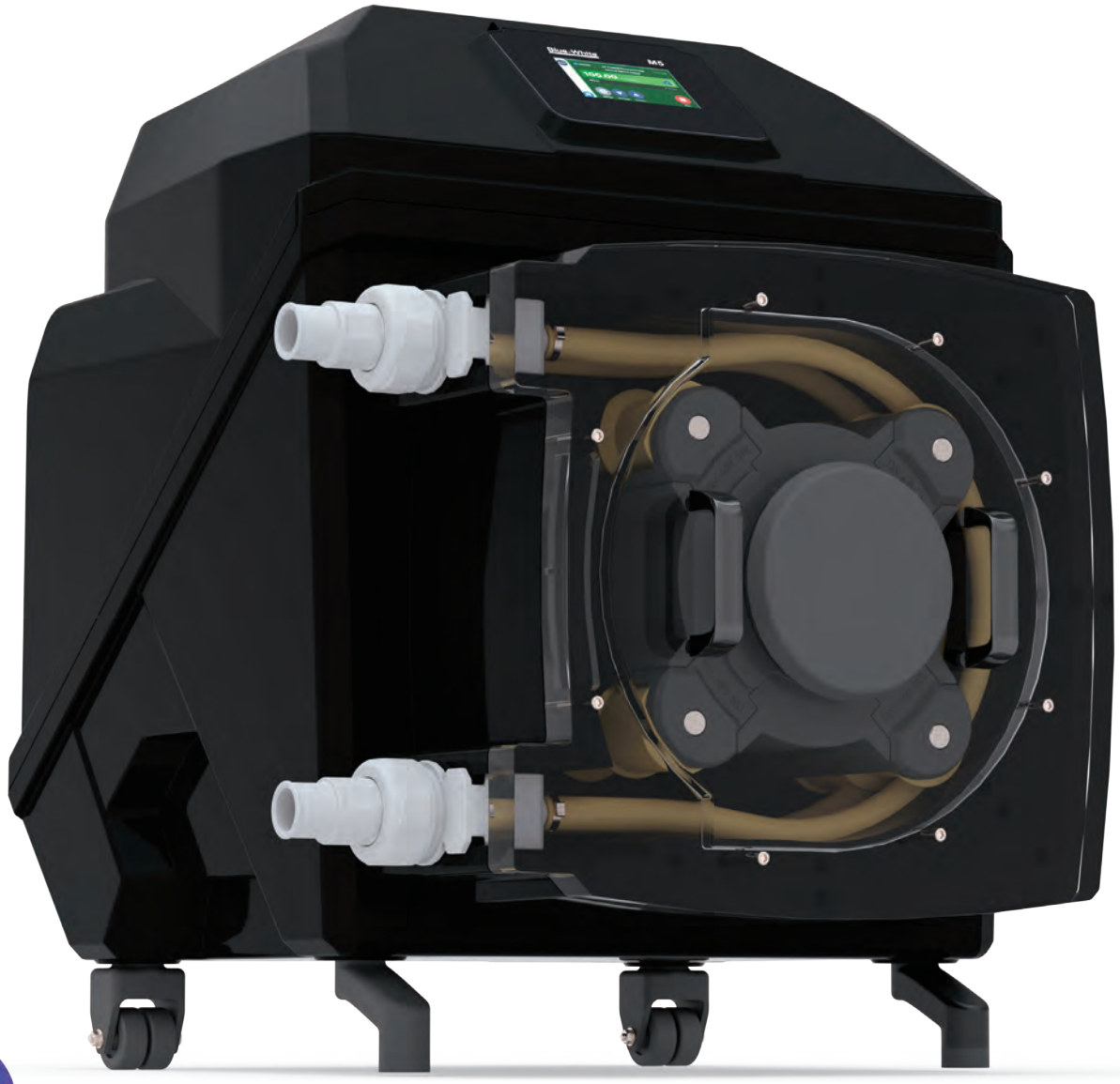

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contents September 2022

top performers

coming next month: October 2022 FOCUS: **WEFTEC Show Issue / Clarifiers, Digesters, Water Towers, Structures and Components**

» Let's Be Clear: The Sewer Crew Theory of Government » TOP PERFORMERS: Yorba Linda (California) Water District I Wastewater Operator: Rodney Lance, Veolia, Great Falls, Montana I Water Operator: Paul Crocker, ReliabilityX, Kansas City, Kansas » In My Words: Training for water careers at Maine's community colleges » Sustainable Operations: Hydroturbines for power generation in Pueblo, Colorado » Hearts and Minds: Utility technicians take center stage » Technology Deep Dive: Oxygen and ozone injection for odor control

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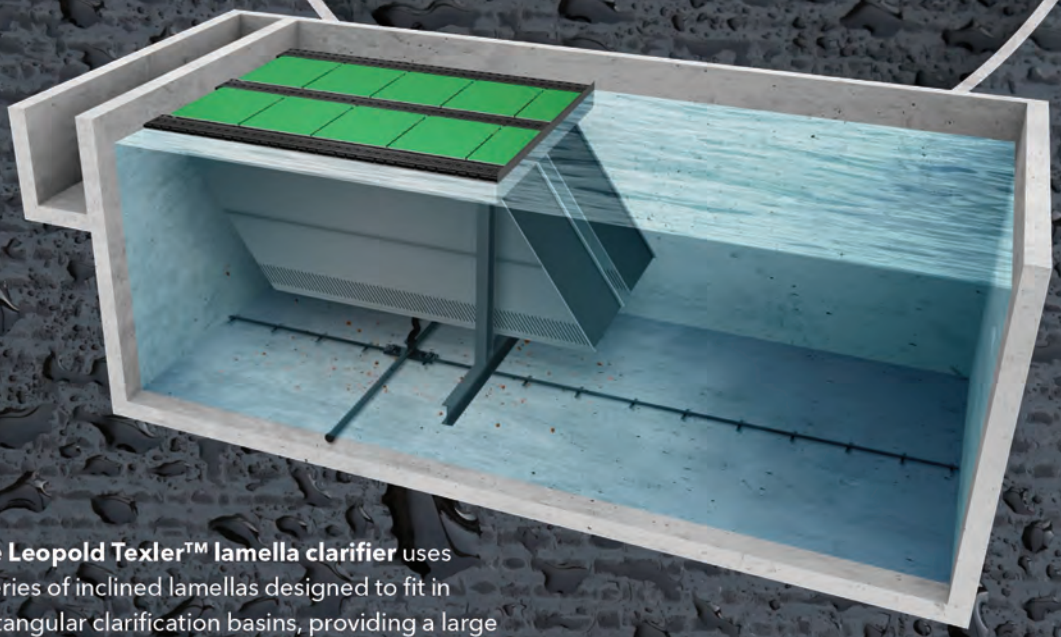

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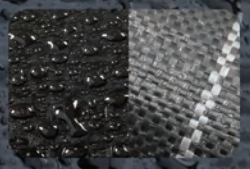

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Biosolids: Playing Offense

HOW DO YOU APPROACH COMMUNICATION ABOUT YOUR BENEFICIAL USE PROGRAM? APOLOGIZING FOR POTENTIAL NEGATIVES? OR PROUDLY PROCLAIMING THE BENEFITS?

By Ted J. Rulseh, Editor

Biosolids recycling has always existed under a cloud. Some people have concerns about odor. Heavy metals. Pathogens.

Then there are the mischaracterizations of the product as "treated human waste," or worse, that often appear in the news media. And now we have the specter of PFAS and the fear that our farmland and landscapes are being despoiled with "forever chemicals."

Put it all together and it's enough to force clean-water agencies with beneficial use programs into a defensive crouch. There are so many accusations and innuendos flying that it's tempting to slip on a figurative Kevlar vest and gird for the attacks.

But playing defense, or "playing not to lose," has never been a productive strategy. It's sort of like promoting a product by saying, "Gee, it's really not so bad." It's allowing the concerned and the misinformed to set the agenda for discussion.

COUNTING BENEFITS

The concerns, of course, have to be acknowledged and addressed. Avoiding them, trying to sweep them under the rug, is a sure way to destroy credibility. But it's unwise to lead off by explaining away negatives, especially when there are so many positives to talk about.

And those positives go beyond the presence of nutrients that help stimulate crop and plant growth and that save users money they would otherwise spend on commercial fertilizers. According to the Water Environment Federation, "The body of research documenting the comprehensive benefits from biosolids use — from improved ecosystem servicing to soil health and carbon sequestration — is growing."

> Agriculture agencies are starting to emphasize the role organic matter plays in soil health and greenhouse gas mitigation.

Biosolids have the major advantage of containing significant organic matter. This strikes close to home because last fall a landscaper advised me to consider applying Milorganite fertilizer (a Milwaukee biosolids product) to an area of my property that gets baked dry by the sun and where grass and wildflowers plants therefore have trouble growing.

The organic matter helps the soil hold more water and could help rejuvenate an area that has been somewhat barren for a long time.

Meanwhile, agriculture agencies are starting to emphasize the role organic matter plays in soil health and greenhouse gas mitigation. That can

only bode well for biosolids, whether Class B products for cropland or Class A pelletized material or compost for golf courses, parks and residential lawns and ornamental gardens.

STAYING POSITIVE

Perhaps the easiest way to put biosolids in a deservedly positive light is to emphasize recycling. It's a concept people readily understand and tend to view favorably. Most people recycle daily — their aluminum cans, glass bottles, plastics, paper, cardboard.

From there it's not a long stretch to talk about recycling as it applies to wastewater: how treatment plants turn the raw material of sewage into clean water, a rich source of plant nutrition and soil restoration and, in many cases, a renewable fuel (biogas).

The trick, despite all the negativity that can surround biosolids, is to promote the product with enthusiasm. I recall a sales training session during which the leader suggested remembering the last four letters of that word: IASM. As in: I Am Sold Myself. You have to believe in what you are selling in order to be effective.

In an important sense, if your agency markets biosolids in any form, you are in the sales business. If you believe in your product and it shows, you'll have a much easier time getting your publics to go along.

As the sports cliché goes, the best defense is a good offense. The concerns about biosolids will always be there; they aren't that hard to explain. PFAS? We cook on it. We wear it. It's in our furniture and carpet. We dress our babies in it. It's all over our households. Why would we think tiny quantities in the soil from biosolids are a major health concern?

Anyway, the simple truth is you've got a great product. Don't be afraid to talk it up. **tpo**

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WATER STEWARDSHIP

Great Lakes Region Partnership

The Council of the Great Lakes Region and The Water Council recently announced a partnership to deepen ties and accelerate water innovation and stewardship in the binational Great Lakes region, the engine of the North American economy and guardian of the largest freshwater system in the world. Read more about the mutual effort in this online exclusive article.

tpomag.com/featured

OVERHEARD ONLINE

"Disinfection is the most important treatment goal in many cases because waterborne diseases are one of the leading causes of mortality and morbidity around the globe."

Harnessing the Sun to Disinfect Water

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AWARD WINNERS

Drought Stress Detection

The Water Environment Federation recently announced that John Benedict Estrada and Pauline Victoria Estrada — siblings from Clovis North High School in California — are the winners of the 2022 U.S. Stockholm Junior Water Prize for their project on conservation of irrigation water using a drought assessment tool powered by artificial intelligence.

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AN EXPANDED TEAM AT PLUM CREEK IN COLORADO LEARNED AND FLAWLESSLY DEPLOYED AN ADVANCED WATER TREATMENT PROCESS WHILE TRANSITIONING FROM AN OLDER FACILITY

STORY: **Jim Force** | PHOTOGRAPHY: **Carl Scofield**

Operator Alpha Camara checks the valves in the ozone production room (Primozone).

"Just because it is written doesn't make it true in the field."

So says David Montgomery, treatment services superintendent of the Plum Creek Water Purification Facility in Castle Rock, Colorado, reflecting on the new advanced treatment processes in operation at the town's 6 mgd plant.

Adds Tim Lambert, water treatment supervisor and operator in responsible charge, "Sample, test, verify and repeat, particularly with advanced processes which require draw-down testing, flowmeter verification and chemical dosing confirmations."

Montgomery, Lambert and the Plum Creek team are successfully operating the new facility, designed for future direct potable reuse, but now operating as an indirect reuse plant. "Our team contributed by helping to design, construct and start up the advanced process, while flawlessly operating the existing surface water treatment plant," says Montgomery.

"All this work was completed during the pandemic. The team learned how to operate the new processes without any noticeable impact on our customers."

BOOM TOWN

The original water system in Castle Rock, just south of Denver, was made up of several small package pressure filter facilities. In the early 1980s, the town built a series of plants designed to remove iron and manganese from the raw water, which was pulled from multiple wells scattered across the area.

The team at the Plum Creek Water Purification Facility includes, from left, John Ferguson and Kevin Moore, operator supervisors; Tim Lambert, water treatment supervisor; David Montgomery, treatment services superintendent; Joe Compton and Mitchell Horner, operators; Shawn Griffith, operations manager; and Alpha Camara and Andrew Dieter, operators.

With the town growing rapidly, the Ray Waterman Regional Water Treatment Facility was built in 2006, using manganese oxide-greensand for iron and manganese removal. In 2013, the town started up the Plum Creek plant, the first surface water treatment plant ever owned by the town. "It enabled us to use local renewable water as a water supply," says Montgomery.

Then, in 2020, with the advanced processes online, the Burns & McDonnell-designed Plum Creek plant began treating a blend of deep groundwater, raw water from Plum Creek, and indirect reuse water.

"The plant is now designed specifically to enhance water quality and treat for Contaminants of Emerging Concern," says Lambert "We'll be able to handle direct potable reuse in the near future once the State of Colorado sets regulatory standards."

ADVANCED TREATMENT

In the advanced process, raw water from wells and surface water is pre-ozonated using Primozone ozone generators before combining in a 1-million-gallon raw water mixing and equalization basin. The water passes through aerators, and ferric chloride and potassium permanganate are injected before the flocculator/sedimentation plate settlers (Parkson Corporation). The rapid mixers are Lightnin.

Clarified water travels to biologically active carbon filters (Calgon Carbon Corporation), recently converted from conventional anthracite gravity filters. The filtered water collects in a pre-membrane feed well, before being pumped through four racks of Aria Microza microfiltration membrane filters (Pall Water).

The water is re-ozonated, hydrogen peroxide is added and the water passes through granular activated carbon filters (also Calgon Carbon Corporation). From there, the water is UV disinfected (Trojan Technologies) and injected with sodium hydroxide (caustic) for pH adjustment. Sodium hypochlorite (bleach) is added before the water enters the clear well.

Liquid ammonium sulfate is added for chloramination before the water flows to the distribution system. Watson-Marlowe pumps are used for chemical feed throughout. Plant PLCs run Allen Bradley ControlLogix (Rockwell Automation). The human-machine interface is PlantPAx and FactoryTalk (also Rockwell Automation). Cartegraph supplied the computerized maintenance management system.

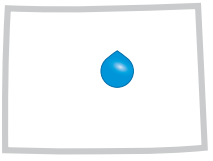
STAFFING UP

Staffing has matched the increases in treatment complexity at Plum Creek. In 2013, the operations staff consisted of one supervisor and five operators who ran the plant only during daylight hours.

Plum Creek Water Purification Facility,

Castle Rock, Colorado

www.crgov.com



BUILT:
2013; upgraded 2020-21

AREA SERVED:
Town of Castle Rock (35 square miles)

POPULATION SERVED:
73,000

SOURCE WATER:
Plum Creek, alluvial wells and deep groundwater wells

PROCESS:
Ozonation, rapid mixing, flocculation-sedimentation, carbon and membrane filtration

PRODUCTION CAPACITY:
6 mgd

SYSTEM STORAGE:
35 million gallons

DISTRIBUTION:
486 miles of pipeline, 24,000 service connections

ANNUAL BUDGET:
$850,000 (operations)


Tim Lambert, water treatment supervisor


The Plum Creek staff in the control room managing plant operations by way of the SCADA system.


Kristen Reaves takes a reading of pump discharge gases (water filtration system from Amiad).

Now, in addition to Montgomery and Lambert, the staff includes John Ferguson and Kevin Moore, operator supervisors; treatment operators Andrew Dieter, Lanre Ajayi, Ed Allbright, John Whitesel, Matt Arpaio, Alpha Camara, Randy Mullins, Brent Pickrell, Kristen Reaves, Joe Compton and Courtney Stoddard. Crew members work two shifts seven days a week.

Bringing a new plant online without disrupting service is always difficult, and that was no less so at Plum Creek. The town was moving from a small daytime operation to a complex plant requiring many more operators.

Lambert says that setting clear treatment goals helped in the transition. So did calling on the Texas AWWA for operator training assistance, and running a pilot study to determine treatment performance of the new processes.

TEXAS TO THE RESCUE

The treatment technology at the Plum Creek Water Purification Facility is so new that the operations staff couldn't find any advanced treatment process training in Colorado.

The answer was in Texas. "I searched the web for advanced treatment plant online training and found that the Texas AWWA was developing ATP training," says Tim Lambert, water treatment supervisor.

"I worked with Daniel Nix, who coordinated with our Department of Public Health and Environment so that we could get Colorado training units by taking the Texas training. We're using the training to help grow operators' knowledge in advanced treatment processes. And now, through the efforts of the staff here, all the other certified operators in Colorado can take advantage of the training and obtain certification."

"In order to get the treatment staff on board and organized to operate the advanced processes, the engineering group came up with a list of treatment goals, which provided a framework for the operators to follow," says Montgomery. The goals listed water quality action levels for the raw water at each treatment step and for the finished water. The goals set standards that exceeded Colorado regulatory requirements.

CONTROLLING TOC

Those goals surely helped as operators faced significant increases in TOC brought by accelerated pumping of raw water from Plum Creek. Precise TOC measurements are critical to helping operators understand changes in water quality and make informed decisions about TOC-related processes, Lambert says.

"At first our operators used a spectrophotometer for TOC analysis, but that was not ideal," says Lambert. "It required a lot of prep work to set up the instrument with reagents. Samples needed to incubate for several hours before testing, and the entire process took over four hours to get a reading."

Eventually the staff purchased a TOC analyzer (SUEZ), which provides real-time sample analysis. It includes a 63-vial auto-sampler, along with pre-cleaned and pre-tested sample vials. "Plant operators simply place a sample vial into the analyzer and results returned with 15 minutes," Lambert says.

The operations staff made a number of other changes on their own. "The plant operates best using mid to high flows," says Lambert. "Low-demand

> "Our team contributed by helping to design, construct, and start up the advanced process, while flawlessly operating the existing surface water treatment plant."
> **DAVID MONTGOMERY**

winter flows can be challenging. The staff developed a process flow calculator based on water quality, which helps to fine tune treatment based the raw water quality parameters. The calculator provides data that steers the staff to blend surface and groundwater to achieve the best ratio for water quality."

AT THE INTAKE

The staff also came up with ways to improve operations at the Plum Creek diversion pump station intake structure. "It was being overtaken by huge sand loads traveling down the creek bed," Lambert says. "The staff designed and built new stop-logs that held back the sand and debris but allowed the water filter through screens." The change has improved water quality and eased maintenance requirements.

In another change for the better, the staff also purchased an excavator to dredge the creek directly in front of the intake structure, greatly improving the quality of water entering the raw water pump station.

The Plum Creek team also made major process adjustments to manage high total dissolved solids in the surface water, primarily inorganic salts and small amounts of organic matter. TDS can cause discolored water, hardness deposits on fixtures, and a salty taste. Staff members also had to fight through processing high levels of manganese that was binding the new GAC filters after overfeeding of peroxide and ozone.

But the biggest challenge has been keeping up with growth. "The team has managed to keep the wells repaired, drilled new wells, rehabilitated the

From left, Andrew Dieter, Alpha Camara and Mitchell Horner in the raw water vault, cleaning the ozone analyzers (Emerson/Rosemount).

treatment plants, started up the new surface water plant, and have kept growing, right along with the town," says Montgomery.

"We've maximized the development of a renewable water supply, and we've passed the last three sanitary surveys with no deficiencies."

Changing from daytime to around-the-clock operations has also been challenging, especially with increased staffing: "We restructured the staff working hours and hired additional staff. We try to have two operators on shift at all times, with one experienced operator and a less experienced operator on each shift for safety and training."

(continued)

AMPLE RECOGNITION

The Plum Creek Water Purification Facility has won a long list of awards. They include:

- 2021 Rocky Mountain AWWA Outstanding Water Treatment Plant (Large Plant category) 2021 American Council of Civil Engineers Excellence in Engineering Award
- 2020 Commitment Award for community service and 2017-2020 Gold Awards for sustainability and excellence, Colorado Department of Public Health and Environment
- 2021 Maintenance Award, Rocky Mountain AWWA
- 2015 Rocky Mountain AWWA Best-Tasting Water

PEOPLE MATTER

While the technical successes at Plum Creek are noteworthy, Montgomery, Lambert and rest of plant management are proudest of achievements on the people side. Montgomery emphasizes "the trust and friendships that have been developed over the years with fellow operators are vital and the reason for our success."

Safety is paramount. "We've not had a major injury over last 20 years," says Lambert. "Considering the hazards the staff faces each day, like bulk chemical handling, working in ice and snow, in confined spaces, on slippery surfaces, around water, and automated electrically driven machinery, safety of our staff is the biggest achievement. The machines can easily be replaced, but well trained and dedicated professionals are hard to find and essential to keep." tpo

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Community volunteers collect trash, litter and debris during Rivers Alive stream cleanup.

Keeping Rivers Alive

AN EVENT SPONSORED BY THE CLAYTON COUNTY WATER AUTHORITY ENGAGES THE COMMUNITY TO HELP KEEP WATERWAYS CLEAN

By Sandra Buettner

It's amazing what people sometimes find when working on stream cleanup projects. During the Rivers Alive cleanup sponsored by the Clayton County (Georgia) Water Authority, community volunteers have found a car door, a transmission housing and one object the adults easily recognized, but the kids did not.

The Rivers Alive cleanup was created more than 20 years ago to encourage communities to keep rivers healthy. Sponsored by government and non-governmental organizations, it was an offshoot of the Keep America Beautiful campaign.

"During the past two years, we have had to cancel the event due to COVID," notes Suzanne Brown, communications and community relations manager. "It was so disappointing for the community and the staff because everyone has so much fun and looks forward to it. We are happy to announce that it will be back on for 2022."

Clayton County Water Authority, about 15 miles from Atlanta, treats up to 38.4 mgd at three water reclamation facilities and serves a population of about 300,000.

ROTATING VENUES

The event is promoted through bill inserts, the utility's Facebook page, e-blasts from its county commissioners, flyers at the local libraries, the Clayton County government access channel, and the authority's website and social media.

> "One of the most unusual objects we found was a pay phone. The kids didn't know what it was, and we had to explain that at one time coins were put in a phone to make a call."
> **SUZANNE BROWN**

The event is held on the fourth Saturday in October and focuses on the Flint River, and creeks connected to county parks. Utility staff members pick a park or school along a stream where there is ample parking and access to restrooms. Venues have included Swint Elementary School, Panhandle Park, Independence Park and Rex Park.

The volunteers arrive at 9 a.m. and receive supplies that include a Rivers Alive T-shirt, gloves and trash bags. They sign waivers and receive a safety briefing. If the weather is hot the organizers alert the volunteers to beware of bees and snakes.

Volunteers range from five years old to well past retirement. A group of AT&T retirees, the Pioneers, come every year. Other groups include Girl

Scouts, Boy Scouts, church groups, high school and university students and utility staff. Up to 300 volunteers take part; the average is 150 to 200.

Volunteers are divided into groups with a team leader. The trash collecting lasts 45 minutes, at which point a blowhorn signals the groups to return to their starting point. The groups typically collect 1,000 to 1,500 pounds, and in some years up to 3,000 pounds.

FUN FESTIVITIES

When the volunteers are back where they checked in, they enjoy an hour of fun activities, along with lunch. There are games and prizes for the kids. The games include a version of cornhole in which children toss brown and yellow bean bags, representing poop and pee, at a toilet seat. The kids learn what they should and should not put into toilets.

A prize wheel teaches and quizzes the students about water conservation, stormwater and pollution prevention. They get prizes for answering questions correctly. A model water tower and fire hydrants are on display. A group of authority staffers teach the kids about watersheds and show them samples of water from the river or stream they helped clean up.

Along with the car door and transmission housing, the volunteers found a shopping cart.

"One of the most unusual objects we found was a pay phone," Brown recalls. "The kids didn't know what it was, and we had to explain that at one time coins were put in a phone to make a call. They had a hard time believing that."tpo

Volunteers learn how elevated water towers work and connect to a distribution system.

Rivers Alive community volunteers fill their bags with trash and other items while cleaning up around the Flint River.

John Gage, senior civil engineer and project manager, inspects the gas reheat temperature and suction pressure in the biogas compression in the BioCNG treatment skid unit built by Unison.

Fuel for the Fleet

BIOGAS TO RNG PROJECT FURTHERS SUSTAINABILITY AND RESOURCE RECOVERY AIMS WHILE GENERATING SIGNIFICANT REVENUE FOR LONGMONT, COLORADO

STORY: **Ted J. Rulseh** | PHOTOGRAPHY: **Carl Scofield**

> We were very collaborative, and we had good conversations through the planning process about what we needed from our operations teams."
>
> **CHARLES KAMENIDES**

Charles Kamenides, waste services manager, monitors the CNG compressor (ANGI Energy Systems) at the fueling end of the BioCNG system.

The city of Longmont Wastewater Treatment Plant generates 140,000 cubic feet per day of biogas. Putting more of it to beneficial use became a priority five years ago.

Today, the city uses 70-80% of the biogas, thanks to a project that converts that fuel to renewable natural gas for the Waste Services truck fleet. Eleven new trucks in a fleet of 21 now run on the biogas-based fuel; by the end of 2022, three more RNG-fueled trucks will replace diesel units that have reached the end of their life cycle. The city expects to complete the replacement of the diesel vehicles by 2025, using nearly all the available biogas.

"This project is directly in line with the city's Sustainability Plan," says John Gage, P.E., senior civil engineer and project manager. "We are significantly reducing greenhouse gas emissions with the transition of our trash, recycle and compost collection trucks from diesel fuel to renewable natural gas."

There's a benefit on the financial side, as well: After the expense of producing the fuel, the city reaps a net of about $600,000 per year from the sale of renewable fuel credits and the avoidance of diesel fuel costs. The $8.3 million project was partially funded by a $1 million grant from the Colorado Department of Local Affairs and a $385,000 grant from the Colorado Regional Air Quality Council.

Operations teams at the wastewater treatment plant and the city's Waste Services and Fleet Management departments had input from the early stages, ensuring that their concerns were addressed and contributing to the effort's success. For its accomplishment, the city earned a 2021 Project Excellence Award from the Water Environment Federation.

TAPPING A RESOURCE

Longmont, a city of about 100,000 in north-central Colorado about 30 miles north of Denver, operates an activated sludge treatment plant (13 mgd design). Effluent discharges to the St. Vrain Creek.

Biogas Treatment and RNG Fueling Station,

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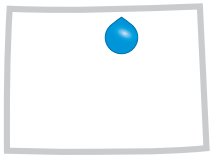

COMPLETED:
2020

PARTNERS:
Carollo Engineers (design), CGRS (design-build contractor)

PROJECT COST:
$8.3 million (design and construction)

TREATMENT PLANT FLOWS:
13 mgd design, 7 mgd average

BIOGAS VOLUME:
140,000 cubic feet/day

FUEL UTILIZATION:
11 Waste Services trucks (3 more to be added in 2022, complete conversion by 2025)

FINANCIAL BENEFIT:
~$600,000 annually in net benefit by renewable credit revenue and fuel cost reduction

RECOGNITION:
Water Environment Federation 2021 Project Excellence Award

Primary sludge is gravity thickened and waste activated sludge is thickened in a dissolved air flotation process before the materials are sent to the anaerobic digesters. The digested solids are dewatered in centrifuges (Centrisys/CNP) to 16-19% solids. Denali Water Solutions hauls the cake to a blending facility that serves multiple area treatment plants; the finished product is land-applied on farms.

In 2017, the city hired Carollo Engineers to study alternatives for making optimal use of the plant's biogas. At that point the plant used about one-third of the gas for process heating and flared the rest. The engineers looked at installing a combined heat and power facility, and supplying biogas to local industry, before settling on the biogas-to-RNG project.

The city undertook a design-build project with Carollo and CGRS, which handled all construction and designed the truck fueling station and a new building to fuel and store the Waste Services fleet. Unison Solutions supplied a biogas treatment system that removes hydrogen sulfide, moisture, carbon dioxide, siloxanes and volatile organic compounds.

The cleaned gas, at 95% methane, is sent through a newly built pipeline to the fueling station on city land next to the wastewater treatment plant. Compressors pressurize the gas into storage vessels at 4,500 psi; the fuel then discharges to the trucks while they are parked overnight.

Charles Kamenides, left, and John Gage in the final fueling area in the service vehicle garage.

CLOSE COLLABORATION

Operations team members were intimately involved in the project planning, notes Charles Kamenides, waste services manager.

"We developed strong relationships early on," Kamenides says. "We were very collaborative, and we had good conversations through the planning process about what we needed from our operations teams. We knew there would be some challenges because a facility like this was new to the city, but we had a lot of input and meetings where we talked about how to make the project work."

Gage adds, "When exploring the direct fueling of vehicles, we knew it was going to be a partnership. It was important to get the whole team together and ask: What is this going to take?" Gage, Kamenides, treatment operations assistant manager Karl Heil, fleet manager Cash Johns visited a similar process in Grand Junction, Colorado. "It really built confidence for all of us to see things on the ground and how all the pieces fit together," Gage recalls.

A key objective was to minimize impact on the operations teams. The new Waste Services building was constructed near the treatment plant to avoid installing a four-mile pipeline through a congested area to the existing fleet facility. The Waste Services trucks were stored indoors before the project, and that is still the case in the new building. "The operations staff has a work environment similar to what they previously did," Gage says. "We built the new building and pretty much matched what they had been doing."

The 2,680-square-foot building has five indoor fueling bays with 16 fueling positions. A natural gas supply is available as backup to the RNG system.

HIGHLY AUTOMATED

On the treatment plant side, Gage observes, "Most people in the industry say that staffs are lean. More and more utilities are relying on automation. Feedback from our treatment operations staff was to keep the focus on what the plant was built for, which is to meet the discharge permit. Their main goal is to treat wastewater effectively.

"The utility is starting to lean more toward being holistic on the energy side, but their concern was that they didn't want the project to be a distraction, where they would have to learn this new process and touch it and inspect it every day."

Accordingly, the biogas treatment process is highly automated. It can be monitored remotely, and operating data is fed to the city's reporting system. "Every day we get an automated report showing a list of 15 to 20 parameters, their expected ranges, and whether any are falling outside those ranges," says Gage. "So we know quickly whether it was operating the way it should have on the previous day."

CGRS handles the maintenance under a contract. "We don't necessarily want to be experts on gas systems; that's not what we've been trained to do,"

IT'S NOT ABOUT PAYBACK

In calculating the benefits of its biogas-to-RNG project, Longmont's leaders looked beyond pure economics. Sustainability is a key component of the city's long-range planning, and the project contributes significantly to it.

"The conversation needs to be bigger than whether a project will pay for itself in 10 years or not," observes John Gage, P.E. project manager. "You have to recognize that sustainability, doing the right thing, matters for your community. But does this project have potential for good financial recovery? I think it definitely does."

The beneficial use of biogas enables the city to sell renewable fuel credits that generate up to $400,000 in annual revenue, Gage reports. The fuel also replaces about 100,000 gallons of diesel fuel per year, saving about $300,000. Producing the fuel costs about $1.20 per diesel gallon equivalent. The net financial benefit thus approaches $600,000 per year.

Meanwhile the cleaner fuel, free of sulfur, soot and heavy metals, reduces greenhouse gas emissions by about 1,000 metric tons of carbon dioxide equivalent per year, about the same as taking 200 cars off the road. That reduction will increase as the city converts more of its fleet vehicles to run on the renewable fuel.

And when on the job, the trucks operate quietly and without odors, minimizing disruption to neighborhoods while improving air quality and general quality of life for city residents.

says Gage. "CGRS specializes in working on high-pressure gas systems. They take care of routine maintenance.

"We worked with CGRS and the manufacturer to make sure we understood what all the planned maintenance tasks were. We occasionally go with them just to observe what they're doing so we have some capacity within our organization, but we don't spend staff time maintaining the system."

OPTIMUM USAGE

A key technical challenge to the project was matching fuel supply to demand so as to make the best use of the biogas generated. The treatment plant digesters produce gas continuously, while the trucks operate four days a week and are fueled overnight. This made it necessary to provide gas storage upstream and downstream of the biogas treatment system.

On the upstream side, the floating cover on one digester was fitted with a level indicator that communicates the cover's elevation to the biogas treatment system. The treatment system's production then increases or decreases to maintain a digester cover setpoint. If the digester with the floating cover is out of service, the gas treatment system is controlled based on digester gas pressure.

On the downstream side, the truck fueling system has two compressors and two gas-storage systems. A low-pressure storage tank is located upstream from the first compressor, which sends RNG to a high-pressure storage bank with six aboveground tanks holding a combined 104,000 standard cubic feet at 4,500 psi. The second compressor distributes RNG to the trucks as needed; it can fill up to 30 trucks over seven to eight hours.

LOOKING FORWARD

Ultimately, all of the Waste Services trucks will be converted to operate on RNG. "We have designated a life cycle for each truck, and once the remaining diesel trucks have reached the end of that period, they will be replaced and upgraded as compressed natural gas vehicles," Kamenides says.

> "It has really been hands-off; it was not so difficult a project to incorporate into our operations."
> **CHARLES KAMENIDES**

He credits a sound design and collaboration across departments for the project's smooth performance: "It has really been hands-off; it was not so difficult a project to incorporate into our operations. They built a great facility for our operation. A collaborative approach in the design-build process was really important."

Gage believes the project's success could encourage other utilities to embrace the biogas-to-RNG technology. "When it comes to renewables projects like this one, mid-range utilities might feel like it's too much for them to handle," he says. "One thing we've learned is that we have a lot of power in our database management. Also, finding really good partners, like our contracted maintenance teams, can ease the burden on operations staff."

For now, the clean-fueled collection trucks moving through the streets of Longmont are helping to show the way to more sustainable communities. **tpo**

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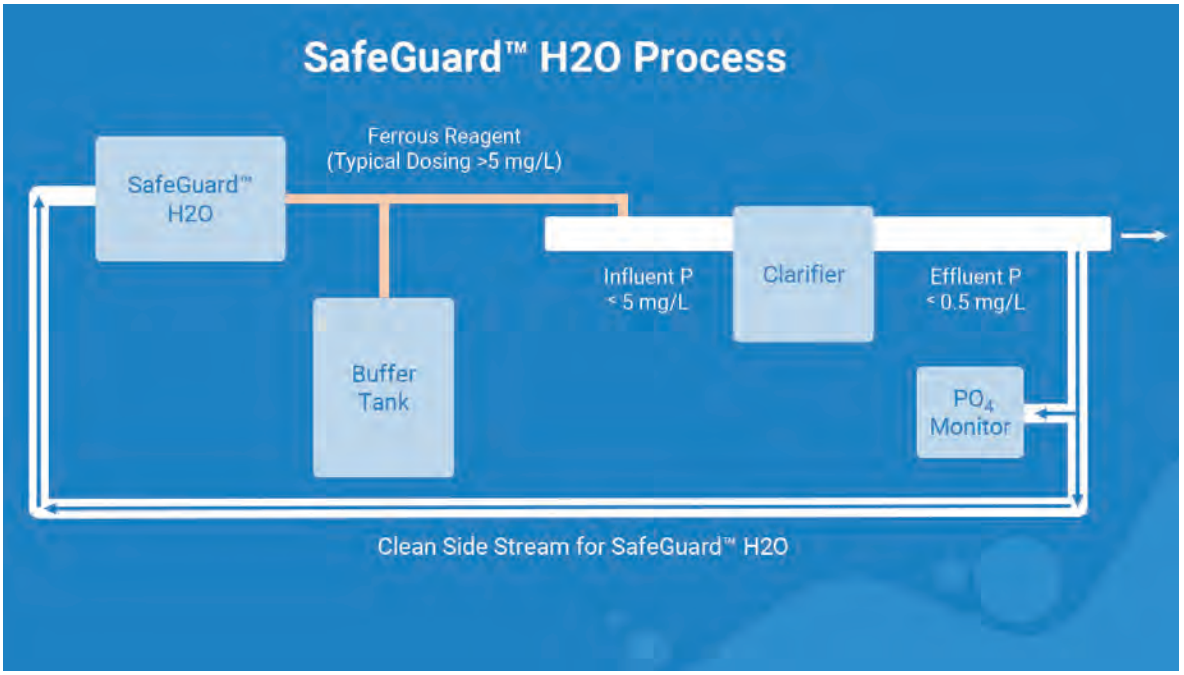

The SafeGuard process includes automatic dosing based on continuous, real-time monitoring of phosphate levels in the influent and effluent.

Dosing On Demand

AN AUTOMATED SYSTEM FOR CHEMICAL PHOSPHORUS CONTROL USES ON-SITE GENERATION OF HIGH-QUALITY FERROUS REAGENTS

By Ted J. Rulseh

While some clean-water plants transition to biological methods for phosphorus removal, many still rely on chemical methods.

Typically, they dose the wastewater with ferric chloride or ferrous sulfate; the iron binds with the phosphates to form precipitates. A key issue is dosing correctly to minimize chemical costs while ensuring permit compliance. In addition, the chemicals need to be shipped to the site and stored; they also need to be handled safely by operations staff.

Now Aqua Metrology Systems has introduced a fully automated ferrous/ferric reagent generation system designed to provide affordable and sustainable chemical phosphate removal. The company says its generation system, SafeGuard H2O, delivers 60% cost savings. The technology uses a certified iron precursor and an in situ electrolytic generator to create a ferrous/ferric reagent on demand.

The process includes automatic dosing based on continuous, real-time monitoring of phosphate levels in the influent and effluent, ensuring optimal treatment and compliance with regulatory and operational targets. Vladimir Dozortsev, senior product manager with Aqua Metrology, talked about the technology in an interview with *Treatment Plant Operator.*

tpo: What was the motivation for developing this technology?

Dozortsev: We started developing the technology about six years ago. The intent was to provide intelligent phosphorus removal technology that is cost-effective and fully automated, enhanced by online monitoring and, most important, able to achieve much more ambitious treatment goals than conventional methods.

> "If the process doesn't have enough online monitoring, the operators don't know how efficient the chemical treatment is."
> **VLADIMIR DOZORTSEV**

tpo: How does this solution differ from conventional chemical phosphorus treatment?

Dozortsev: The conventional approach uses liquid ferric chloride or ferrous sulfate reagents. The user buys bulk chemicals, has them delivered to the site and doses them into the system. One associated issue is toxic nature of the reagents. They are highly acidic and very concentrated, and sometimes need specially trained personnel and a lot of precautions for handling. Another concern is the logistics of bulk chemical supply. The cost may be unstable, and availability of the reagent may be problematic.

tpo: Are there any issues with the quality of these reagents?

Dozortsev: They are often made from scrap metal, and the solution may contain multiple contaminants, some of which, like lead and cadmium and others, may be very toxic.

tpo: Is there an issue with accurate dosing when using the conventional method?

Dozortsev: If the process doesn't have enough online monitoring, the operators don't know how efficient the chemical treatment is. If they don't

know the concentration of the target contaminant, they may either underdose or overdose. If they overdose they waste reagent and produce sludge for no reason. If they underdose they don't treat effectively.

tpo: What is the benefit of generating the reagent on site?

Dozortsev: It is advantageous to produce reagent on demand because some reagents, like ferrous sulfate, have an expiration date. If you buy and store it, it may degrade. You think you dosed X, but in reality you may have dosed 80% or 60% of X, or less.

tpo: In basic terms, how does your reagent generation process work?

Dozortsev: We produce ferric or ferrous reagent on demand from a metal precursor. We electrolyze mild steel and produce the solution of dissolved reagent in a way that is 100% efficient. Based on parameters we control, we know how much reagent we produced per second, per minute, per day. And we can dose the precise amount at the time when it's needed. Users don't need to carry liquid reagents. They just store metal. The electricity demand is very modest and can be supplied from renewable sources like solar or wind.

tpo: What ensures the quality of the reagents?

Dozortsev: The metal precursor we use is certified. If it has impurities, we know what they are. We know how much manganese it has, how much carbon. We never use steel that has dangerous or unpredictable contaminants.

tpo: In the generation process, where does the chloride or sulfate come from?

Dozortsev: In the case of ferric chloride, for example, the reagent generator contains a certain amount of chloride, in the form of sodium chloride, with a small amount of hydrochloric acid to keep the pH in the correct range. We use an amount of chloride that matches the amount of iron in a stoichiometric iron-chloride ratio.

tpo: How does the monitoring process operate?

Dozortsev: We monitor the electrolyzer itself for critical parameters like current and voltage. We also monitor the influent for all contaminants that may affect our efficiency. Once we know how much phosphate is present, we know the optimum dose of reagent needed to achieve the desired removal. Then we monitor the effluent to make sure we achieve the target level. The difference between the influent and effluent concentrations is the amount of phosphate removal. Users can see a live diagram of how much phosphate has been removed and what amount of iron we used to remove it.

> "The metal precursor we use is certified. If it has impurities, we know what they are."
> VLADIMIR DOZORTSEV

tpo: How are the automated controls executed?

Dozortsev: Input on phosphate concentration from the influent monitor is sent to a PLC. The machine then knows what dose of iron to produce and adjusts the generation parameters to match. Then the input from the effluent analyzer reports the residual amount of phosphate. By analyzing all inputs, the dosing device adjusts in real time to achieve the treatment goal.

tpo: How much operator attention does the technology require?

Dozortsev: Because the system can be fully controlled, monitored and optimized remotely, there is minimal need for on-site supervision. This makes the technology well suited for smaller treatment plants that do not have personnel trained to operate bulk-chemical-based systems. tpo

Against the Flow

BARTLESVILLE WINS A U.S. EPA AWARD FOR A PLAN TO PUMP SOME OF ITS WASTEWATER EFFLUENT UPSTREAM FOR POTENTIAL INDIRECT POTABLE REUSE

By Steve Lund

Bartlesville may never have to reuse its wastewater effluent as a supplement to its water supply, but the city is prepared if the need arises.

Its plan to pipe a portion of the effluent upstream of the raw water intake in the Caney River won an award from the Oklahoma Water Resources Board. In January it received a U.S. EPA George F. Ames PISCES Award for excellence in problem-solving, one of five PISCES awards presented in 2022.

The possibility of water shortages during drought is a chronic concern in the region. Bartlesville draws its entire water supply from a large flood-control lake developed by the U.S. Army Corps of Engineers, a smaller lake, and the Caney River, which flows through the city. The storage capacity of the lakes is diminishing because of sedimentation, says Terry Lauritsen, water utilities director.

"We've had times when water has been abundant, and we've had times when water is very, very scarce," Lauritsen says. "The intent is for a contingency water supply, so during a drought or some other condition where our lakes are unavailable or compromised, or whatever the scenario may be, we can divert treated wastewater to the river. That gives us another 4 mgd on top of the natural flows of the river as a supplementary raw water source."

Terry Lauritsen is water utilities director in Bartlesville, which won an EPA PISCES Award for its plan to pump some wastewater effluent upstream of the water treatment plant intake for indirect potable reuse.

> "Reuse, I think, is a very feasible option when you compare it to the huge capital costs to dredge a lake or build a new lake."
>
> **TERRY LAURITSEN**

The project involves building a pipeline to pump effluent seven miles upstream from the water treatment plant. In addition, the work includes an outfall on the riverbank and improvements to a pump station, along with some modifications to the wastewater treatment plant (20 mgd design, 7.5 mgd average flow).

Effluent would be pumped upstream only in times of need. "If we don't need the water, then we don't need to incur the expense to move that water upstream on the river," Lauritsen says.

LONG MIXING TIME

The discharge point for the effluent is near a bridge; it was selected for ease of maintenance and for distance from the water plant intake.

"What ultimately drove it was the road network and how that crosses the river," Lauritsen says. "We wanted to keep that pipeline close to a road. It makes it easier to monitor, and if any maintenance or other work is needed, the location makes it simpler.

"The other part is we wanted to build enough of a buffer. It's a pretty slow-moving river. Under normal flow when we're discharging, it would take several days for that water to get down to where we would pull it out of the river again. It facilitates a good mix with the river."

The distance from the intake also gives the utility time to react if an incident at the wastewater treatment plant should cause temporary concern about reusing the effluent. "It gives us some time to turn off the pump station and gives us some extra safety in case that kind of a scenario comes up," Lauritsen says.

FIRST IN THE STATE

The project is estimated to cost $8.2 million. The city is using grants and low-interest loans from the Oklahoma Water Resources Board's State Revolving Fund to pay for the project. Bartlesville is the first utility in the state to build this type of water reuse project.

"The challenges are that we are the first in Oklahoma to even proceed with the concept of the project," Lauritsen says. "It has taken a collaborative effort with the Oklahoma Department of Environmental Quality and consultants to build a consensus of support with our constituents. We've been talking about water reuse since 2015 with whoever would listen."

The region experienced a severe drought in 2001, when the city's reservoir sources were depleted to about 20% of the normal volume.

"It was scary," Lauritsen says. "The city council was going to consider some onerous water restrictions, but the week before they met, we had a

6-inch rain in the watershed. A few weeks later we had another 6-inch rain, and we filled the lakes back up in less than a month.

"We had been in a drought for nine months to a year up to that point, and it was replenished in less than four weeks. It took some drastic weather conditions to replenish that. It was a wakeup call telling us we needed to do something to look at long-term water supply."

THE NEXT FRONTIER

The Water for 2060 Act, which state legislature passed in 2012, encourages communities to develop plans to consume no more freshwater in 2060 than in 2012.

"That opened up reuse scenarios — not only industrial and irrigation applications but also potable use. Indirect potable use is the angle we are pursuing. It's not an end-all solution, but it buys us a lot of time to look at area lakes or other sources of water that we could possibly reclaim to replace the storage we've lost to sedimentation."

Lauritsen thinks other area communities facing similar losses of storage capacity in flood control lakes built in 60 or more years ago will consider indirect potable reuse projects.

"Water reuse is the next frontier. Historically we have been very rich in water supply in lakes, but the lakes close to us were built in the 1950s and 1960s. They are losing a lot of water storage space. Reuse is a very feasible option when you compare it to the huge capital costs to dredge a lake or build a new lake." **tpo**

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A Career Change for the Better

JAMIE BELDEN FIRST WANTED TO BE A FISHERIES BIOLOGIST. IN WASTEWATER TREATMENT HE FOUND MORE REWARDS AND GREATER CAPACITY TO MAKE A DIFFERENCE FOR THE ENVIRONMENT.

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

Wastewater work gave Jamie Belden a chance to help the streams he cares deeply about while earning a good wage.

After many years of varied experience, Belden is operations supervisor with the Wichita Public Works and Utilities Water Reclamation Division, overseeing the city's four wastewater treatment plants and the biosolids dewatering and land application programs.

Wichita's largest clean-water plant is the Lower Arkansas River facility (54.4 mgd design). It receives and combines dewatered biosolids from three smaller plants (Four Mile Creek 3 mgd, Cowskin Creek 2 mgd, Mid-Continent 3 mgd, all design flows) for application to cropland.

The smaller plants resulted from a decision to stop expanding the collection system and to build treatment capacity closer to growth areas. From 2010-20, the city's population grew 4%; today it is 390,000. The smaller facilities also opened the possibility of water reuse, helped mitigate odors, and reduced the need for expensive upgrades at the Lower Arkansas plant.

Belden's stewardship of these plants was recognized when he received a 2021 William D. Hatfield Award from the Kansas Water Environment Association.

A NATURAL ATTRACTION

Belden grew up in Mulvane, Kansas, about 10 miles south of Wichita, where he gravitated toward water. His grandparents owned land with a creek. He recalls, "I actually wanted to be a stream fisheries biologist because I wanted to look more at rivers and streams and land-use practices and their effects on the populations in the rivers and streams. There's so many cool

Jamie Belden, operations supervisor, watches worker Vicente Hernandez clean the lamps in the UV disinfection system (Trojan Technologies) installed at the Lower Arkansas River Wastewater Treatment Facility.

little fish and macroinvertebrate species in these streams and rivers that nobody knows about."

He earned a degree in environmental biology from Friends University while playing some football and a lot of baseball: "I was a 5-10, 165-pound right-handed pitcher. I threw hard, and I had four pitches." Major league scouts invited him to a couple of camps, but a scout told him he'd never leave the minors because he wasn't bulky enough to project authority as a pitcher.

"At that point I was accepted to graduate school, I was engaged and I already had my path going forward," he says. "It would have been fun to go play overseas or play independent league, but all it would have done was keep me playing for a few years."

Instead, he took a job in 2000 as pretreatment specialist in Wichita, where he earned one-third more than a seasonal fisheries biologist with a master's degree. In pretreatment he was involved in a program to reduce mercury loading. In part it meant working with dentists to modify their handling of office wastewater and amalgam filling debris.

In 2004 he was promoted to operations supervisor, where he found that he had more daily effect on stream water quality than he would have in fisheries.

SWITCHING SECTORS

In 2008 a friend at a farm equipment manufacturer recruited Belden as an environmental health and safety manager. He was there for about 18 months, implemented some very successful programs, and traveled to various facilities to help them prepare for audits.

It wasn't the best situation for a man with two young daughters: "It was good money. I learned a lot, I gained a lot of maturity, and I got a lot thrown at me, but I needed a chance to step back and be with my kids a little bit more."

So in 2010 he took a job with the city of Rose Hill, Kansas, a community of about 4,000 people eight miles southeast of Wichita. The city had just finished a new biological nutrient removal plant. Belden's job was to get the plant running and explain its benefits to citizens. But after a couple of years, after being promoted to public works superintendent, the political environment looked uncertain.

He contacted Rebecca Lewis, his former boss at Wichita, who had hired him for pretreatment. "She let me know my old position was open and said, 'I'd love to have you back.' And we ended up reuniting as a team."

DEFERRED NEEDS

When he came back to Wichita in 2014, the operation was different. After the 2008 recession, funding had dwindled, and maintenance had been deferred on the city's World War II-era infrastructure.

At the Cowskin Creek plant, a headworks rehabilitation addressed concrete corrosion digester and diffuser problems. "And we were hauling liquid biosolids, which is a lot of risk, effort, manpower and fuel." The city added centrifuge dewatering (Westfalia), saving considerable expense and labor.

At the Lower Arkansas River plant, the team changed from a Trojan4000UV disinfection system to a Trojan Signa system (Trojan Technologies). Electricity use dropped so much that the power utility called to ask why. Payback on the change was 30 months.

The Four Mile Creek plant capacity was increased from 3 mgd to 6 mgd. BNR capacity doubled, and the project added rotary drum thickeners (Parkson Corp.), jet aeration (Evoqua Water Technologies), a new pump station, two FSM filterscreens (SAVECO / Enviro-Care) and a rebuilt centrifuge (Andritz).

MAJOR UPGRADE

Meanwhile, the Lower Arkansas River plant, built in 1957, had another in a series of upgrades in for form of a complete revamping of the headworks. The uses an extended aeration activated sludge process; on the solids side it uses dissolved air flotation (Ovivo) for thickening, anaerobic digestion and a belt filter press (Alfa Laval).

Jamie Belden, operations supervisor

"When you understand how technical the job is and how much goes into it, it's just not what people think at all. It's a good industry to be in."
JAMIE BELDEN

Jamie Belden,

Wichita (Kansas) Public Works and Utilities

POSITION:
Operations Supervisor

EXPERIENCE:
25 years

DUTIES:
Supervise staff at four water reclamation facilities; also biosolids dewatering and land application

EDUCATION:
Bachelor's degree, environmental biology, Friends University

CERTIFICATION:
Class IV Wastewater Operator

GOAL:
Ensure optimum design of a new biological nutrient recovery upgrade for largest plant

The plant uses about 1 mgd of recycled water for its processes; another 1 mgd goes to Spirit AeroSystems, the area's largest employer and one of the world's largest manufacturers of aircraft structures, such as fuselages and wings. The remaining treated water is discharged to the Arkansas River.

Next up for the plant is a $350 million project to improve biological nutrient removal capability. Construction begins next year. The project will improve screening and grit removal, replace trickling filters with anaerobic and anoxic zones in aeration basins, upgrade the clarifiers and blowers, and improve the UV disinfection system.

For solids processing, dissolved air flotation may be replaced with rotary drum thickeners to reduce polymer use and energy use. The anaerobic digesters will be rehabilitated, and the city is considering selling the biogas.

Biosolids handling will also change. About six truck trailers per shift are hauled to a large drying shed on the north end of the plant property. Plans call for replacing trucks with a pipeline and building a new dewatering facility. "We can minimize the amount of driving and operation, so it should really give us a lot better efficiency," Belden says.

Odor control is a priority: "When they built these plants in the 1950s and 1960s, they went out to the edge of town, everything was open-air, and nobody would move next to them," Belden says. Subdivisions now crowd close to the Lower Arkansas plant.

With engineering company CDM, the staff is looking at odor controls that in some cases may be as simple as adding a cover and sending the odorous air through a biofilter. "We'll never eliminate odors, but if we can really improve the atmosphere for citizens, that's another real big benefit to this project," Belden says.

COMMUNITY OUTREACH

Good public relations is a priority for Wichita. "One thing we've done is work with Wichita State University," Belden says. "Each summer we get high school kids to come out. I do a presentation, show them what wastewater is about, and talk to them about the biology and chemistry and all the stuff that makes it exciting and interesting," Belden says.

The university does this through Work in Water, a program that encourages young people to pursue water careers and teaches them the importance of water treatment for public health and the environment.

The city has also worked with master's degree students in public health so that they understand the treatment plant. "Even the adult population really doesn't know where their water comes from, where it goes, how it's treated, where it goes afterward, and the importance of treatment," Belden says. "Our industry has been very effective at hiding what we do for a lot of years."

MAKING IT FUN

With all of the aging plants, Belden's team has had to think about how to operate the equipment if something should go wrong. "Although that's scary at times to think about, sometimes that's when you learn the most, and it's the most fun to operate," Belden says. "Because when everything is perfect and you have a nice brand new plant, you don't get to sit down and brainstorm with your team and come up with ways to meet new challenges."

The plant team includes Rebecca Lewis, division manager; Carlos Botello, David Firsching and Jeff Williams, plant operators; David Harper, maintenance manager; Mike Carroll and Lucius Howland, maintenance supervisors; Daniel Botello, pretreatment administrator; and Ryan Bogatie, biosolids supervisor.

A number of the supervisors started in operations. Belden is most proud of the team overcoming problems while staying within permit limits. For example, one day an intermediate clarifier went down, and no one was sure why.

Jamie Belden received a 2021 William D. Hatfield Award from the Kansas Water Environment Association for his stewardship of Wichita's clean-water plants.

A general view of the Parkson OxyCharger static aerators installed at the Lower Arkansas River Wastewater Treatment Facility.

The team at Lower Arkansas River facility includes, from left, Dave Harper, maintenance manager; Rebecca Lewis, division manager; Jamie Belden, operations supervisor; and Jeff Williams, Carlos Botello, and Dave Firsching, operators.

The clarifier came offline, but that meant also shutting down a bank of trickling filters. That reduced ammonia removal because all the oxygen was used to remove BOD. Operators adjusted the mixed liquor in the aeration basins, adjusted the return activated sludge pumping rate, and shaved off some flow to hold in storage, all to reduce loading on the basins.

Meantime, the team worked with utility managers to find money to repair the 60-year-old clarifier. The equipment came back online, and while there was some increase in ammonia, it was within permit limits.

That's the kind of thing that keeps Belden going: "When you understand how technical the job is and how much goes into it, it's just not what people think at all. And the technology that's coming out these days is so exciting. It's a good industry to be in." tpo

> "When they built these plants in the 1950s and 1960s, they went out to the edge of town, everything was open-air, and nobody would move next to them."
> **JAMIE BELDEN**

COMMUNICATIONS AND SERVICE

Jamie Belden faced a challenge when he took over as leader of the wastewater division in the city of Rose Hill, Kansas, a decade ago.

The community of about 4,000 had just completed a fully mechanical biological nutrient removal plant and was about to shift to it from a system of lagoons. The person overseeing wastewater had left for another job, and so had the project's lead engineer.

Ratepayers had taken a significant hit to build that plant. Belden used a public relations program to explain what that investment meant: "I did a lot of work with the citizens, developing some community programs and working with the schools to help them understand why that plant was there, and the benefits of it."

Another part of community relations was developing a single-stream recycling capability and a composting site for green waste. Composting proved popular because citizens could use some of the product.

Many citizens came to appreciate having the wastewater treatment plant: "They still may not have liked the rate increases, but after the public education we did, they understood why it needed to happen."

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Chris Patterson
Water and Wastewater Manager
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WASTEWATER

By Rick Lallish

Which method to turn pumps on or off uses air pressure?

A. Mercury switch (mercroid style)
B. Bubble systems
C. Electrode systems
D. Float switch

ANSWER: B. Bubble systems used to be a very common method of turning pumps on or off in lift stations. The method uses a system of switches and a small tube in the lift station. The system uses an air compressor to pump air in the tube, and the pressure of the water above the tube is sensed by the pressure switches. A low-pressure signal will turn the pumps off, and high pressure turns them on. Understanding various means of pump or motor controls is vital for the daily operator duties and advancement of certifications. More information may be found in the *Electrical Fundamentals for Water and Wastewater* textbook from Skeet Arasmith, Third Edition, 2015.

DRINKING WATER

By Drew Hoelscher

In an emergency, the operator bypassed a failed variable-frequency drive installed on a 2 hp three-phase pump motor by hardwiring the pump's motor directly to the power source. Afterward, the operator noticed that the shaft of the pump was rotating in the wrong direction. How will this affect the equipment?

A. The overloads will trip due to excessively high electric current
B. The pump's discharge flow rate will be drastically reduced
C. The pump will have an increased flow rate and develop a suction cavitation condition
D. The pump impeller and cooling fan will lock up or break from being over-tightened

ANSWER: B. Electric motors are designed to rotate clockwise, counterclockwise, or both. Typically, the direction of rotation is indicated by arrows and is viewed from the driven end or where the load is applied. In this scenario, the operator should swap any two phases of power to correct the direction of rotation, which will reestablish the correct discharge flow rate. Larger high-speed motors with incorrect rotation could be affected more so by improper cooling. In some cases, cooling fans have angled blades to ensure sufficient cooling during operation.

ABOUT THE AUTHORS

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

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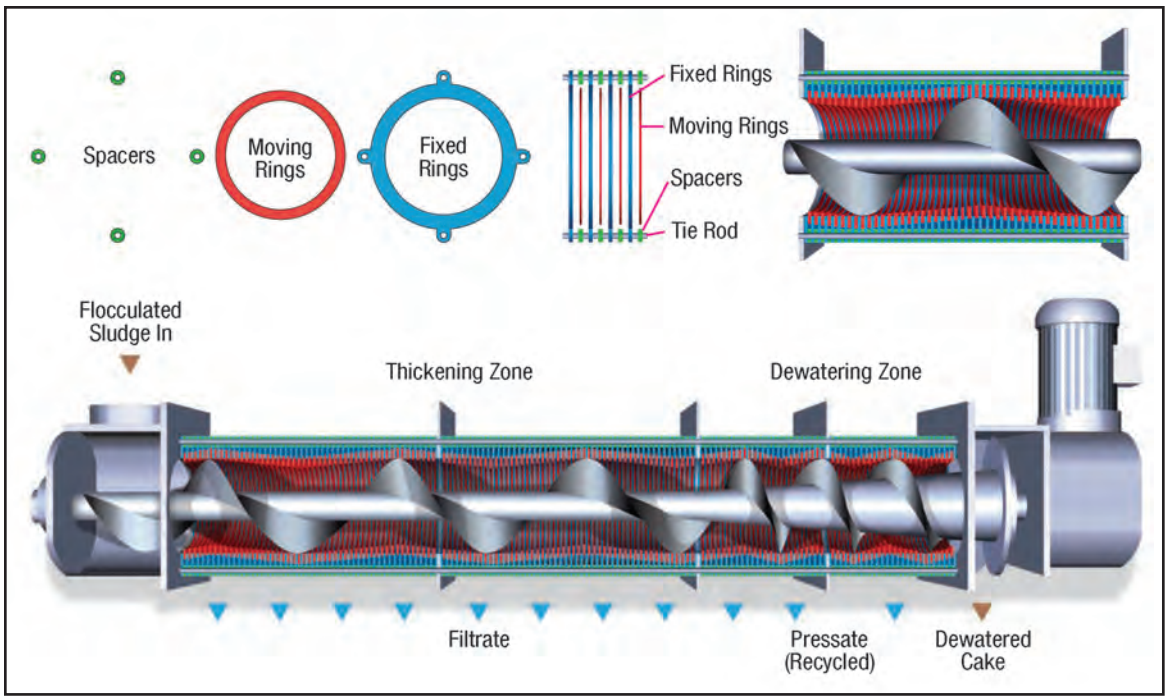


The Volute press from PWTech thickens and dewaters in a single, compact operation within the dewatering drum.

GRAPHIC AND PHOTOS COURTESY OF CHELSEY LITTLE

A Pressing Issue

A SUDDEN CHANGE IN INFLUENT LED TO CHALLENGES WITH DEWATERING AND PERMIT ISSUES. A NEW TWO-CHANNEL VOLUTE PRESS RESTORED THE PLANT TO COMPLIANCE.

By Scottie Dayton

For decades the Montague Water Pollution Control Facility received pulp and paper waste from two mills, and some parts of a 2010 upgrade were tailored around their flows.

Both mills ceased operations, and the largest (70,000 gpd) closing abruptly in August 2017. Almost overnight, sludge consistency changed to a mix of residential, industrial and septage waste streams.

"Before we lost the mills, our new four-channel rotary press dewatered material to 30-45% solids," says Chelsey Little, plant superintendent and pretreatment coordinator for the facility in Northwest Massachusetts. "Now we were seeing cake at 15% solids and couldn't keep up, even with our contract hauler making weekly trips to Rhode Island."

Consequently, TSS in the treated wastewater accumulated until the plant was running at 60,000 total system pounds. The backlog of TSS short-circuited into the effluent, triggered monthly permit violations, and led to U.S. EPA administrative orders.

Seeking solutions, Little worked with Russell Resources, a vendor that arranged for two manufacturers to demonstrate their spiral screw dewatering presses for a week. Both produced cake at 18% solids. Little put the project out to bid, and PWTech (Process Wastewater Technologies) won it.

Within a month, the ES-302 two-channel Volute dewatering press (AMCON) reduced backup loadings to 9,000 total system pounds and restored the plant to compliance.

SETTING THE STAGE

The 1.83 mgd (design) activated sludge plant averages 780,000 gpd, of which 150,000 gpd is industrial process wastewater. Some 10% of the collection system consists of combined sewers.

Installing the Volute (meaning spiral) dewatering press fell to Little's team, which includes Tim Little, foreman and operations manager, and operators Tim Puera, Adam Kleeberg and Samuel Stevens. The unit's 149-by-52-inch footprint (64 inches high) enabled the crew to put it next to the previous press, which they retained for dewatering primary sludge.

> "At 18% solids, our return on investment is 8.6 years. The payoff with 26% solids is 3.5 years, giving us an annual cost saving of $74,957."
> **CHELSEY LITTLE**

Over two months, the operators poured the concrete pad and trenched in the drainage. Kleeberg, a licensed plumber, oversaw plumbing the return activated sludge feed and flow meter, while Stevens supervised running the conduit and pulling the wires. Outside control engineers installed and connected the control panel. Then the press arrived in two crates.

Although specifications came with the press and PWTech provided a checklist of what to do, the plant staff had to figure out how to put it together. In addition, they couldn't test what they were doing. "Only a PWTech representative could activate the press after inspecting the installation, so we didn't even know if the machine would turn on and run," Little says. It did both, in early January 2022.

HOW IT WORKS

The press thickens and dewaters in a single, compact operation within the dewatering drum. Inside the drum, rows of tie rods hold spacers and

Operator Samuel Stevens (right) shows Chelsey Little, plant superintendent, how to start the Volute press.

The unit's 149-by-52-inch footprint enabled installation next to the previous press.

fixed rings in position. Alternating between these rows are rows of moving rings that rotate as the screw turns.

The moving rings are slightly smaller than the outer diameter of the screw and slightly narrower than the spacers, enabling them to clean the fine gaps between all the rings. The moving rings also cut into the cake to release more moisture.

Operators can pull feed sludge directly from the 37,700-gallon gravity thickener, from the return or waste activated sludge lines, and from two 10,000-gallon mixing tanks. "We're still fine-tuning the mix of primary and secondary sludge," Little says. "The primary has coarse particles, but the waste activated is thin with fine particles. The occasional cake at 40% solids is too dry and binds up the press, so we're still looking for that sweet spot."

MANAGEMENT OPTIONS

Before installation of the Volute press, material at a sloppy 15% solids limited management options and made it difficult to secure hauling contracts.

"Most disposal facilities will only accept cake at 18% solids or higher, and we had no time to establish a track record on which vendors could bid," Little says. "Consequently, cake is transported once every two weeks through three states to Canada at an annual fee of $368,000. But because the percent solids is now higher, the cost almost evens out with what we paid the previous hauler."

Little also is exploring on-site composting. During the paper mill days, the plant superintendent tried making Class A biosolids, but the watery cake was difficult to compost and he abandoned the idea. Recently, Little ordered a feasibility study based on opening a regional composting facility.

"I sized the press for just that purpose," she says. "My goal is to dewater our sludge and liquid sludge from neighboring facilities, then compost the cake."

The press has averaged 26% cake solids with a low of 18% and a high of 28%.

REAPING THE REWARDS

Initially, Montague operators ran the rotary press low and slow for 10 hours to optimize dewatering. "They constantly adjusted the pressure based on the feed solids and always worked overtime," Little says. "The fully automated, self-cleaning Volute dewaters the same volume in two hours."

Her team made the project affordable, easy, and successful — doubly important because the utility is an enterprise fund (customers fund the budget). Little estimates that keeping the installation work in-house saved more than $100,000.

There also were energy savings, as the previous press has a drive train powered by a 5 hp motor, and the Volute unit has twin motors using a combined 1.9 hp. "We've reduced overtime as well because the rotary press isn't run too often," Little says.

In April, the plant averaged 26% cake solids with a low of 18% and a high of 28%. "At 18% solids, our return on investment is 8.6 years," Little says. "The payoff with 26% solids is 3.5 years, giving us an annual cost saving of $74,957." Little anticipates even better results once operators find the sweet spot for the mixed sludges. **tpo**

N, P, Kudos

NSMART RECOGNITION PROGRAM HONORS CLEAN-WATER UTILITIES FOR EXEMPLARY AND INNOVATIVE EFFORTS TO REDUCE NITROGEN AND PHOSPHORUS IN EFFLUENT

By Ted J. Rulseh

Nitrogen and phosphorus from clean-water plant discharges and a variety of other sources are a growing cause for concern, since they can foster harmful algal blooms in lakes, streams and reservoirs.

As a consequence, regulatory agencies are ratcheting down effluent limits in facilities' discharge permits. Earlier this year, the Water Environment Federation, in collaboration with the U.S. EPA, launched the NutrientSmart program to encourage reduction in nutrient loadings to waterways and recognize utilities that lead the way.

NSmart began as a pilot program, supporting the adoption of enhanced nutrient management practices and distributing information on tools and methods for effluent nutrient reduction. To take part, utilities need to demonstrate intent or actions to limit nutrient releases to waterways.

The program has components for utilities to engage with their communities through outreach, and for reduction of nitrogen and phosphorus releases. The program recognizes utilities that implement innovative strategies to achieve reductions.

NSmart is a voluntary program for water resource recovery facilities, and potentially for industries and other entities in partnership with them. Patrick Dube, practice lead for resource recovery with WEF, talked about NSmart in an interview with *Treatment Plant Operator*.

tpo: What was the origin of the idea for this program?

Dube: It started three years ago. The EPA brought together a variety of associations: the Association of Clean Water Administrators, the Environmental Council of the States, the National Association of Clean Water Agencies, the Water Research Foundation, and WEF. They all came together with the aim to develop a program to recognize utilities that are doing a good job of removing nitrogen and phosphorus. WEF is now managing and executing it as a pilot project with an EPA grant.

tpo: Why was this recognition program considered necessary or beneficial?

Dube: The negative impacts of nitrogen and phosphorus are significant, harming ecosystems, affecting economies and threatening human and animal health. We thought it was important to recognize utilities that are doing a good job at reducing these nutrients and their potential impacts, and to provide something to strive toward for utilities that may not be doing it yet.

tpo: What kind of recognition could utilities receive?

Dube: In January the program opened for two months. In that time, utilities could apply to be recognized for nitrogen or phosphorus removal, or both. The program has two components. One is the recognition for P removal of the nutrients, by which we simply mean the percent reduction of nitrogen and phosphorus from influent to effluent. Depending how much utilities removed, they were eligible to become an Advocate — 30% to 70% reduction — or achieve one of three levels of Partner for greater percent reductions, the top level being platinum for reduction of more than 90%.

Patrick Dube

tpo: Were there also other forms of recognition beyond pure reductions in the nutrients?

Dube: There was a community outreach component to the Partner application. We wanted to spread the word about nutrient removal and the benefits of it, and ensure that utilities doing some type of outreach to their communities or constituents were recognized for that. It could include a website, community events, sharing on social media and similar activities. Another component was an Innovator award with two categories, for innovations in treatment technology and for leadership in management. Here utilities were welcome to provide a narrative to showcase the innovative treatment technologies they were using and what their leaders were doing to promote it nutrient removal.

tpo: How did you promote the initiative?

Dube: We promoted it through our technical committees and through our daily newsletter called WEF SmartBriefs. We also had a webcast to enable utility representatives to learn about the program and ask questions, and we promoted it at WEFTEC, our specialty conferences and other events. We had 19 applicants; for a first-year program we were happy with the response.

tpo: How extensive did the applications for recognition need to be?

Dube: We tried to strike a nice balance, to avoid overburdening utilities. We tried to keep the nutrient reduction calculation relatively simple. We asked for influent and effluent data over a 12-month span. They did have to support their data with Discharge Monitoring Reports to make sure we could confirm the numbers they reported. So we tried to keep it simple and yet effective and at a high level of quality.

> "It wasn't just the large utilities doing it; we had some much smaller utilities achieving high levels. It was promising to see."
>
> **PATRICK DUBE**

tpo: How were the various award winners selected?

Dube: After we received the applications, representatives from the partner advisory group I mentioned earlier scored and judged the different applications by looking at the data utilities submitted. The judges also evaluated the innovator awards. Judging concluded up in April, and we held an awards webinar in May.

tpo: In general terms, how would you characterize the quality of the entries?

Dube: Our judges were really impressed with the scope of a number of the projects. Some utilities had been removing nutrients at a high level for

And the Winners Are ...

The NSmart program recognized 15 utilities for significantly reducing nutrient pollution.

These utilities reduced nutrients by at least 90%:

- Nine Springs Treatment Facility, Madison (Wisconsin) Metropolitan Sewerage District
- Upper Occoquan Service Authority, Virginia
- Town of Cary, North Carolina
- Dorsey Run Advanced Wastewater Treatment Plant, Maryland
- Stafford County (Virginia) Utilities
- Rocky Gap State Park (Maryland) Wastewater Treatment Plant
- Freedom District (Maryland) Wastewater Treatment Plant

These utilities reduced nutrients by 85-90%:

- Lancaster (Pennsylvania) Area Sewer Authority
- City of Boise, Idaho

These utilities reduced nutrients by 70-85%:

- Narragansett Bay Commission, Rhode Island
- South Platte Renew, Colorado
- Waterbury (Connecticut) Water Pollution Control Facility
- American Bottoms Regional Wastewater Facility, Illinois

These utilities are working toward 30-70% nutrient reduction percent and are beginning outreach to the community on the issue:

- City of Greensboro, North Carolina
- Centennial (Colorado) Water and Sanitation District

These utilities were also recognized as innovators for outstanding treatment technology or leadership in nutrient management:

- Treatment technology: City of Boise, Narragansett Bay Commission, Town of Cary
- Leadership in nutrient management: Upper Occoquan Service Authority

ten or more years. We had a large number of Platinum awardees and were happy to see so many utilities achieving 90% or greater removal. It wasn't just the large utilities doing it; we had some much smaller utilities achieving high levels. It was promising to see.

tpo: How would you characterize the general state of play for nutrient removal in the industry?

Dube: It varies. There are some distressed areas, of which the Chesapeake Bay region is one. Areas that have had issues in the past or foresee issues in the future are seeing stricter nutrient limits. The good news is that the technology is there for these utilities to get very high removal rates and achieve very low effluent nitrogen or phosphorus. Often, technologies are limited to larger utilities because of budget, size and scale. So it was nice to see some facilities under 1 mgd achieve high removal rates. The EPA in April came out with a policy memorandum on nutrients, so the subject is top of mind, and it's an important thing to continue focusing on.

tpo: Where do you see the NSmart initiative going in the future?

Dube: This was intended as a one-year pilot program, after which we could gauge the response we got. We hope the EPA supports this initiative going forward, or if not, WEF would like to continue it in one way or another, whether that's keeping it as a free-standing program or combining it with some of our other offerings. We were happy with the program and excited to see the next phase. tpo

LEVELS OF RECOGNITION

The NSmart program has three levels of recognition for utilities making exemplary progress toward effluent nutrient reduction:

Advocate: For entities working toward active engagement for nutrient reduction within their watersheds via outreach. This recognition is for facilities working to implement a strategy that results in nutrient reduction from 30% to 69.9%.

Partner: This level is for facilities with a fully implemented nutrient reduction plan and an active outreach program. The utility can focus on reducing nitrogen, phosphorus or both. There are three tiers of recognition based on the level of nutrient reduction: Silver (70% to 84.9%), Gold (85% to 89.9%) and Platinum (90% or more).

Innovator: This recognition is a competition for utilities already in the partner level. The facility can earn further recognition nutrient reduction innovation. Facilities are evaluated against one another based on design flow rate. The recognition falls into two categories: treatment technology and leadership in nutrient management.

For more information, visit www.wef.org/resources/for-the-public/nsmart/.

PPG appoints Joe Swingle as senior marketing and pricing manager

PPG has named Joe Swingle as senior marketing and pricing manager of its protective and marine coatings business in the United States and Canada. In this role, Swingle will be responsible for developing and executing marketing and pricing strategies that drive growth for the U.S. and Canada region of PPG's protective and marine coatings segment, collaborating closely with sales, technical support, product management and leadership teams. He joins PPG after 18 years with Sherwin Williams where he most recently served as a district manager with its paint stores group.

Envirosuite provides update on EVS Water

Envirosuite announced its EVS Water product line is nearing its initial commercial objective of achieving $1 million in total sales. Launched in 2021, EVS Water has gone global with the addition of new customers in Australia, Asia and Europe, in addition to its presence in the U.S. The EVS Water Plant Optimizer software has been used in these locations to reduce electric and chemical costs in water treatment and delivery.

Chris Hubbard joins PWTech leadership team

Process Wastewater Technologies welcomed Chris Hubbard as joint business development manager and regional sales manager. With more than 20 years' water industry experience, Hubbard has served the industry in various managerial and sales roles, while also co-founding a consulting business focused on flood mitigation equipment. PW Tech expects Hubbard to play a major role in the growth of its Volute Dewatering Press arm of business.

Veolia earns Intel's 2022 EPIC Distinguished Supplier Award

Veolia North America announced it has earned Intel's EPIC Distinguished Supplier Award. As one of only 26 Distinguished Award recipients across Intel's global supply chain, Veolia was recognized for its level of performance that consistently exceeds Intel's expectations. To qualify for the award, suppliers must exceed expectations, meet aggressive performance goals and score 80% or higher in performance assessments throughout the year. Suppliers must also meet 80% or more of their improvement plan deliverables and demonstrate formidable quality and business systems.

QuantumFlo earns ISO 9001 and ISO 45001 certifications

QuantumFlo, a Brand of WILO USA, has earned ISO 9001 and ISO 45001 certifications. The ISO 9001 standard is utilized to certify quality management systems that focus on continuous improvement, customer satisfaction, and the active involvement of both management and employees in a process-based approach. ISO 45001 specifies requirements for occupational health and safety management system to enable an organization to proactively improve its performance in preventing injury and ill health.

Xylem wins for Net Zero leadership at Global Water Awards

Xylem was named Net Zero Carbon Champion at the 2022 Global Water Awards, recognizing the company's work to accelerate the decarbonization of the water sector. In addition to its own commitments to achieve net-zero carbon emissions, Xylem is partnering with utilities, businesses and water managers around the world to help reduce their carbon footprint.

Asahi/America introduces new business development manager

Mark Gore

Asahi/America has promoted Mark Gore to industrial business development manager for the eastern and central regions. He will lead Asahi/America's sales efforts of industrial and environmental single-wall and double-wall piping systems. Gore has been with Asahi/America for 15 years as a district sales manager in Alabama, Arkansas, Louisiana, Mississippi, Tennessee and the Florida panhandle.

The Reservoir Center for Water Solutions created

Water sector leaders, including academia, technology providers, trade associations and non-governmental organizations, are partnering in a new consortium to accelerate solutions to the world's critical water and sustainability challenges. The Reservoir Center for Water Solutions, located in Washington, D.C., will serve as a global collaboration hub to advance breakthrough water solutions and innovations. The center's 33 partners, including the U.S. Water Alliance, the International Water Association, EarthEcho International, the Aspen Institute, and Reservoir sponsor and global water technology company, Xylem, will bring together their resources, knowledge and partnerships to drive progress. tpo

AquaSBR®
Sequencing Batch Reactor

Easily Achieve Nutrient Removal with the Flexibility of a Time-Based, True Batch System

Biological nitrogen and phosphorus removal can be a challenge for wastewater plants as effluent objectives change due to new or future permits. Since the mid-1980s, the **AquaSBR®** sequencing batch reactor has achieved efficient, cost-effective nutrient removal with more than 1,100 installations, worldwide.

True batch operation and time adjustment flexibility allow plants to easily achieve low Total Nitrogen less than 3.0 mg/l and Total Phosphorus less than 0.5 mg/l with reduced chemicals and power compared to other activated sludge systems.

- Independent aeration and mixing with the Aqua MixAir® system
- Modular system is ideal for small to large flows
- Lowest cost of ownership
- Remote 24/7 process support

All components are accessible from the side of the basin for ease of maintenance.

New Plant Construction | Existing Plant Upgrades and Retrofits | Plant Expansions

weftec 2022
Booth 2229

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

www.AquaSBR.com | 815-654-2501

New Technology Slated for WEFTEC 2022

By Craig Mandli

WEFTEC, the Water Environment Federation's annual Technical Exhibition and Conference, offers international water and wastewater professionals exposure to the newest products, along with water-quality education and training. This year's event, from Oct. 8 to 12 in New Orleans, promises to show off some of the finest new products on the market for municipal water, industrial water and wastewater professionals. Below is a preview of some of the newest products that will be highlighted at this year's show.

Aerzen Rental Temporary Oil-Free Blowers

Aerzen Rental provides temporary **oil-free blower packages** engineered for aggressive rental environments with onboard variable-frequency drives, remote monitoring and outdoor builds with sound attenuating enclosures. The rental units are available for immediate deployment in the event of a production failure or shortfall to longer-term operational leasing and rent to own.

844-400-2379; www.aerzenrentalusa.com; Booth 843

AllMax Software Operator10

There are a lot of moving parts involved in operating a water treatment facility, and operational data can come from many sources, leaving operators with multiple databases and software applications housing the data needed to analyze plant efficiency and generate regulatory reports. **Operator10** from **AllMax Software** is a centralized database solution to manage all operations data, with features that make data entry quick and easy. DataView data entry screens allow for manual data entry and review; Sampling Events store extra information associated with lab results, and OPC/DDE Interface and Historian Interface automate the collection of SCADA data.

800-670-1867; www.allmaxsoftware.com; Booth 622

Aqua-Aerobic Systems AquaPrime

The **AquaPrime** cloth media filtration system from **Aqua-Aerobic Systems** is designed as an economical and efficient solution for the treatment of primary wastewater. This system utilizes a disk configuration and OptiFiber PF-14 pile cloth filtration media to effectively filter high-solids waste streams without chemicals. This system is ideal for primary wastewater treatment due to its proven removal efficiencies and high-quality effluent, even under varying influent conditions.

815-654-2501; www.aquaprimefiltration.com; Booth 5647

Aqualitec Screentec

Screentec from **Aqualitec** is an automatic vertical bar screen designed for headworks, pump stations, lift stations, wet wells and manholes. It protects pumps from rags, wipes, plastics and other solids. It also prevents pumps from clogging up, extends their life cycle and improves wastewater treatment quality. Thanks to its vertical design, it fits into narrow and deep structures, avoiding costly structural changes. It doesn't have any moving parts under grade level, providing easy and safe maintenance for the operational staff.

855-650-2214; www.aqualitec.com; Booth 2845

Asahi/America Type-21a SST

Asahi/America's Type-21a SST flow control valve paired with the Series 19 Smart Pack actuator provides a cost-effective, high-accuracy flow control package. The characterized ball valve provides a modified equal percentage flow control with repeatable results across the span of travel. The actuator is capable of 0.01% accuracy of setpoint. The Series 19 actuator features 4-20mA control, fail-safe capability, ISO-mounting configuration and corrosion-resistant NEMA 4x enclosure. The Type-21a SST ball valve is available in ½- to 2-inch true union sizes, which is suitable for OEMs and skid manufactures where space is at a premium, but functionality cannot be sacrificed.

800-343-3618; www.asahi-america.com; Booth 929

BDP Industries Dual 4x10 Rotary Drum Thickener

The **Dual 4x10 Rotary Drum Thickener** from **BDP Industries** provides double the filtration area of a regular rotary drum, leading to higher thickening capacities. Each drum can function independently of one another, allowing flexibility for process and maintenance operations. This model can be used on all kinds of sludge types from both water and wastewater facilities. The dual drum design allows for a smaller footprint when compared to two stand-alone RDTs. Internally baffled thickening zones, fully stainless-steel construction, and bearings outside of the enclosure are just a few of the benefits this equipment has to offer.

518-695-6851; www.bdpindustries.com; Booth 1829

BioSafe Systems SaniDate 15.0

SaniDate 15.0 from **BioSafe Systems** oxidizes bacteria and odor-causing organisms in sewage and effluent water on contact and breaks down into water, oxygen, and acetic acid. It is designed to operate with equal efficacy as chlorine or hypochlorite and exhibits higher oxidization potential than common halogen chemistries. It is EPA-registered for wastewater disinfection and is compatible with most existing chlorination or UV disinfection systems, which may help avoid costly expansions. It doesn't require quenching and lowers health and environmental safety concerns compared to liquid or gaseous chlorine.

888-273-3088; www.biosafesystems.com; Booth 1213

Blue-White Industries FLEXFLO M5

The **FLEXFLO M5** peristaltic metering pump from **Blue-**

White Industries will accurately dose chemical from 0.0124 to 540 gph at motor speeds of just 75 rpm. This not only serves to greatly increase tube life, but it's also energy-efficient. As it's all-inclusive, it doesn't require external components. The chemical-resistant enclosure houses an energy-efficient BLDC motor, premium control boards and all connections (manual, remote analog/digital, EtherNet IP, Modbus TCP/IP, PROFIBUS). Its roller assembly reduces pulsations by 80%, and pump tube assemblies are dual channel and deliver excellent tube life. It is ideal for installs with high chemical demand.
714-893-8529; www.blue-white.com; Booth 1817

Bright Technologies, Division of Sebright Products, Belt Filter Press

The compact 0.6-meter skid-mounted **belt filter press** from **Bright Technologies, Division of Sebright Products** has stainless steel frame and roller construction as well as radius wedge zone and wing roller for sludge dewatering. Components include a sludge pump, polymer system and wash-water booster pump. Options include a sludge flowmeter, air compressor and discharge conveyors. The compact walk-around skid design can be utilized in as little as a 10-by-20-foot floor area. Rates of 25 to 50 gpm make it ideal for small applications or when a processor has outgrown dewatering containers.
800-253-0532; www.brightbeltpress.com; Booth 5045

CCI Piping Systems WrapidSeal Manhole Encapsulation System

The **WrapidSeal Manhole Encapsulation System** from **CCI Piping Systems** consists of an engineered primer and a wraparound, heat-shrinkable sleeve designed specifically to seal joints and prevent groundwater from entering a collection system. It features quick installation, with the heat-activated material supplied in bulk rolls. It offers complete joint coverage, a positive external seal, corrosion protection, high tensile strength and elongation, excellent abrasion resistance and long-term protection against soil stresses, acidity and freeze-thaw cycles.
800-867-2772; ccipipe.com; Booth 4101

Charter Machine Sentry Press

Charter Machine's three-belt **Sentry Press** offers maximum flexibility with an independent gravity deck, a positive pressure wedge zone and an eight- or 15-roll pressure section. Independent drives of the gravity deck and pressure sections allow for better operational control and potentially higher throughput. It is designed with stacked rollers in the pressure section to give a full 205-degree wrap on every roller, and can be configured horizontally as well. Presses are available in 1.2, 1.7 and 2.2 meters wide. Center Pivot Tracking extends belt life and can be controlled pneumatically or hydraulically. The perforated roll has 89% open area, which allows for maximum water drainage.
732-548-4400; www.chartermachinecompany.com; Booth 729

Cla-Val Model XP2F

The **Cla-Val Model XP2F** is an all-encompassing data acquisition instrumentation package option available now for any Cla-Val control valve. This also has flow calculation data, is a differential pressure-based solution and comes complete with pressure transmitters, a valve position transmitter and flow calculation module. It is IP68 rated and comes with a 12-24 volts DC input along with four analog inputs and outputs with the abilities to accept additional field instrumentation and retransmit measurements to PLC/SCADA via 4-20mA signals. It is supported by a nationwide staff of field and factory personnel to provide trouble-free implementation.
800-942-6326; www.cla-val.com; Booth 3905

CUES grout vehicle-mounted system

CUES grout vehicle-mounted systems enable long-term defense against inflow and infiltration of groundwater into structurally sound sewer systems. CUES offers a full line of portable, truck and trailer-mounted grout rehabilitation systems for mainline, manhole and lateral joint sealing with the latest CCTV equipment and decision support software for television inspection. Condition assessment and subsequent rehabilitation are accomplished with one system. Sealing packers are available for mainline and lateral assets. Units can be configured to run urethane, acrylamide and acrylate-based grouts. Systems can be mounted in a dry freight box for export. The graphical user interface leads the technician intuitively through the grouting process.
800-327-7791; www.cuesinc.com; Booth 519

Eagle Microsystems PS-2000 Multifunction Controller

The **Eagle Microsystems PS-2000** is a multifunction controller capable of being configured as a process controller, sensor monitor and data logger. It can fulfill a large number of tasks that would normally require multiple separate instruments. This is accomplished by its ability to accept a wide variety of input signals and the availability of up to 10 user-configurable relays. The multifunction controller uses a color touchscreen interface allowing for intuitive operation and configuration.
610-323-2250; www.eaglemicrosystems.com; Booth 5938

Elode Electro-Osmosis Dehydrator

Electro-Osmosis Dehydrators from **Elode** can reduce a plant's sludge disposal cost by 60% and landfill acceptable by having much drier sludge cake. This compact machine can easily retrofit in line with many existing presses. This dewatering machine does not use thermal heat energy to pull water away from your sludge cake. It is so efficient the sludge cake never gets too hot to the touch. It uses electrical potential difference in the sludge cake to separate water in their process and it works on 95% of municipal wastewater plant sludge cakes tested. That is done without any chemical, polymer, heat, nor mechanical press.
201-568-7778; www.elodeusa.com; Booth 729

Emerald Coast Mtg. WAVE

The **WAVE** from **Emerald Coast Mfg.** is an all-climate, heavy-duty vacuum wastewater sampler. The ABS/acrylic case provides superior weather protection, according to the maker. Its 7-inch color touchscreen grants ease of programming and status viewing. This refrigerated sampler provides composite sampling with high accuracy, and the powerful vacuum system will lift nearly 30 feet. It is completely user-friendly. Sample size can be programmed,

and the system will automatically adjust to ensure an accurate repeatable sample.
850-469-1142; www.emeraldcoastmfg.com; Booth 6242

Envirosight ROVVER X

ROVVER X from **Envirosight** is a sewer inspection platform that empowers operators to run inspections, view and record video, and log observations and generate reports. Twelve wheel options enable it to inspect lines from 4 to 96 inches and travel up to 1,640 feet into pipe. Its six-wheel drive navigates past obstacles, and overlapping wheels climb offsets with ease. Its Flexspection sewer video platform adds new capabilities. Three video resolution options (1080p HD, 720p HD and SD) allow operators to change file size and resolution on each job depending on the storage available and detail required.
866-838-3763; www.envirosight.com; Booth 5547

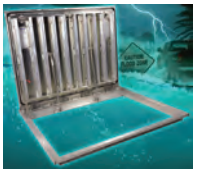
Flomatic Valves Model 408S6 Ball Check Valve

With today's increasing use of nondegradable sanitary products, **Flomatic Valves** offers a solution to meet the harsh complexities of congested wastewater systems: the AIS-compliant **Model 408S6 Ball Check Valve.** It is AIS compliant and designed according to AWWA C508 standard lay lengths. The self-cleaning model has no sharp edges or snag points, helping to prevent clogging from nondegradable sanitary products. There are no moving parts except for the Buna-N vulcanized metal ball.
800-833-2040; www.flomatic.com; Booth 6873

Gorman-Rupp Eradicator Plus

Gorman-Rupp is offering **Eradicator Plus** solids reduction technology for select Super T Series self-priming centrifugal trash pumps. The Eradicator Plus product was designed for the most extreme-duty applications in the municipal, industrial and agricultural markets. For liquids containing trash bags, wipes, mop heads, hair, industrial byproducts and agricultural wastes, it is ideal when cutting and tearing of organic solids entering the pump is required. Based on the same principles of the Eradicator Solids Management System, Eradicator Plus models are the most aggressive in the Super T Series product lineup.
419-755-1011; www.grpumps.com; Booth 917

Halliday Products Series F Flushmount Floodtight Covers



Series F Flushmount Floodtight Covers from **Halliday Products** are made from highly durable aluminum and stainless steel, and feature EDPM compression gaskets, spring assists and stainless steel cam locks. They are structurally designed to support a 25-foot column of water.
800-298-1027; www.hallidayproducts.com; Booth 2951

InfoSense SL-RAT

The Sewer Line Rapid Assessment Tool, or **SL-RAT,** from **InfoSense** acts as a force multiplier for municipal wastewater collection system operators. It does this by enabling a change from a reactive or time-based cleaning strategy to a condition-based cleaning strategy. The sewer system is screened programmatically, allowing for cleaning the right pipe at the right time. By changing to this method, hundreds of wastewater utilities around the globe have seen significant savings in terms of dollars, fuel usage, cleaning labor, flushing water and cleaning equipment utilization.
704-644-114; www.infosense.com; Booth 1229

Inovair IM-Series

Integrally-geared, high-efficiency **Inovair IM-Series blowers** cover applications from 15 to 500 hp. Their technology is robust, compact, and quiet, providing safety, performance, and reliability, even in the most demanding duty cycles. Service and support are highlights, and customers appreciate that maintenance is performed by the plant operators, meaning no costly maintenance contracts.
913-469-7244; www.inovair.com; Booth 2857

JDV Equipment Nozzle Mix System

The dual-zone **Nozzle Mix System** from **JDV Equipment** provides uniform mixing patterns that produce even distribution and a stable environment. It optimizes solids suspension and contact to promote efficiency in a wide range of applications. The system is designed with pumps installed outside the tanks and are typically chopper pumps or pumps incorporating in-line grinders. The high-velocity nozzles mounted inside the tank completely mix the tank contents. Applications include anaerobic digestion, biosolids storage, blending tanks, excess flow tanks, septage or leachate, anoxic zones, CSO handling, aerobic digestion, secondary treatment, and biosolids holding ponds.
973-366-6556; www.jdvequipment.com; Booth 2601

JWC Environmental Monster Metal Cutters

JWC's Monster Metal cutters last twice as long as typical industry cutters and work in both abrasive and corrosive environments commonly found in wastewater treatment plants. It is available on select Muffin Monster, Channel Monster and Channel Monster FLEX units. A five-year warranty covering the cartridge and wear components is included on Muffin Monster units, while a three-year warranty is available for Channel Monster and Channel Monster FLEX units.
800-331-2277; www.jwce.com; Booth 3451

Keller America Econoline

The **Econoline** pressure transmitter from **Keller America** combines a media-isolated piezoresistive silicon sensor with signal conditioning electronics to provide a compact pressure transmitter with less than ±1% Total Error Band accuracy from 0 to 50 degrees C. The industry standard 4-20mA analog output is compatible with most existing monitoring infrastructure and SCADA systems and provides meaningful output in ranges from 30 to 10,000 psi. The design makes it suitable for use under harsh environmental conditions, including those with high levels of electromagnetic radiation and/or those involving aggressive media where small size, low weight and reasonable cost are required. Modular production provides short lead times and maximum versatility for customer-specific applications.
877-253-5537; www.kelleramerica.com; Booth 330

Komline-Wyssmont Turbo-Dryer

The **Komline-Wyssmont Turbo-Dryer** is a tried and tested dryer design for even, thorough, and rapid drying using a system of rotating trays which material is transferred onto one after the other. This high thermal efficiency, low-maintenance dryer produces Class A Biosolids. It offers a small footprint and low operating cost.

800-225-5457; www.komline.com; Booth 2517

Ladtech System

Concrete and brick manhole risers are one of the leading causes of I&I. Constant traffic impact and freeze-thaw cycles cause this critical part of the system to crack and crumble. This is also where the majority of groundwater impacts systems. The **Ladtech System** addresses this issue by making the chimney riser section of the manhole uniform and completely watertight. Made from 100% recycled HDPE, sealed with butyl rubber sealant, the joints between the cone, risers, frame and cover are permanently flexible and watertight. Its H25 load rating ensures that traffic impact will not compromise performance. It is impervious to hydrogen sulfide, including slope rings and 1/4-inch spacers, allowing a precision installation.

877-235-7464; www.ladtech.com; Booth 4004

Lakeside Equipment Raptor Septage Acceptance and Septage Complete Plants

Raptor Septage Acceptance and **Septage Complete Plants** from **Lakeside Equipment** remove debris and inorganic solids from municipal, industrial and septic tank biosolids. This heavy-duty machine incorporates the Raptor Fine Screen for screening, dewatering and compaction. Accessories include grit and rock removal as well as security access and automated accounting systems. With the addition of aerated grit removal, the septage acceptance plant is offered as the Septage Complete Plant (a slight variation of the Raptor Complete Plant).

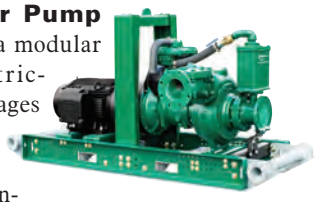
630-837-5640; www.lakeside-equipment.com; Booth 2729

Park Process Sludge King II

The **Sludge King II** roll-off dewatering container from **Park Process** incorporates an engineered design that eliminates any trapped water in the bottom of the filter cake. The second center wall filter increases filter area by 33% producing drier cakes in less time. The plastic floor panels that cover the floor space between wall filters and center wall filters serve three purposes; they hold down the bottom of the filter elements, help to eliminate standing water and facilitate the dumping of filter cake. The inlet manifold is split into three separate inlets, each with a ball valve, allowing the incoming flow to be distributed evenly into the three compartments formed by the two center wall filters.

855-511-7275; www.parkprocess.com; Booth 1637

Pioneer Pump ElectricPAK



The **Pioneer Pump ElectricPAK** is a modular offering of electric-driven pump packages engineered to offer a fully streamlined experience for owners and operators. Each configured assembly includes a high-performance pump and electric motor that provides better flow, higher head and greater efficiency. The design also features a rigid motor stool that keeps the pump and motor permanently aligned, saving countless hours of alignment work and service time. Franklin Electric's online specification tool, FE Select, allows users to configure and quote a full ElectricPAK that meets their application needs anytime and from any web-enabled device.

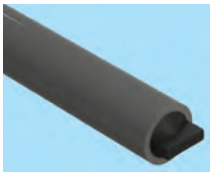
503-266-4115; www.pioneerpump.com; Booth 2936

Pulsed Hydraulics Large Bubble Mixers

Pulsed Hydraulics manufactures large bubble mixing systems that are used in lift stations to reduce FOG and odors. When installed in anaerobic/anoxic basins, the circular mixing created by the mixer granulates floc. The larger floc reduces the TSS count by an average of 20%, reducing nitrogen, ammonia and phosphorus. The mixers increase the efficiency of diffusers when installed in aeration basins, as they are vertical mixers that keep the small bubbles in suspension longer and transfer more oxygen. No in-basin maintenance or repairs are required.

800-641-1726; www.phiwater.com; Booth 4503

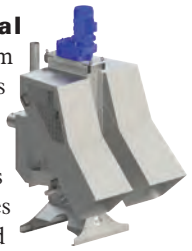
Saf-T-Flo Chemical Injection SafF-T-Seal



The **Saf-T-Seal** elastomeric duckbill tip from **Saf-T-Flo Chemical Injection** can be a timesaver when added to injection quills dosing sodium hypochlorite or ammonia. These chemicals are prone to forming deposits, which eventually lead to a clogged injection quill. The tip can be added to any 3/8- or 1/2-inch injection quill to help reduce tip clogging, extending maintenance intervals.

800-957-2383; www.saftflo.com; Booth 2012

SAVECO/Enviro-Care SEPCOM Vertical Screw Separator



The **SEPCOM Vertical Screw Separator** from **SAVECO/Enviro-Care** was engineered to dewater liquid/solid mixtures in which the ratio of liquid to solid fluctuates dramatically. The design includes two vertical screws manufactured from SINT-engineered polymers. This separator ensures there is no clogging or loss of plug during operation. Separation is performed by a flexible combination of gravity and mechanical compression. This flexibility allows the machine to separate the liquid phase from the solid phase of a wide range of materials where the percentage of the liquid inside the solids may be constantly changing.

815-636-8306; www.savecowaterna.com; Booth 4309

Sealing Systems Flex-Seal 2.0

Flex-Seal 2.0 from **Sealing Systems** is an all-purpose sealant that adheres to many surfaces and has over 800% elongation. It is designed to prevent inflow/infiltration and to provide corrosion protection at the grade adjustment ring section or joint sections of manholes and catch basins. It is 100% safe and Prop 65 compliant. The internal seal is manually applied using a paintbrush, and the kit is designed to cover 12 vertical inches on a 27-inch-diameter manhole.

800-478-2054; www.ssisealingsystems.com; Booth 3928

(continued)

SEEPEX Smart Air Injection

Smart Air Injection is a **SEEPEX** customized system for pumping over long distances. The system uses compressed air and polymer injections to convey biosolids, or other media with a dry matter content of 20% to 40%, over distances of up to 1,000 meters. This combination ensures a low pressure level in the delivery line as well as low friction, which translates into a long life cycle and low operating costs. It integrates easily into existing automation and control systems; reduces the pressure rating of the pipework and valves; and is an enclosed pipework system, eliminating unpleasant odors or rainfall dilution.

937-864-7150; www.seepex.com; Booth 3109

Sulzer Pumps Solutions HST Turbocompressor

The **HST Turbocompressor** from **Sulzer Pumps Solutions** offers an advanced design with digitally controlled magnetic bearing technology and a premium efficient high-speed motor driven through a built-in frequency converter. It has no mechanical wearing parts or lubricants requiring minimal maintenance. This is made possible by electronically controlled magnetic bearing technology, which levitates the integrated rotor/shaft/impeller single-piece assembly along the self-diagnostic features of the active magnetic bearing controller. The result is a compressor with no performance deterioration over time and no need for scheduled maintenance. They are widely used in wastewater treatment plants and in low-pressure industrial processes.

203-238-2700; www.sulzer.com; Booth 3439

Vaughan Co. Chopper Pump

The **Vaughan Chopper Pump** is a centrifugal pump with the ability to chop all incoming solids prior to pumping. This durable product features dry suction lifts up to 22 feet, flows over 13,000 gpm, hydraulic efficiencies over 70%, discharge sizes from 3 to 16 inches, heat-treated and hardened components, direct or belt-drive configurations, over 60 years' field testing and optimization, and nonclog guarantees.

360-249-4042; www.chopperpumps.com; Booth 4017

VEGA Americas VEGAPLUS

The **VEGAPLUS** line of 80 GHz radar sensors from **VEGA Americas** uses precision focusing to deliver reliable measurements regardless of internal obstructions, changing temperatures, condensation or dust. The series is a standalone loop-powered sensor available as either a compact version with cable connection housing or with an IP68 housing and fixed cable connection. These sensors are easily adjusted via Bluetooth with a smartphone or tablet, making setup and diagnostics significantly easier.

800-367-5383; www.vega.com; Booth 1101

Wachs Utility Products valve maintenance systems

Wachs Utility Products manufactures **valve maintenance systems** and advanced pipe cutting solutions, including VITALS software that interfaces with desktop systems. Options include the Diamond Wire Guillotine series of pipe saws, handheld powered valve exercisers, valve maintenance trailers and valve maintenance skids designed to bolt down ready to run on flatbed trucks. Depending on specifications they may include power wash, vacuum, spoils tanks and VITALS-equipped ERV-750 and TM-7 HD Plus automated valve exercisers.

847-537-8800; www.turnvalves.com; Booth 1529

WinCan Sewermatics AI

Sewermatics AI from **WinCan** delivers quick, accurate automatic defect coding that gives a sewer inspection the productivity boost it needs to cut through backlogs and stay on pace. With direct access to results via WinCan Web, it works fast, processing inspection media in 5% of the playback time. A final quality check by a NASSCO-trained team ensures sewer inspection data is complete, certified and ready for analysis, all while the team is free to tackle other jobs. Schedule a free demo to learn how it can enhance a sewer team's coding workflows.

877-626-8386; www.wincan.com; Booth 6648

Xylem Adaptive Mixer technology

With a traditional single-speed mixer, you have to operate at 100% capacity, regardless of how much thrust you actually need. Without the ability to control your mixing, you're wasting energy, time and the opportunity to adapt to change. Using **Xylem's adaptive mixer technology,** you can improve process resiliency, spend less on energy, reduce mixer inventory and increase mixer uptime.

855-995-4261; www.xylem.com; Booth 4528 tpo

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weftec 2022
Booth 2945

Digital Technology

By Craig Mandli

Analytical Instrumentation

CLA-VAL MODEL XP2F

Model XP2F data instrumentation package from Cla-Val

The Cla-Val Model XP2F is an all-encompassing data acquisition instrumentation package option available for any Cla-Val control valve. It has flow calculation data and is a differential pressure-based solution and comes complete with pressure transmitters, a valve position transmitter and a flow calculation module. It is IP 68 rated, has 12-24 volts DC input, four analog inputs and four analog outputs with the ability to accept additional field instrumentation and retransmit measurements to PLC/SCADA via 4-20mA signals. **800-942-6326; www.cla-val.com**

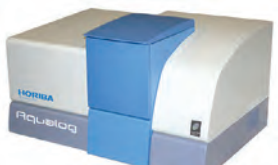
HF SCIENTIFIC, A WATTS BRAND CLX ONLINE CHLORINE ANALYZER

CLX Online Chlorine Analyzer from HF scientific, a Watts Brand

Save on time, labor and total cost of ownership with the CLX Online Chlorine Analyzer from HF scientific, a Watts Brand. It uses a flow-through cuvette design to flush out debris during each cycle, and a double-checked reagent injection design for maximum precision. The unit flushes the cuvette and takes a zero reading before injecting reagent for accurate readings, even as the glass becomes dirty. Its use means no more erratic trend graph readings, messy sample chambers that backflow into the reagent bottles or constantly cleaning the sample chamber. **888-203-7248; www.watts.com/our-story/brands/hf-scientific**

HORIBA SCIENTIFIC AQUALOG A-TEEM

The Aqualog A-TEEM from HORIBA Scientific is a fluorometer that simultaneously scans for absorbance and fluorescence excitation and emission matrix (A-TEEM). Unlike traditional scanning spectrofluorometers that take hours, its optical technology with multichannel CCD detection allows for rapid A-TEEM scans from seconds up to minutes per sample. A-TEEM provides true, traceable molecular fingerprints as well as precise quantification for compounds of interest. Its ability for automatic inner-filter effects correction not only ensures the accuracy of the fluorescence spectra but also extends the sample's concentration linearity range. With the combination of multivariate analysis, it complements an organics lab as an advanced tool for organic matter characterization. It is a simple, fast and powerful analytical tool that in some cases displaces laborious and expensive chromatography-based techniques. **866-562-4698; www.horiba.com/scientific**



Aqualog A-TEEM fluorometer from HORIBA Scientific

Control/Electrical Panels

GORMAN-RUPP INTEGRINEX ADVANCED

Integrinex Advanced controls from Gorman-Rupp

Integrinex Advanced controls from Gorman-Rupp are custom-engineered to meet unique system requirements. When equipped with FloSmart technology, the control system can detect a pump obstruction and run a cleaning cycle until the debris clears, according to the maker. Upon detection, the device initiates a cleaning operation without interfering with the operation of the pump station. When the cycle is complete, the pump is ready to return to normal operation. If the clog remains, the cleaning sequence repeats until the blockage is cleared. FloSmart is designed to help maximize uptime while reducing maintenance costs. **419-755-1011; www.grpumps.com**

ORENCO CONTROLS OLS CONTROL PANELS

OLS Control Panels from Orenco Controls

OLS Control Panels from Orenco Controls come with the choice of either integrated starters or variable-frequency drives that optimize system operation. These panels are suitable for a variety of pumping applications such as lift stations, stormwater pump stations, water boosting, dewatering or sludge pumping. They can also be used as a SCADA patch, connecting peripheral equipment to future or existing SCADA systems. Parameters can be configured via a human-machine interface and include a user-friendly startup wizard. Engineers can preprogram user interfaces to the site-specific needs of an installation, making the panel virtually plug-and-play. Maintenance staff can easily adjust settings and monitor the system remotely. These weatherproof control panels are UL 508A listed and include service-rated circuit protection, phase and voltage protection, and level controls. **877-257-8712; www.orenco.com**

SMITH & LOVELESS SHADE AIDE

SHADE AIDE screen protector from Smith & Loveless

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

Drives

Cerus X-Drive from Franklin Electric

FRANKLIN ELECTRIC CERUS X-DRIVE

Designed for variable torque applications up to 600 hp, the Cerus X-Drive is Franklin Electric's all-inclusive drive solution for a variety of markets. Available as a standalone drive

and in multiple enclosed configurations, these panels are built to last, according to the maker, with every detail and component centered around the application's specific requirements. It can be paired with a choice of motors and pumps to maximize the performance of the application. **866-271-2859; www.franklinengineered.com**

Flow Monitoring

BADGER METER MODMAG M2000

ModMAG M2000 flowmeter from Badger Meter

Water treatment and distribution applications can be complex and result in limited pipe runs to install flowmeters. When space runs out, the ModMAG M2000 electromagnetic flowmeter from Badger Meter is a solution, delivering accuracies of ±1% with zero straight run required or ±0.2% with appropriate straight run. It effectively measures water, wastewater, water-based fluids and other liquids that meet minimum electrical conductivity. It has a full-bore design, which means there is no size reduction resulting in undesirable pressure drops. **877-243-1010; www.badgermeter.com**

BLUE-WHITE INDUSTRIES BW DIGIMETER F-2000 SERIES

BW DIGIMETER F-2000 Series flowmeters from Blue-White Industries

BW DIGIMETER F-2000 Series electronic insertion style flowmeters from Blue-White Industries are quickly installed on IPS (ASTM-D-1785) pipe sizes from 1 1/2 through 12 inches. The electronic display and communication enclosure can be mounted directly to the sensor, or remotely mounted to a pipe or panel. Standard models display flow rate and accumulated total flow, and they include an NPN open collector output for communication with data loggers, SCADA systems and other external devices. Optional 4-20 mA / 0-10 volts DC plug-in circuitry can be added for additional communication requirements. Optional batch processing plug-in circuitry includes an 8-amp relay board that adds manual or automatic batch processing capability, or a high/low flow rate alarm output. The electronics can be battery operated using four standard AA-size batteries, or AC powered using a 15-24-volt DC plug-in transformer. A battery backup option is also available. Battery life in standard mode is a minimum of one year. **714-893-8529; www.blue-white.com**

Gas/Odor/Leak Detection Equipment

RKI INSTRUMENTS GX-3R PRO CONNECTED WORKER SOLUTION

GX-3R Pro Connected Worker Solution from RKI Instruments

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

Monitors

FORCE FLOW WIZARD 4000

Wizard 4000 monitor from Force Flow

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

Operations/Maintenance/ Process Control Software

Operator10 from AllMax Software

ALLMAX SOFTWARE OPERATOR10

Operator10 from AllMax Software provides a central database for all of a plant's operational and process control data. Users have the ability to manually enter data, pull data directly from SCADA and/or import data from LIMS programs. Built-in tools allow for regulatory reporting/electronic submittal, custom report creation, graphing, process control calculations, built-in formulas (mean cell residence time, sludge volume index, food-to-microorganism ratio, etc.), easy customizable data entry sheets, customizable user dashboards, a full audit trail and a biosolids module. Users benefit from easy access to historical/current plant data, decreased time on monthly reporting, better overall data management and improved plant efficiency. **800-670-1867; www.allmaxsoftware.com**

BLACKLINE SAFETY LIVE AND BLACKLINE ANALYTICS

Blackline Safety Live platform

Blackline Safety Live is a safety monitoring and reporting platform to help companies quickly locate people and respond to incidents, manage and improve compliance, and create time and cost efficiencies. Harnessing the data generated from cloud-connected G7 Personal Wearables and G7 EXO Area Monitors. The platform enables easy setup and low complexity, as companies can configure, customize, see and monitor all their safety devices from

a single screen, with no IT integration required. Devices are connected to a network the moment they are turned on and begin logging immediately accessible usage, location and compliance data, with no manual collection or docking required. Real-time location information equips customers to initiate fast and informed responses. Automated recording, filtering and seamless organization of usage (from bump test and calibrations to gas exposures and alerts) in easy-to-use charts, graphs and tables, helps companies make data-informed decisions and identify trends. **877-869-7212; www.blacklinesafety.com**

ENVIROSUITE EVS WATER

EVS Water software from Envirosuite

Envirosuite EVS Water includes Plant Optimiser software which, through the outputs of its unique machine-learning and deterministic modeling, helps customers to materially reduce the two highest costs in water treatment and delivery: electricity and chemicals. In doing so, it can materially decrease the collateral environmental footprints of its users' operations. SeweX software is an advanced mathematical modeling tool that helps utilities proactively manage and respond to safety, corrosion and odor risks in sewer networks. The customer's cost of deployment is more than offset financially by productivity gains, as well as substantially extending the life of water assets through reduced chemical strain that delays the capital cost of upgrade and replacement. Climate impact and reporting is a major driver for deploying it to reduce electricity consumption and the associated emissions. **866-583-0280; www.envirosuite.com**

YSI, A XYLEM BRAND PHOSPHORUS IN WASTEWATER

Phosphorus in Wastewater from YSI, a Xylem brand

One of the pressing issues facing wastewater treatment today is excess phosphorus. As the EPA continues to lower effluent limits for total phosphorus, wastewater operators need reliable data to improve treatment processes, remove phosphorus efficiently and meet lower effluent limits. Phosphorus in Wastewater from YSI, a Xylem brand is a comprehensive guide for wastewater professionals that covers phosphorus removal strategies, treatment options and how orthophosphate measurements can help monitor or control the phosphorus removal process. This 43-page online e-book also includes detailed sections on the different forms of phosphorus in wastewater, measurement methods and instrumentation used for sampling or continuous monitoring. **800-765-4974; www.ysi.com**

Process Control System

DE NORA WATER TECHNOLOGIES MICROCHEM 450

MicroChem 450 controller from De Nora Water Technologies

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**

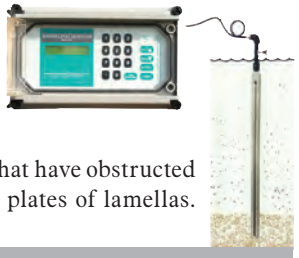
Sensors

KELLER AMERICA ECONOLINE

Econoline pressure transmitter from Keller America

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

MARKLAND SPECIALTY ENGINEERING AUTOMATIC SLUDGE BLANKET LEVEL DETECTOR



Automatic Sludge Blanket Level Detector from Markland Specialty Engineering

The Automatic Sludge Blanket Level Detector from Markland Specialty Engineering uses high-intensity infrared light that, along with its slim profile, enables it to measure the sludge bed depth even in water and wastewater clarifiers and tanks that have obstructed or constricted areas, such as the inclined plates of lamellas. Beam intensity of the LED-phototransistor sensors automatically adjusts for thick or thin biosolids concentration or even light flocs. This detector allows operators to program desludge pumps to run only when necessary for maintaining the preferred liquid-solids interface level, saving wear and tear on pumps. It helps maximize water removal and optimize sludge feed density. In DAF units, it can adjust surface skimmer speeds to match variations in the thickness of the floating sludge layer. In SBRs, it can control the decant valve to minimize cycle times. Calibration is not required. **855-873-7791; www.sludgecontrols.com**

By Craig Mandli

Wastewater collection and treatment plant updated with PLCs, SCADA

Problem

The city of Faribault, Minnesota, needed to modernize its wastewater collection system and treatment plant. The project included a major upgrade to all electrical components, including PLCs and SCADA system programming.

Solution

PRIMEX worked with the electrical contractor on engineering and commissioning the upgrades. A thin client architecture provides scalability and management. Critical upgrades included seven PLCs, motor control centers on a DeviceNet bus, 28 separately enclosed VFD controllers, and the Wonderware System Platform deployed inside the plant on virtualized server hardware. Virtualization allows the city to replace hardware rather than upgrading SCADA software licenses, saving money. As part of complete integration, PRIMEX handled system documentation, including a comprehensive description of operation, application programming and overall system responsibility.

RESULT:

The Wonderware platform deployed across the entire plant includes redundant links that make sure all communications operate as desired. **844-477-4639; www.primexcontrols.com**

Customized solution to treat varying water quality

Problem

The city of Lexington, Illinois, needed a new water treatment plant as residents were seeing tinted drinking water caused by organic compounds. Water is sourced from multiple wells, creating complexity due to the unstable water quality.

Solution

Tonka Water, a Kurita America Brand, provided a customized solution for removal of TOC, iron, manganese and hardness. It included forced draft aeration, pressure filtration, detention and ion exchange, as well as full plant controls. The system provides four treatment processes under one manufacturer's responsibility. The process begins with aeration for iron oxidation. Water then flows to detention, allowing time for the iron to oxidize. Next, water flows through an OptaCell Plus pressure filter for iron and manganese removal. The filter has isolated cell compartments above and below the underdrain, allowing individual cells to be backwashed or taken offline while the others remain in service. Each cell includes the Simul-Wash backwash system, reducing backwash waste and providing cost savings. In the next stage the water flows through four RidION ion-exchange softener vessels, followed by an Organix system for TOC removal.

RESULT:

The plant has met expectations since commissioning. **866-663-7633; www.kuritaamerica.co** tpo

PULSAR MEASUREMENT DBI-MODBUS

dBi-Modbus sensors from Pulsar Measurement

Pulsar Measurement's dBi-Modbus intelligent ultrasonic level sensors are suitable for remote installations. These transducers include DATEM (Digital Adaptive Tracking of Echo Movement) signal processing for precise and repeatable results in challenging applications, with measurement range options from 4.9 inches to 49.2 feet. It only takes one second to power on and make a measurement. When connected to a wireless telemetry device, power consumption is as little as 5 micro-amp hours. Alternatively, connect it to an existing Modbus network to take advantage of the performance full time. It is ready for challenging environments with ATEX approvals, IP68 protection and an operating temperature range of -40 to 176 degrees F. **888-473-9546; www.pulsarmeasurement.com** tpo

Ostara's nutrient recovery solution from Evoqua

Ostara's Pearl system from Evoqua is a fluidized bed reactor designed to recover phosphorus from municipal and industrial waste streams through the controlled precipitation of crystalline struvite. The growth of struvite (magnesium ammonium phosphate) is facilitated by the addition of magnesium. This allows nutrients to crystallize into eco-friendly fertilizer granules which are harvested, dried and then distributed and sold by Ostara as Crystal Green Fertilizer. This cost-effective nutrient recovery solution converts wastewater treatment plants into resource recovery facilities.

800-466-7873; www.evoqua.com

ATC Diversified Electronics SENSERT remote monitoring system

An affordable remote process monitoring technology makes it easy for water departments and wastewater treatment plants to monitor and measure operations without committing to a costly condition monitoring system that's only compatible with proprietary sensors. SENSERT, from ATC Diversified Electronics, is a remote monitoring and alert system in which a variety of sensors can be hardwired directly to the SENSERT base unit or wirelessly connected via the SENSERT remote I/O. SENSERT monitors use the sensors that are already in place, giving operators total control over the kinds of sensors they use in the future. SENSERT can monitor many conditions including level, temperature, pressure, flow and current, as well as vibration, presence of voltage and others. It works throughout water and wastewater treatment plants. SENSERT's unique capabilities, ease of use and low price make it a ready solution for water and wastewater treatment plants.

304-387-1200; www.sensertio.com

product spotlight water

Satellite-based system monitors operating conditions at remote sites

By Craig Mandli

SAT4D from Sensaphone

Many water and wastewater facilities are located in remote areas that lack cellular, internet and phone service. While the ability to automize facets of the treatment process makes the job more convenient for facility managers, monitoring those processes is essential. That's why **Sensaphone** offers the **SAT4D satellite-based monitoring system.**

The SAT4D system is a convenient, powerful monitoring solution suitable for even the most remote locations with no telephone or network connections, according to Rob Fusco, Director of Business Development with Sensaphone. Using satellite technology, it provides virtually unlimited coverage throughout the U.S. and many other countries without relying on telephone lines, Ethernet connections, or cellular networks. It can operate in temperatures ranging from -22 to 140 degrees F without any effect on battery life. Website access allows users to access status information and make programming changes.

"The product will work nearly anywhere in the world," says Fusco. "Because it runs on batteries and doesn't require any outside power, its available to work in almost any environment no matter how desolate or remote. It can provide peace of mind that your applications are functioning properly, saving personnel from wellness visits that cost both time and money."

The system monitors up to four critical conditions 24/7, including tank floats, turbidity, pump status, security, power failure and equipment malfunction, at locations such as pump houses and wells. When a sensor falls out of the preset range, the system notifies personnel via phone call, email or text message. This early warning of a possible problem helps to protect valuable assets and prevent costly downtime. Operators can access status information and make programming changes via Sensaphone's dedicated website.

"It can be wired to an existing PLC or controller and programmed to immediately send alerts on the controller's alarm," says Fusco. "You can give each zone a unique name so that you'll receive that information with the alarm to identify what is wrong. Users can then program and check the status by logging into the device's website."

The SAT4D system is self-powered and can operate for over three years on its replaceable battery. Each unit is sealed in a weatherproof, locking NEMA-4X enclosure to protect it from harsh conditions or vandalism. GPS technology pinpoints the location of the monitored equipment.

"This fills a void in our product line and customer requests for monitoring their most remote, previously unmonitored infrastructure," says Fusco.

877-373-2700; www.sensaphone.com

Val-Matic Air Valve sizing software

Val-Matic's Air Valve sizing program is a web-based software designed to aid in selecting AWWA air valves along a pipeline. The program calculates the collapse pressure, slope and gravity flow in the pipe and allows the user to save design information specific to their pump, water pipeline or wastewater force main. Recommendations are then given for air valve locations, sizes and model numbers for a pipeline and pump discharge locations.

630-941-7600; www.valmatic.com

OZ Lifting Dyno-Hoist lever hoist

OZ Lifting Products introduces the first lever hoist with an integrated dynamometer to the North American market, the Dyno-Hoist. It gives users a real-time reading of the load — in kilograms or pounds — they are applying to the hoist, whether during a lifting or pulling application. An overload alert is triggered at 126%. The hoist is available in 0.75, 1.5-, 3-, 6- and 9-ton capacity, matching the ranges of the company's industrial and premium (overload protected) lever hoist offerings. Dyno-Hoist's dynamometer fitting can also retrofit to either of the industrial or premium lever hoists. Other features include all-steel construction; steel handle with rubber grip; zinc-plated load chain; forged alloy steel hooks; and fully enclosed gearing. Dyno-Hoist meets or exceeds CE, ASME B30.21, and AS 1418.2 standards. Standard AA batteries offer a runtime of 150 hours, but the

product can be plugged into a 115/1/60 outlet. Each hoist is load-tested and arrives with a test certificate, one-year warranty and a free set of latches.
888-617-3579;
www.ozliftingproducts.com

Patterson Manufacturing Davit Cranes

Give your operations a lift with Patterson Davit Cranes, available in ½-ton and 1-ton capacities. The low maintenance, easy-to-assemble design offers adequate reach to accommodate lifting large loads within tight spaces, and a boom that can be adjusted to nearly 45 degrees to allow for clearance over obstructions such as handrails. Built for durability, it comes standard with a hot-dipped galvanized finish and stainless steel hardware to prevent rust and corrosion in wet work environments. Following Patterson's tradition of safety-focused innovation, the davit features a reliable brake to keep loads in position without creeping. For over 160 years Patterson has been a trusted supplier of winches, rigging, fittings and custom products for lifting applications. Patterson Davit Cranes are made in the U.S.A. and deliver on the company's promise of helping businesses run safer, easier and faster. Find out how Patterson can improve employee safety and positively impact your bottom line.
800-322-2018;
www.pattersonmfg.com/davit-cranes

HF scientific MCX monochloramine analyzer

HF scientific, a Watts brand, has developed an online monochloramine, total ammonia and free ammonia analyzer designed specifically for process control in municipal drinking water plants. The MCX, which uses simple fluidics, accurately measures monochloramine and total ammonia to calculate free ammonia. The MCX is easy to use and maintain and provides accurate readings every 15 to 20 minutes for better control and operation. The analyzer offers easy, 30-day reagent replacement for continuous operation and is compatible with a sequencer for multistream applications. Standard communications include 4-20mA with isolator or RS-485 with Modbus protocol, and the MCX is certified to UL, CSA, CE, Australia RCM and NEMA 4X.
888-203-7248; www.watts.com

Blue-White CHEM-FEED wall-mount skid system

Blue-White's new CHEM-FEED space saving wall-mount skid systems provide a convenient, fully assembled alternative to bulky floor models. The system deliver the chemical resistance with a choice of four pipe material options, including PVC, CPVC, PVDF and Chem Proline. All skids are fusion welded for added strength and plumbing connections are threadless for a leak-free operation. CHEM-FEED skids have a lightweight, chemical-resistant polyethylene back panel with access holes for easy access to wiring. In addition, there are four conveniently located handles to assist with installation. The wall-mount units are available in one or two pump.
714-893-8529; www.blue-white.com

Magnetrol-AMETEK Genesis multiphase detector

The Genesis multiphase detector from Magnetrol-AMETEK provides profiler performance at a competitive cost without the regulatory burdens and HSE concerns. The Genesis is designed to measure multiple phases in applications with thick and dynamic emulsion layers including vapor phase, total level, top of emulsion layer, bottom of emulsion layer and sediment. It has 24-volt input with four 4-20mA outputs (including HART) for convenient control and a four-button keypad and graphic LCD display to allow for viewing of configuration parameters and performance curves. Electronics can be remote-mounted up to 100 feet away from the probe, and calibration or moving levels in the vessel are not required.
800-624-8765;
www.magnetrol.com

De Nora SORB system for PFAS treatment

The preconfigured SORB systems from De Nora employ proven methods of contaminant removal to reduce PFAS in water sources to a non-detectable level, including ion exchange and granular activated carbon. The updated product line for PFAS treatment includes the SORB FX and SORB CX. Systems are pre-engineered and optimized on a local level, depending on variables such as flow, seasonality and targeted contaminants. In-house engineers also have the ability to take budgetary concerns into consideration during the design phase, providing solutions that cater to operating or capital expense goals or availability. EAOP and ClorTec on site sodium hypochlorite generation with be coming in the future as an add-on for final disinfection of resin media, available as a recurring aftermarket service or permanent installation.
215-997-4000;
www.denora.com

AQUAFIX AQUABACxt biological larvicide

AQUABACxt from AQUAFIX is a professional grade, EPA-registered biological larvicide for use against midge flies and the myriad of issues they cause within a plant. It contains a species of bacteria called *bacillus thuringiensis*, an approved larvicide for controlling red worms and midge flies in wastewater treatment plants and waterways. AQUABACxt can either be poured into the aeration basin or secondary clarifiers, depending on where the red worm problem is. It also works extremely well in UV disinfection chambers. AQUABACxt has also been proven effective against bristle worms (aeolosoma) and water fleas in the field. AQUABACxt contains six complex biological larvicide compounds (endotoxins) that are highly effective against red worms but safe for fish, birds, mammals and other life-forms. With the endotoxins, it is difficult for red worms to build a resistance, giving it an advantage over single endotoxin larvicides.
888-757-9577;
www.teamaquafix.com tpo

(continued)

"Water really motivates me. When I was a kid I remember driving by Lake Superior on a family vacation and looking out over the blue waters of the lake. It gave me a sense of awe and wonderment.

"This work offers me the opportunity to be a real environmentalist. I'm serving on the front line of environmental protection."

Phil Webster
MANAGER, WATER POLLUTION CONTROL DEPARTMENT
Alliance Water Resources, Sedalia, Mo.

product spotlight
wastewater

Accurate device designed for single-parameter analysis

By Craig Mandli

ChemScan Mini Analyzer from In-Situ

Analysis of water and wastewater sample is highly technical. Therefore, the tools used to interpret those samples are complicated, and for the sake of public safety, required to be extremely accurate. While there are many analysis tools which measure multiple sample parameters, sometimes only one parameter needs to be tested for at a particular site. That's where **In-Situ's ChemScan Mini Analyzer** goes to work.

This highly reliable, easy-to-use online colorimetric water analyzer family provides accurate analysis, real-time data and continuous monitoring for municipal drinking water and wastewater applications. The ChemScan Mini Analyzer handles a single sample line and is available in a wide array of parameters and measurement ranges. The parameters the analyzer can be programed to read include ortho phosphate, copper, iron-free ammonia, low ortho phosphate, low chrome VI, ammonia, low ammonia, nickel, monochloramine, low chlorine, sulfite, manganese, low manganese, peracetic acid and silica.

"It has an industrial design, with sample tubing that is approximately two times larger than competitive systems," says Heather Risatti from In-Situ's marketing department. "The Mini Analyzer can be used across water and wastewater applications for reliable and accurate analysis."

According to Risatti, that larger sample tubing minimizes the chance of plugging for exceptional reliability and lower maintenance. It is self-cleaning to eliminate internal fouling, offers simple field-adjustable calibration, and was designed from the ground up to reduce facility maintenance requirements.

"The Mini Analyzer was developed using our popular multi-parameter analysis systems as models," she says. "Reagent replacement is only on a three-month basis, which gives the customer the flexibility they are looking for. It's a great fit for the industry because it's a reliable solution, and with our experience in the process industry, we were well versed to design a solution for single parameter analysis."

The Mini Analyzer's reliability combined with affordable reagents and spare parts results in a very low cost of ownership. In addition, ChemScan Mini Analyzers are easy to start up and maintain, meaning that service maintenance contracts are not necessary.

"It was designed as a product that is easy to understand and maintain," says Risatti. "It has an extremely functional design and is easy to calibrate. Those are factors that operators are looking for."

800-665-7133; www.chemscan.com

RADAR
IS THE BETTER ULTRASONIC

Compact 80 GHz level sensor with in-head display

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people/awards

Midland and Pioneer Natural Resources' private partnership to upgrade the city's wastewater treatment plant has earned the Governor's Environmental Excellence Award for water conservation from the Texas Commission on Environmental Quality.

Babcock Ranch Water Utilities won three first-place awards for accomplishments in water reclamation, operational performance and safety from the Florida Water Environment Association.

Bonita Springs Utilities won the Division 4 Outstanding Water Distribution Award from the Florida Section AWWA.

The **Hamilton Public Works Department** received an Environmental Excellence Award from the Montana Department of Environmental Quality.

Philip Shaul, an Idaho Falls wastewater treatment plant operator, was named Operator of the Year by the Southeast Idaho Operators Section, Pacific Northwest Clean Water Association.

A pair of water employees in Sadalia, Missouri, were honored for longevity. **Curtis Campbell,** a water pollution control crew supervisor, has served 30 years. **William Bracken,** filtration plant chief operator, has served for 15 years.

A May 21 Arbor Day program and tree dedication honored the memory of **Charles 'Chip' Webster,** a long-time employee and wastewater treatment plant manager in Warrensburg, New York.

Brad Duncan, Fairbury sewer superintendent, received the Operator of the Year award from the Illinois Association of Water Pollution Control Operators.

West Virginia American Water's New River Water System received the statewide award for best tasting water in the Tap Water Taste Test at the annual AWWA West Virginia Section conference.

The **Roswell Water Utility** received three awards from the Georgia Association of Water Professionals: Water Treatment Plant of the Year, Top Operator of the Year, and the Gold Award for operations.

Gwinnett County was voted as the Best Tasting Water in the state by the Georgia Association of Water Professionals.

Dion Dionysiou, professor of environmental engineering at the University of Cincinnati, received the UC Distinguished Research Professor award for his work developing sensors and strategies to identify and treat water pollutants.

Betsy Miller Vixie was named general manager of the San Bernardino (California) Valley Water Conservation District, replacing Daniel Cozad, who retired.

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

events

Sept. 7
AWWA Water Reuse – Global Practices in Strengthening Water Communities webinar. Visit www.awwa.org.

Sept. 11-14
AWWA Water Infrastructure Conference, Hilton Portland (Oregon) Downtown. Visit www.awwa.org.

Sept. 12-15
Virginia AWWA Section WaterJAM 2022, Virginia Beach Convention Center. Visit www.vaawwa.org.

Sept. 12-30
AWWA High-Tech Operator Course 1, online. Visit www.awwa.org.

Sept. 12-Oct. 14
AWWA Water Treatment Operator Level 2 course, online. Visit www.awwa.org.

Sept. 13-16
Michigan AWWA Section Annual Conference, Grand Traverse Resort and Spa, Acme. Visit www.mi-water.org.

Sept. 13-16
Minnesota AWWA Annual Conference, Duluth Entertainment and Convention Center. Visit www.mnawwa.org.

Sept. 14-16
South Dakota AWWA Section Annual Conference, Sioux Falls Ramkota. Visit www.sdawwa.org.

Sept. 14-16
Wisconsin AWWA Section Annual Conference, Monona Terrace, Madison. Visit www.wiawwa.org.

Sept. 18-21
New England Water Works Association Annual Conference, Newport (Rhode Island) Marriott. Visit www.newwa.org.

Sept. 18-21
Rocky Mountain AWWA Section Annual Conference, Keystone (Colorado) Resort Conference Center. Visit www.rmsawwa.org.

Sept. 20-23
Western Canada AWWA Section Annual Conference, Telus Convention Centre, Edmonton, Alberta. Visit www.wcawwa.net.

Sept. 21
AWWA National Water Pipeline Database — Better Data and Models for Improved Asset Management, online. Visit www.awwa.org.

Sept. 28
AWWA Cybersecurity Preparedness webinar. Visit www.awwa.org.

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