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Michele Higdon credits much of her success to the Southern Indiana Operators Association. She says thanks by giving back as a volunteer.

By Scottie Dayton

ON THE COVER: In a career spanning more than three decades, Michele (Shelly) Higdon advanced from mainly secretarial work to her current position as laboratory manager for the Shelbyville Water Resource Recovery Facility. She credits much of her success to the Southern Indiana Operators Association, in which she has held offices including president. (Photography by Marc Lebryk)

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What's So Scary About Technology?

WE SHOULDN'T FEAR ELECTRONIC INSTRUMENTS FOR THEIR UNFAMILIARITY. WE SHOULD EMBRACE THEM FOR THEIR SIMPLICITY OF USE AND POWER TO INFORM AND IMPROVE.

By Ted J. Rulseh, Editor



couple of years ago I asked my 32-year-old son if he would help me burn a music playlist onto a CD. He replied, "Sure, Dad. And right after that we can powder our wigs."

One of my all-time favorite commercials (I can't even remember what they were advertising) showed an older couple warmly welcoming two grandkids to their home ("How lovely to see you!"), and then immediately handing them armloads of electronics. Grandma said, "None of this works."

So, why do some older folks think of technology as being for the young? Or assume that we can't understand it, and so avoid it and fall behind the rest of the world?

WHAT'S IN THE WAY?

I've readily embraced computing (which for work is a necessity). I've adopted smartphone technology, bought an e-book reader, and recently started streaming music with wireless speakers. But I've tended to be slow at accepting certain changes, like switching from satellite TV to one of the online services such as Hulu or Google TV.

It's largely about fear of the unknown. But why? My experience with technologies and devices is that once you dive in, they are incredibly easy to learn and use. Or as the old ads for Canon automatic digital cameras used to say, "So advanced, it's simple." A brother who works in medical software says that's by necessity; companies like his make the basic functions extremely simple, because otherwise people will turn away.

When I bought my first iPhone, I left the store thinking, "Now comes a three-hour session with the user manual." That never happened. I got the device home and just started using it. It was that easy. Granted, I'd had a little experience with a BlackBerry, but still, the fundamentals of operation, though different, were extremely intuitive.

THE WORK WORLD

It's pretty much the same with electronic devices we use at work. Technology in the water and wastewater sector becomes more pervasive every year. It brings new ways to save energy, save time, improve performance, fine-tune maintenance, facilitate permit compliance and more.

And it doesn't have to be the province of younger operators. Many people in the water sector have 20, 30, 40 or more years of experience. Mostly what technology means is better, faster, cheaper, easier ways of doing things we've always done. Or ways of doing things never previously possible.

For example, just today I received news about a technology that lets operators connect a smartphone to view a sample of mixed liquor and send pictures of bacteria for analysis, thus getting a near-instant evaluation of plant conditions by way of artificial intelligence.

WHAT, ME WORRY?

That sounds like something I would initially be scared of: Surely it's not that easy. Surely I would find a way to mess it up. In all likelihood, those fears would turn out to be unfounded. So why should I let fear stand in the way. For that matter, why should you?

I think we need to start treating fear of technology like the monster that, as kids, we were certain hung out under our bed or in the closet at night. As in, he's not really there. So why be afraid? Just resolve to grab that technology, learn it, get it to work, and make your life on the job better as a result.

Now, if you'll excuse me, I've got to order up that new high-speed internet service, ditch the satellite, and get started with online TV. That's right, I'm terrified. **tpo**



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PROJECT EXCELLENCE

Biogas to Natural Gas

A renewable-natural-gas-to-pipeline project in Colorado won the 2020 Project Excellence Award from the Water Environment Federation. It's the first system in Colorado to convert raw biogas from a water resource recovery facility to renewable natural gas and inject that product into a natural gas pipeline for downstream use as transportation fuel. tpomag.com/featured

OVERHEARD ONLINE

"I hope that advances in this new frontier of precise solute-solute separation will enhance our ability to engineer water quality."

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From Learner to Mentor

MICHELE HIGDON CREDITS MUCH OF HER SUCCESS TO THE SOUTHERN INDIANA OPERATORS ASSOCIATION. SHE SAYS THANKS BY GIVING BACK AS A VOLUNTEER.

STORY: Scottie Dayton PHOTOGRAPHY: Marc Lebryk

> hat does a career spanning more than three decades in one place look like? Ask Michele "Shelly" Higdon, laboratory manager for the Shelbyville (Indiana) Water Resource Recovery Facility.

> Hired at age 19, lightly trained and heavily selfeducated, Higdon advanced from mainly secretarial work to her current position. Early on, she discovered her most valuable resource — the Southern Indiana Operators Association — and earned her Class I (lowest) operator's license.



Higdon's dedication to the association shows in the offices she has held. "I'm almost a fixture when it comes to secretary/treasurer, but I have been president twice," she says. She has also represented the group on the executive board of the Indiana Water Environment Association.

In 1995 and 2012, the operators group recognized Higdon with Professional of the Year awards. She also received the Laboratory Excellence Award from the Indiana WEA 19 times between 1995 and 2019. Along the way, she standardized the lab, raised a family, and trained numerous plant operators in basic wastewater tests.

"The first time I walked into the lab, I thought it was pretty cool, very interesting, and something different," Higdon says. "I haven't changed my mind."

TREATING THE FLOW

Built in 1960 and upgraded in 1988 and 2001, Shelbyville's 16 mgd (design) trickling-filter-packed bed reactor (biotower) plant averages 8 mgd from 19,000 customers. At the Conrey Pump Station, an inline doubledrum Channel Monster grinder (Sulzer Pumps) macerates debris before four dry pit submersible pumps (Pentair Fairbanks Nijhuis) move the wastewater through a 24-inch force main under the Big Blue River to the headworks.

A Parshall flume at the headworks measures the flow before it enters two grit chambers at a 60/40 split to slow the stream. Two Model C grit pumps (Trillium Pumps USA Inc. – WEMCO) send the grit to a Grit Mitt Classifier (WesTech Engineering) before it is landfilled.



"We need a fun name for our City of Shelbyville Operations Challenge team, but none of our suggestions have met with enthusiasm," says Shelly Higdon, laboratory manager.

One thing not lacking enthusiasm is her passion for the competition. Higdon has been a team member since 2004. She debuted with a team from the Greensburg plant that won the state laboratory event: "It had nothing to do with me, but the experience left me wanting more," Higdon says.

She hasn't missed a year since. Together with various members, the Shelbyville team has won individual state Ops Challenge events and placed second and third overall. "It's really fun to discover what you know and don't know, and to learn by doing," Higdon says. "In addition, the camaraderie is great, and we always look forward to seeing other teams. This is especially true for our northern Indiana counterparts, as we rarely see them due to the distances between us."

In May 2018, the Indiana WEA Annual Wastewater Challenge was held at the Shelbyville Water Resource Recovery Facility. The Mishawaka Ninja Turdles won the laboratory event. "Shelbyville hasn't won a laboratory award since 2004," Higdon says. "I want that one and for the team to win first overall, so we can compete at the WEFTEC nationals."

Shelly Higdon, laboratory manager, has created step-by-step instructions for every lab test.

Wastewater enters three primary settling tanks followed by a recirculation pump station. Four variablespeed pumps (Pentair Fairbanks Nijhuis) send water to three 14-foot-tall high-rate trickling filters filled with plastic crossflow mesh for fixed-film suspended growth. From there, liquid flows to two aeration basins with five blowers (Hoffman & Lamson, by Gardner Denver), then to three secondary clarifiers, a TrojanUV4000 disinfection system, and a 36-inch Parshall flume before discharge to the river.

Sludge is pumped to two primary anaerobic digesters, heated, homogenized by Pearth dual gas mixers

Michele "Shelly" Higdon, Shelbyville (Indiana) Water Resource Recovery Facility

POSITION: Laboratory manager

EXPERIENCE: 34 years in the industry

EDUCATION: Applied chemistry course at Ivy Tech Community College of Indiana

CERTIFICATIONS: Class I wastewater operator MEMBERSHIPS: Southern Indiana Operators Association, Indiana WEA

GOALS: Leave the lab in top condition and train a dedicated replacement

(Evoqua Water Technologies), and stored in a secondary digester with a Dystor system (Evoqua). Captured methane gas substitutes for natural gas to heat the primary digesters.

Material at 4-6% solids is dewatered to 24-27% solids cake on a 1.5-meter K-S Kompress belt filter press (Komline-Sanderson) and land applied. In the lab, Higdon uses an Orion pH meter (Thermo Fisher Scientific), Hach luminescence BOD probe and spectrophotometer, IDEXX Laboratories solutions and Colilert test for *E. coli*.

WORLD OF CHANGE

Higdon's clean, organized laboratory gives few clues to its evolution. When she was hired in April 1986, the BOD, TSS, pH and fecal coliform tests took a few hours to run in the morning, leaving the rest of the day for secretarial work.

"I came to the lab through the back door," says Higdon, who took secretarial courses in high school and worked part-time for the city through the school-sponsored work experience program. "The year after graduation, the laboratory technician/secretary position became available, and the money was a little better. I never knew the plant existed until I filled out the application."

The first time I walked into the lab, I thought it was pretty cool, very interesting and something different. I haven't changed my mind."



Higdon trained for two months under Beverly Brenner before she retired. "I loved her to death," says Higdon. "Bev helped me realize that I could do lab work and that mistakes were part of the learning process."

At age 19, alone in the lab with only Brad Fix, plant superintendent, in a next-door office, Higdon began her long venture. Her first stop was an applied chemistry course at Ivy Tech Community College of Indiana. It covered all testing done in wastewater labs.

Her education accelerated that year when Fix introduced her to the SIOA: "I joined right away. Here was an entire network of mentors willing to answer questions and help me understand scientific elements in lay terms."

BROAD SHOULDERS

After two years on the job, Higdon's confidence level had risen substantially. Then came the 1988 rebuild, and with it a new lab and new requirements, such as ammonia testing, quality control, and QC charts showing results from the maintenance, repair and operations forms. It fell to Higdon to develop the quality assurance plan: "I had plenty of time to learn, but occasionally struggled with new things because I was always alone and learning on my own."

To form a game plan, Higdon relied on the Indiana WEA Laboratory Committee and attended seminars. "I couldn't understand why we did quality control charts, because the inspectors never looked at them," she says. "And I was terrified to submit the prescribed test results for the annual U.S. EPA Discharge Monitoring Report-Quality Assurance Study."

Her anxiety hit the stratosphere with the arrival of state laboratory inspectors. They turned out to be mentors in disguise, explaining the ins and outs of quality assurance and the documentation needed to produce defensible data with known precision and accuracy. As new requirements were added, the inspectors taught Higdon what to do.

"At least new things arrived one at a time, enabling me to assimilate them into my routine before the next one hit," Higdon says. "It took a long time before I understood Standard Methods, but the more I learned, the more I developed my own system of doing things."

ORGANIZATIONAL SKILLS

Higdon originally ran lab tests during the workweek and held samples over the weekend. After the addition, testing went to seven days a week, and for the first 16 years Higdon spent three hours on Saturday mornings and on holidays running tests. An operator did basic tests on Sundays. By 1991, Higdon was taking home bench sheets and quality control charts to keep up, and she was pregnant with her first son.

With her maternity leave looming, Fix hired Bronda Vierling to take over the secretarial work and learn to run basic lab tests. (Vierling's husband is the wastewater foreman.) "Had I known what it took to get an assistant, I would have become pregnant sooner," Higdon says, who was married in 1990. Her second son arrived in 1992, and her third son in 2002. "One reason I love my job is because I have the freedom to run home if needed. Bronda made that possible."

All the while, Higdon continued to improve the lab, starting by training all the operators in the basics of how to run it. She established a daily routine, which stretched her organizational skills but eliminated confusion. Then she wrote standard operating procedures — step-by-step instructions for how to run every test in the Shelbyville lab. During training, operators receive their own copies of the SOPs in which to write notes.

Higdon also wrote the quality assurance manual that includes work instructions, records and her operating procedures. "That was a lengthy project and it's all in lay terms," she says.

Physically organizing the lab came next. Every beaker, reagent kit, solution bottle and cylinder has its place and Higdon demands that users return them to their assigned cabinet or pegboard: "I'm big on organization and cleanliness. I don't like clutter."

SHARING KNOWLEDGE

Over the years, Higdon has morphed into the mentor, involved in education in her lab or through the SIOA. In the lab, she reassures operators that there is nothing they can do wrong that she hasn't done already: "I can tell where the mistake was made by the results. Recently, an operator put a sample in the tube instead of a standard and got 2.36 ppm instead of 1.00 ppm. It's not a catastrophe. Start over."

Higdon determines which operators cover the lab on weekends and in her absence. Before leaving, she checks that they have dilution water, adds

I watched some how-tos on basic lab tests on YouTube and saw a definite need for someone to do them correctly. The errors were so appalling, I had to stop watching."

> Higdon is a big believer in the Water Environment Federation Operations Challenge and has been a participant since 2004.

dates to bench sheets, and highlights what to do on them. If operators haven't been in the lab for a few months, she holds a refresher course, especially if procedures have changed.

In summer 2019, Higdon took part in a new educational opportunity through a Workforce Development project. Two seniors from the Shelbyville High School science department trained and worked part-time in the lab with her for a month and were paid by the city.

The students also toured the plant and learned about treating wastewater. By the second week, both had mastered all the lab tests. "I was very impressed with the knowledge they had already and how quickly they understood what I taught them," Higdon says. "I would love to see this become an annual program."

REWARDING CAREER

Lacking the desire to be a public speaker, Higdon works behind the scenes, serving on the Planning Committee for SIOA's monthly meetings. Members gather at treatment plants for a tour, lunch, a business meeting and a presentation. Attendees earn two contact hours per meeting. The committee asks operators to suggest seminar topics, recruits speakers, collects their bios and submits outlines of their programs to the Indiana Department of Environmental Management for approval of the contact hours.

The only time Higdon wants to step into the limelight is to do a handson lab video: "I watched some how-tos on basic lab tests on YouTube and saw a definite need for someone to do them correctly. The errors were so appalling, I had to stop watching."

In 2010, the city revised its job descriptions and made Higdon the laboratory manager. Nothing else changed, not even the nameplate on her desk, which still reads Laboratory Technician.

Although Higdon has reached the Golden 85 for retirement (age plus years of service), she isn't sure it's time to leave. "Many factors will influence

my decision, including finding a trustworthy replacement with the same passionate commitment I have to the laboratory, and a person who will keep SIOA going strong," she says.

"Personally, 34 years have flown by in a flash, and I'm still happy with the way things are. How many people can say that?" **tpo**

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An artist's rendering shows a typical surface-mounted floodwall of the kind that can be used to protect wastewater treatment facilities.

Fending Off Flooding

SURFACE-MOUNTED SYSTEMS CAN PROVIDE A PRACTICAL SOLUTION TO THE GROWING PROBLEM OF FLOODING DUE TO SEA LEVEL RISE AND HEAVIER RAINFALLS FROM INCREASINGLY SEVERE STORMS

By Rick Adler

ritical infrastructure is not always well equipped to resist rising floodwaters and coastal inundation and erosion, which can cause millions of dollars in damage and extensive downtime to bring essential equipment back online.

However, there are new solutions that can suit the most challenging settings. Many flood-control products on the market can protect a wide range of equipment and structures. These include smaller temporary systems designed to protect doors and windows to a height of about 3 feet. They rely on the building to provide structural support.

These systems are not practical for large facilities that require perimeter protection. Larger free-standing perimeter systems rely on extensive excavation with piles buried deep in the ground for added strength. That can be a problem where excavation is limited due to belowgrade structures or buried infrastructure like pipelines or electrical conduits.

When a floodwall system cannot be embedded in the

soil, additional features are required to keep water from seeping under the floodwall. This type of barrier must be engineered to resist the lateral forces from moving floodwater without sliding or overturning. The design of a surface-mounted perimeter floodwall for a wastewater facility that is no longer adequately protected by existing flood-control measures presents special challenges.

ENGINEERING CHALLENGE

In 2019, a retired City of Houston engineer working with a consulting firm sought bids for design of a floodwall system for a wastewater facility

next to a bayou. The city provided as-built drawings, information about the threat levels (flood height) and where the transitions were to be on the campus. The city also granted permission to walk the site and film drone footage.

The resulting design, still under the city's consideration, is a surfacemounted retrofit system to accommodate extensive underground infrastructure that could not be relocated, and to provide 2,000 linear feet of flood protection with just one foot of excavation.

The system includes a floodwall that provides 5 to 10 feet of flood protection, a special floodgate to close off the roadway while preserving access,

The design of a surface-mounted perimeter floodwall for a wastewater facility that is no longer adequately protected by existing flood-control measures presents special challenges.

and a pumping system to address flooding inside the perimeter walls from heavy rainfall.

The design calls for the relatively low-permeability soil under the wall to be compacted and the hydraulic gradient increased by providing an asphalt underlay extending beyond the limits of the wall footing, while ensuring a good seal along the bottom of the concrete. These structural elements ensure adequate support of the floodwall.

A successful surface-mounted floodwall needs a footing sized to ensure that the bearing pressure at the toe is sufficiently below the bearing capacity of the founding soil, and that there is no uplift at the heel.



A typical drainage pump and sump for protecting the facility interior against flooding from heavy rainfall (artist rendering).



Artist rendering of a typical access gate assembly as part of a surfacemounted floodwall.

CONSTRUCTION ELEMENTS

Concrete reinforced with rebar is a practical choice for wall materials because it is relatively inexpensive compared to steel, and the mass helps anchor the system to the ground. This type of system can be constructed from precast sections or by casting in place.

Precast sections are generally limited in size by the capacity of the trucks used to haul them to the site and the crane needed to move them into place. Larger walls are cast in place with reusable forms. Precast sections are sealed between sections as they are installed. The cast-in-place method is constructed using a continuous pour with no seams to fill. Many sets of forms can be used simultaneously to speed up construction.

The waterproof floodgate designed for the access road is to be composed of precast concrete sections that match up to the roadway level and the adjacent walls. A base slab would be embedded in the ground flush to the full width of the roadway and would extend to the side where the gate resides when open. An inverted-angle guide rail is to be attached to the base to enable the gate to easily roll open and shut.

Abutment blocks at both ends of the base slab would secure the gate system to the walls and provide overturning resistance. A vertical wall panel

would extend from the end abutment to another smaller abutment at the edge of the roadway. This panel would seal the area where the gate is stored when not in use. Two towers fabricated of steel would guide the gate and provide vertical stability. The gate design uses flexible seals at the base and both ends to prevent water intrusion around the gate when deployed.

There are many ways to power such a gate, from simple systems such as hand winches to complex control systems with automatic operation. The gate can be operated by an electric gear motor and a sprocket-and-chain system at the top of the guide towers, with the drive sprocket at the motor providing the force to move the gate.

Drainage grates and shallow sumps would capture rainfall to prevent flooding inside the walls. The drainage sumps would connect via underground pipework to sump pumps near the perimeter wall that discharge the water directly into the flood zone.

A float switch would sense when the sump is full and turn on the pump using a motor starter. Another float switch near the bottom would sense when the sump is nearly empty and turn the pump off, leaving enough water to prevent cavitation. A small control box at the pump location would house the motor starter and the interface to the switches. Power would be provided by the facility, but the design allows for a standby generator that can be shared by the gate system, if required.

MEETING NEEDS

The Federal Emergency Management Agency has issued the *FEMA 55 Coastal Construction Manual*, which standardizes the load cases for hydrostatic, hydrodynamic and debris impact. The *ASCE 7 Design Manual for Buildings and Other Structures* also applies. Hydrostatic and hydrodynamic loads are calculated using empirical equations provided by these references. These equations are based on extensive research and post-event surveys, providing a rational approach to floodwall design.

There is an obvious need for flood protection at wastewater treatment facilities due to increasing amounts of flooding and the devastating consequences to surrounding communities. Flood protection comes in many forms, but it must prevent overtopping by floodwaters, remain stable during the flood event, and protect against under-seepage.

Modular, retractable and surface-mounted floodwall systems offer flexibility and the ability to protect facilities where other flood control measures may not be feasible.

ABOUT THE AUTHOR

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Operators Help Champion Poster Contest

These posters were among the awardwinners in the WRWA competition.

10 Water

THE WISCONSIN RURAL WATER ASSOCIATION ENCOURAGES STUDENTS TO BE 'WATER CONSERVATION HEROES' AS THEY CREATE THEIR ARTWORKS

By Sandra Buettner

onserve. Protect. Use less water. Those are behaviors the Wisconsin Rural Water Association looks to instill in children through its annual poster contest.

Now in its 12th year, the contest encourages students in grades one to six to think about the importance of water and helps teachers work water into their curriculums.

The association provides technical assistance and training to water and wastewater utilities, mainly in communities with populations of 10,000 or less. The association also supports member utilities with instruction on how to protect groundwater.

PROMOTING THE CONTEST

Teachers receive an email announcing the contest at the start of the school year. The association also promotes the contest through a quarterly journal sent to members, and through a weekly e-newsletter for water and wastewater operators.

"When these operators are working at the schools collecting water samples, some really champion the contest and promote it to the educators," says Andrew Aslesen, source water specialist for WRWA.

The contest entry period is from October through mid-February. All public, private and home-schooled children are eligible. This year's theme was, "Be a Water Conservation Hero." As a part of the competition, teachers talk to students about the significance of water resources and what they can do to conserve them.

Teachers can ask for an association representative to give a class presentation on groundwater. "We give a demonstration using a model on how groundwater works and moves," says Aslesen. "That gives the children a better visual understanding of the importance of groundwater, and they can also ask questions."

After one such presentation, a student incorporated the groundwater model with wells, sand and rock into his poster, and won the first prize. "It showed that the children really pay attention and learn from the demonstration," Aslesen say. "The parents and the school were really excited that the student won."

Each year 50 to 70 schools take part in the competition; entries total up to 1,100. The teachers pare the entries down to the three best submissions. From those roughly 250 posters, WRWA staff members select 15 from each of the six grades.

When these operators are working at the schools collecting water samples, some really champion the contest and promote it to the educators."

AWARDS AND RECOGNITION

BE AWARE

Every year at its three-day March conference, the association displays the 90 posters in the exhibit hall. The roughly 1,500 attendees, mostly water and wastewater operators, can pick up ballots and vote for their favorites.

At the banquet on the conference's last day, first- and second-place posters from each grade are shown on a large screen. First-place winners receive \$100, and second-place winners \$50. The names of the six first-place winning schools are put in a hat, and the school whose name is drawn receives \$500.

Teachers are asked to recognize their student winners in the classroom. A WRWA representative visits the schools to present the winners with their checks. Winners also appear in the association's journal. The winning posters hang for a year in the Wisconsin Public Service Commission meeting room in Madison, the state capital. One student's family drove more than two hours to get a picture of their daughter with her poster at the commission offices.

CREATIVE JUDGING

All entries for the 2020 contest were received before Wisconsin schools closed for the COVID-19 pandemic, so the competition did not have to be postponed. The judging had to be done virtually because the WRWA conference was cancelled.

In response, the association loaded the 15 submissions from each grade online and used a polling service. All WRWA members received an email encouraging them to vote. More than 300 did so, and the winners received their award money recognition. **tpo**

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The Cookeville Wastewater Treatment Plant was built in 1984 and expanded in 1995. In 2016 the SCADA and UV disinfection systems were updated.

Challenges? No Problem.

INNOVATIONS INCLUDING AN INGENIOUS NUTRIENT-REMOVAL PROCESS CHANGE SPELL CONSISTENT SUCCESS FOR THE OPERATIONS AND MAINTENANCE TEAM IN COOKEVILLE

STORY: Jim Force | PHOTOGRAPHY: Martin Cherry

ivide and conquer is a phrase usually associated with political or military strategy.

It could also describe nutrient removal improvements at the Cookeville (Tennessee) Wastewater Treatment Plant, where operational changes to the oxidation ditches have enabled the plant to meet more stringent permit requirements.

The changes involved dividing each of four ditches into separate vertical zones and turning them on and off to create anoxic conditions to facilitate nitrification-denitrification. Tom Graham, plant superintendent, credits the idea to his assistant, John Buford.

"The state had actually hired a consultant who came in and tried different methods here but couldn't find a solution with the extended aeration type of plant we have," Graham recalls. "But John's idea has worked out great."

SERVING TWO CITIES

Cookeville (population 35,000) lies 80 miles due east of Nashville. The city's sewer system consists of more than 300 miles of pipe and 20 lift stations.

The treatment plant is an oxidation ditch facility built in 1983 (Lakeside Equipment Corporation) and expanded to twice its original size in 1995. Design flow is 14 mgd with a maximum capacity of 30 mgd; average flow is just under 8.0 mgd. The plant serves Cookeville and the neighboring city of Algood and is managed by the Cookeville Department of Water Quality Control.

Wastewater enters the plant through a headworks facility that includes two 1/4-inch multirake bar screens (Vulcan Industries),

and a pair of aerated grit chambers. The wastewater is lifted 50 feet to the oxidation ditches by three 60-inch screw pumps (Lakeside Equipment Corporation) and then flows by gravity through the treatment system.

The plant is really two pairs of Lakeside oxidation ditches (2.36 mgd each) that mirror each other. Each has six surface-mounted brush rotors and a pair of clarifiers (Walker Process Equipment, A Div. of McNish Corp.).

The system includes four small-channel sludge selectors that reduce filamentous growth in the return activated sludge.

After biological treatment, the wastewater settles in four circular clarifiers, two 90 feet and two 100 feet in diameter. The newer portion of the plant is equipped with tertiary clarifiers that double as storm-mode treatment clarifiers during extreme wet-weather events.

A Duralon UV system (WEDECO - a Xylem Brand) with 96 lamps replaced an older disinfection system in 2016.

Effluent discharges to Pigeon Roost Creek, which flows to the Falling Water River. Effluent quality is consistently high; BOD averages 1.9 mg/L and TSS 4.29 mg/L. The plant reduces nitrogen to 3.0 mg/L and phosphorus to about 1.4 mg/L. For its excellent performance, the plant has won Clean Water Professionals of Kentucky-Tennessee Outstanding Performance Awards every year except one since 2007.

ALL BENEFICIAL

Cookeville's biosolids management program earned the 2019 Beneficial Reuse of Biosolids Award from the Clean Water Profes-



One hundred percent of our biosolids are recycled to farmland. Our program is completely beneficial. There are not many utilities in Kentucky or Tennessee doing that."



Cookeville (Tennessee) Wastewater Treatment Plant

BUILT: 1983, upgraded 1995

AREA SERVED: Cities of Cookeville and Algood POPULATION SERVED:

38,500

FLOWS:

14 mgd design, 7.9 mgd average TREATMENT PROCESS: Oxidation ditches

TREATMENT LEVEL: Tertiary

RECEIVING WATER: Pigeon Roost Creek

BIOSOLIDS: Dewatered, lime stabilized, land applied

ANNUAL BUDGET: \$1.272 million (operations)

A ROCK AND A HARD PLACE

Every wastewater utility faces challenges in recruiting people and paying clean-water professionals what they are worth.

Cookeville faces an even bigger challenge because of its size and location. It's what Tom Graham and assistant superintendent John Buford call being between a rock and a hard place.

"We're big enough to need skilled operators, but we're not as big as other cities near us who pay more," Graham says.

It's a tough situation, and Graham cites instances where the plant has posted openings but has received no qualified applicants. The problem is magnified by the pending retirements of several key people. Buford observes, "Three-quarters of our staff will be eligible for retirement in five years."

Graham notes, "We're lucky to have the employees we have," and he believes that job security and excellent benefits will help attract newcomers: "New employees need to know that we're behind them all the way. We'll train you on the fly, supply you with the needed text, send you to the required classes and push you to get licensed. You can be what you want to be."

He says Ronnie Kelly, his director, is forward thinking and does a good job keeping up with needs in equipment and personnel: "Without his help, progressive ideas, and understanding, we would not have been able to reach the operational accomplishments we have."

sionals organization. "One hundred percent of our biosolids are recycled to farmland," Graham says. "Our program is completely beneficial. There are not many utilities in Kentucky or Tennessee doing that."

Waste solids are pumped to two aerated holding tanks and then dewa-

Cookeville Wastewater Treatment Plant PERMIT AND PERFORMANCE INFLUENT EFFLUENT PERMIT

BOD	138.4 mg/L	1.9 mg/L	< 10 mg/L summer < 15 mg/L winter
TSS	226.2 mg/L	4.23 mg/L	30 mg/L
Nitrogen	1,691 lb/day	223.7 lb/day	< 1,532 lb/day
Phosphorus	250 lb/day	104 lb/day	< 245 lb/day

tered to about 18% solids on a Komline-Sanderson belt press. The staff is working on adding a thickener to increase solids content, but in the meantime, it uses an innovative approach to accomplish that.

"We've adopted a different wasting scheme," Graham says. "We turn off our return activated sludge pumps for 12 to 24 hours, then begin wasting the solids from the plant. This helps increase solids from about 0.75% to greater than 2% before being sent to the sludge holding tanks. That increases the final solids percentage off the belts."

A conveyor moves the cake to a lime stabilization process (RDP Technologies) where the solids are pasteurized to create a Class A Exceptional material. The solids are heated to at least 158 degrees F, then mixed with quicklime and held in the lime system for at least 30 minutes.

The end product, about 800 dry tons a year excluding lime, is spread on hay and corn fields by owners of a private 5,500-acre farm about 30 miles from the treatment plant. It's a win-win, as the farm owner gets a free beneficial product and the city avoids hauling costs.

EXPERIENCED TEAM

Graham is proud of his small, but experienced and competent sevenmember team. He and Buford are Grade 4 operators. Mance Brown is the biosolids operator; Bryan Martin and Glen Kleisley are operator trainees; and Ronnie Umbarger and Tim Henry are maintenance and repair technicians.

Graham praises their well-rounded approach: "Everybody knows the

plant operations. They know what they need to do. We work eight-hour shifts each day. Team members alternate on-call duty during off hours. Any one of us can do just about everything. It's a great example of teamwork." Most staff training is done on the fly, including orientation for newcomers.

The team's experience is enviable. Graham has logged almost 37 years at the facility, and Buford has 11. Umbarger and Henry have a total of nearly 50 years' experience. "They're indispensable," Graham says.

"Everything runs smoothly until something breaks. Then we count on the maintenance crew to repair the equipment so that normal operations can resume as soon as possible. We do most of our maintenance and repairs in-house, which saves Cookeville a tremendous amount of money."

The staff members' knowledge will also help as Cookeville faces future challenges, which include higher flow rates and the addition of new plant equipment and the associated operational challenges.



The team at the Cookeville Wastewater Treatment Plant includes, from left, Mance Brown, biosolids operator; Tim Henry, maintenance and repair technician; John Buford, assistant superintendent; Tom Graham, superintendent; Ronnie Umbarger, maintenance and repair technician; Bryan Martin, operator trainee; and Glen Kleisely, operator trainee. Not pictured: Barry Turner, engineer.

REMOVING NUTRIENTS

The challenge of nitrogen removal has been pretty much solved, thanks to Buford's ingenuity. "John's an excellent scientist," Graham says. "He came up with the solution by himself."

The state's consultant tried a few approaches to increase nutrient removal, but nothing worked. "When he left, John started playing with the rotors," says Graham. "That was in 2016." At first, Buford experimented with turning the rotors on and then off, by hand since no automation was available. That didn't work, either.

Then he had the idea to divide each oxidation ditch into three vertical zones, each served by a pair of rotors. "It was like rotors A and B, then C and D, then E and F," Buford says. The plant purchased 24 Tork timers for the ditch rotors and two timers for the sludge holding tank blowers, so that each pair could be turned on and off in a timed sequence.

With the help of the maintenance crew, the timers were installed and the new experiments began. Under the current protocol, which could be the ultimate solution, the first two rotors run for 3 1/2 hours and then shut down for 30 minutes. The solids settle to the bottom, creating an anoxic zone and letting the bugs take the dissolved oxygen content down to zero or near zero (an ORP near -220).

Then, the next two rotors turn on and the next zone is aerated; the ORP rises to about 175 before that zone



Tom Graham, superintendent of the Cookeville Wastewater Treatment Plant.



John Buford at the SCADA system's large touch-screen monitor.

is shut down. Then the third pair of rotors are turned on and off. The entire sequence takes 12 hours. "We've reduced the total nitrogen approximately 85% from what it used to be," Buford says.

Graham adds, "We have plant operators, engineers and college students here on tours to observe the operations. Most have never seen anything like it. It's working really, really well."

There's more. While the plant's nitrogen discharge has been reduced, the power bill is lower, too. "We're seeing a savings of about \$250,000 a year by alternating the rotor operation," Buford says.

From biosolids to training, from nitrogen removal to power consumption, Cookeville has used staff ingenuity to truly conquer its challenges. **tpo**



Tom Graham (left) and John Buford watch the effluent flow into the Pigeon Roost Creek, after it is disinfected by a UV system at the source of the stream (WEDECO - a Xylem Brand).

We're seeing a savings of about \$250,000 a year by alternating the rotor operation."

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Learning to Think Small

RURAL COMMUNITIES FACE KEY CHALLENGES IN UPGRADING WASTEWATER INFRASTRUCTURE, LAND-BASED TECHNOLOGIES CAN BE PART OF THE SOLUTION.

By Ted J. Rulseh

mall communities face the same basic water infrastructure issues as large cities do. The difference is that they are more challenged to find the funding to make needed improvements and updates.

Dr. A.R. "Bob" Rubin has spent decades helping smaller communities deal cost-effectively with issues around wastewater treat-

ment and stormwater. He is a professor emeritus at North Carolina State University in biological and agricultural engineering and has worked extensively with the Water Environment Federation on rural water quality and wastewater management. He has also worked with the U.S. EPA on small and decentralized treatment systems, including solutions that revolve around individual and cluster septic systems.

In Rubin's work, a small community is defined as one with a population of 10,000 or less, or a Standard Metropolitan Statistical Area (SMSA) with a population of 50,000 or less. (An SMSA is defined as a region that consists of a city and surrounding communities that are linked by social and economic factors.)

Rubin was part of an Ask the Experts panel at WEFTEC Connect last October on "Planning Approaches to Sustain-

able and Resilient Infrastructure for Small Communities - One Chance for Success!" He talked about wastewater solutions for smaller towns in an interview with Treatment Plant Operator.

tpo: What is the fundamental difference between large and small communities as it relates to meeting water infrastructure challenges?

Rubin: They've got the same public health and environmental issues. The difference between the two is the ability to get funding and the ability to pay the bills. In your state, for example, Green Bay and Madison have huge tax bases. They are vibrant communities. You have people moving in. You have got a growing workforce and a growing tax base. But in a community with, say 1,000 people, many are retirees on fixed incomes. People are leaving.

(DO): Where does that leave smaller communities in seeking infrastructure funding?

Rubin: They have two choices. They can increase the tax rate, or increase the tax base. In small communities, both of those are a challenge. In large communities, they don't have to increase the tax rate, because they continue to increase the tax base.

tpo: What is your basic approach to dealing with these issues?

Rubin: My approach is natural — using appropriate technology and natural systems whenever possible. That is not to say natural systems are

A.R. "Bob" Rubin

always the only solution. In many instances site and soil conditions may limit potential for use of a natural system, and a mechanical system must be used. This approach suggests a comprehensive options assessment as a necessary part of any design plan.

> **GDD**: As a practical matter, what does that mean? **Rubin:** It means using collection technologies such as small-diameter gravity and low-pressure sewers, with landbased treatment technologies, as part of a managed program.

CDO: What kinds of land-based treatment options are there? And why are they appropriate for smaller communities?

Rubin: They include constructed wetlands, spray irrigation and drip irrigation - using the land. If you're working in a small community, there is a lot of land. In downtown Chicago there is not a lot of land, but in rural communities, there is an abundance of land. So take advantage of that land and use it as a treatment mechanism.

tpo: Are you referring to communities that already have centralized collection and treatment, or those that do not?

Rubin: Both. If they already have a system and it's regulated under the NPDES program, by law they are supposed to upgrade that system every five years when their permit is reissued. A lot of small community systems haven't been upgraded. And now with the Total Maximum Daily Load approach. the federal and state governments are imposing phosphorus limits on permits. Natural systems are really good for removing phosphorus.

the: For operators used to big-pipe sewers, how would you describe a small-diameter low-pressure sewer system?

Rubin: A pressure sewer system is a septic tank or pump tank in everybody's yard, and a connection to a 4-, 6- or 8-inch-diameter pipe that is flowing full. It's like a water system in reverse. In addition to the pressure sewer, small-diameter gravity systems are an excellent option where the slope is conducive to that option. They are essentially watertight, so inflow and infiltration is maintained at a minimum. There are design programs available for such systems from effluent pump and grinder pump manufacturers.

tpo: What's an example of an infrastructure project for a small community with a troubled wastewater system?

Rubin: I am working with a town in North Carolina with fewer than 1,000 people. They have a gravity sewer and an aerobic treatment plant. In heavy rain events, the collection system completely fills, and the aerobic plant



overflows into the adjoining stream. We're looking to upgrade their system to reduce I&I as much as we can with lining and by eliminating some connections that served an old industrial area that is no longer there. Then we'll upgrade the plant, move it to a higher location, and put in some flow equalization so that they can accommodate those peak events. You may ask why not convert to a natural system. The answer is that although suitable soils are available in the area, converting to a land-based system would be more costly than repairs to the existing mechanical system. That's what is planned; it has not been funded yet.

(p0: How can communities secure funding for projects like this? Rubin: The U.S. Department of Agriculture Rural Development pro-

My approach is natural – using appropriate technology and natural systems whenever possible." A.R. "BOB" RUBIN gram. I can go to my local Rural Development office. I can talk to their Rural Development coordinator and say, "We need a small planning grant for our community." I can get up to \$25,000 to \$30,000 for a planning grant. With that I can determine the collections, treatment and management needs.

tpo: What happens after the planning has been completed? **Rubin:** We can put together an

engineered report that lists all the costs and I can apply for a low-interest loan. The money from Rural Development goes to a local bank, which then loans the money to do the infrastructure project.

tpo: What about grants for infrastructure projects?

Rubin: There is money available through the U.S. Department of Housing and Urban Development, as community development grants. And grant is the operative word. There are low-interest loans, but low-income, high-need communities should first be looking for sources of grants available through the federal government. Some states also have grant programs to help promote rural development.

CPO: So this is about communities with centralized infrastructure that is out of date and needs to be upgraded cost-effectively?

Rubin: Yes and no. It could also be a small community that is using onsite

wastewater systems, where those systems are malfunctioning, and there are issues with shallow water tables or shallow bedrock, and where upgrading those systems could cause public health or environmental problems. In those cases we have gone in with collection and treatment systems that will alleviate that onsite wastewater problem.

tpo: So in those cases everyone has a septic tank,

but the wastewater is piped to one central land-based treatment system?

Rubin: Yes, or it could be to treatment systems dispersed through the community. Is it best for everything to go to a single location, or is it possible to use multiple community drainfields? Every system is unique.

CPO: What about a community with a big-pipe system that is reaching end of life and now is facing phosphorus limit and a costly upgrade?

Rubin: It may be that they could continue to use that existing infrastructure. Line the collection system so that it's structurally more sound, and add on something like a constructed wetland. We have good design data for natural systems. WEF has three manuals of practice that include sections on natural systems. The EPA has publications on the design of land-based treatment technologies.

CPD: Where else can community leaders go for information and advice? **Rubin:** They can go to their state university extension service, or to the Natural Resource Conservation Service and the Soil Conservation Service. Yes, those entities deal with agriculture, but removing nutrients from drainage lines going through farm fields is not all that different from removing nutrients from domestic wastewater.

GPO: What are the key advantages of land-based treatment technologies?

Rubin: In most cases, there is no direct discharge to a stream, so the community is no longer in the NPDES program – they are in a state nondischarge program. The water goes either into the soil and flows laterally to a stream, or the water goes to deeper groundwater, in which case it recharges the aquifer and makes that water available to any down-gradient water user.

tpo: Is that water adequately treated by passing through the soil?

Rubin: Oh, yes, flowing through 2 to 3 feet of soil removes 99.9% of the pollutants, or more. In 1 foot of good, loamy soil, from 99% to 99.9% of bacteria and viruses are removed. After 3 feet of soil, the number is down to nondetect.

GPO: Do all of these land-based treatment methods require some level of pretreatment?

Rubin: Yes. Even a septic tank is a pretreatment system. A septic tank will remove about 30% of BOD and 50-60% of solids. It's a really good pretreatment device. With a primary treatment lagoon, you can remove, depending on the temperature, anywhere from 50% to 75% of the pollutants. All of these pretreatment technologies work well.

tpo: What are the disadvantages of land-based treatment systems?

Rubin: Public perception is probably the biggest disadvantage. There can be odors. And part of a land-based treatment system is nutrient management. I design land treatment system to assimilate the nutrients that are contained in the wastewater. If we change the crop, the nutrient uptake changes.

GPO: So in summary, would you say that smaller communities can do themselves a lot of good by thinking outside the box?

Rubin: Yes, and by getting up-to-date information, and that starts with talking to local experts. There is lots of technical information out there, and it's not all engineering oriented. The quest starts with finding out what's appropriate in your area.

Flowing through 2 to 3 feet of soil removes 99.9% of the pollutants, or more. In 1 foot of good, loamy soil, from 99% to 99.9% of bacteria and viruses are removed."
 A.R. "BOB" RUBIN

LPD: So what's the bottom line about small communities and dealing with these infrastructure issues?

Rubin: As long as we have people, we're going to need a water supply, and we're going to have to deal with sewage. As long as we have impermeable surfaces and runoff, we will have to deal with stormwater. And as long as we throw things away, we will have to deal with solid waste. Those environmental infrastructure issues are not going away. **tpo**



Teamwork Does It

RAMON ARGUELLO CREATES AND NURTURES A WORKPLACE CULTURE AND ENVIRONMENT THAT HELPS BRING OUT TEAM MEMBERS' TALENTS AND ACHIEVES IMPRESSIVE RESULTS

STORY: Suzan Chin-Taylor | PHOTOGRAPHY: Carl Scofield

hat started out as just a job to pay the bills turned into a decades-long love and constant source of fascination for Ramon Arguello.

As process control supervisor for the Mulberry and Drake Water Reclamation Facilities in Fort Collins, Colorado, Arguello he has seen tremendous improvement, growth and evolution in the ways wastewater treatment and water resources are handled in his community.

The facilities under the city's Water Reclamation and Biosolids Division have generated some windfalls and potential new sources of revenue during their development. And a few things operators traditionally see as negatives have actually worked to benefit the treatment facilities' performance.

AN INTERESTING START

Arguello began his career as a mechanical engineer, graduating in 1971 with a degree from Colorado State University and going to work for telephone utilities, manufacturing firms and other commercial interests.

Then in 1976, he heard of an opportunity in the Fort Collins in their wastewater division and got his start as an operator at the Drake Water Reclamation Facility, which had just been constructed under the Clean Water Act Fund. It was a ground-floor opportunity for Arguello, who was looking for a long-term career.

Over the years he worked his way up, eventually obtaining Class A Wastewater Plant Operator certification. "What helped me the most when I was beginning in this field was my educational background, being able to look at things from a theoretical standpoint and see how all of the various pieces fit together in a systematic fashion," Arguello says.

"Studying all the components and how they were integrated gave me an understanding for how they would and could be used Ramon Arguello, process control supervisor, Mulberry and Drake Water Reclamation Facilities



White vent pipes are part of the primary clarifiers odor control system that helps make the Drake Water Reclamation Facility a good neighbor.

to solve real-world problems. With wastewater treatment, there are so many processes that influence each other. Over a period of time I gained an appreciation for its complexity and celebrated it. By embracing it this way, it all came to make perfect sense."

His interest in the sciences made wastewater treatment something that could capture his interest and hold it indefinitely. The physics, hydraulics, mechanics, chemistry and biological aspects of the field, all mixed together, made the work challenging and enabled him to consistently expand his learning and skill development.

I firmly believe that the high degree of success we experience is a direct result of the operators being involved throughout the process."

SHIFT IN FOCUS

The Drake reclamation facility is 23 mgd design, 13 mgd average, and the Mulberry facility is 6 mgd design, 3 mgd average, and have been reconfigured and built to perform biological nutrient removal.

In the older parts of Fort Collins, collection systems have begun to develop some inflow and infiltration issues. The collection crews are addressing them systematically, but Arguello notes that over time the effects of I&I as it relates to the treatment facilities could change.

"One would think that when an infiltration problem exists in a collection system, that might impact the hydraulic load on the facility and would be looked at as a negative thing," he says. "However in the case of BNR, there is a part of the process that deals with nitrification, the removal of nitrogen, which reduces alkalinity. That in turn affects pH, and lower pH in effluent isn't a good thing.

"As it turns out, some modest infiltration of groundwater brings in alkalinity that actually helps to regulate and rebalance the process. So infiltration can be looked at as a negative from a hydraulic standpoint, but from a treatment standpoint it actually can be beneficial."

FOSTERING THE PASSION

Arguello's primary duty is to oversee a team of eight talented and spirited plant operators: David Coad, Nick Russell, Warren Barlow, Jim Greg-



The Drake facility has a 23 mgd design capacity and a 13 mgd average flow. It has been reconfigured for biological nutrient removal.

Ramon Arguello Fort Collins, Colorado

POSITION:

Process control supervisor, Water Reclamation and Biosolids Division

EXPERIENCE:

44 years in wastewater treatment

EDUCATION: Bachelor's degree, mechanical engineering, Colorado State University



CERTIFICATIONS: Class A Wastewater Plant Operator

GOALS:

Achieving and exceed treatment and reclamation goals, engage team members' talents to benefit the community

ory, Frank Wallander, Tracy Bane, John Davenport and Eric Lintner. He takes it upon himself to see that they are equipped to perform optimally to clean the wastewater.

Arguello keeps the team engaged and excited through a workplace culture of empowerment: "As a manager, it's very important for me to involve every member of my team in the design and construction of any of our capital improvement projects.

"I firmly believe that the high degree of success we experience is a direct result of the operators being involved throughout the process, having the power and accountability to deal with any issues that come up along the way." Because of competition to attract and retain good people, it is important that we educate job seekers about the advantages of a stable, recession-resistant field like wastewater RAMON ARGUELLO

A SHIFT IN FOCUS

New Colorado requirements to restrict nutrients in cleanwater plant effluent meant the Fort Collins water reclamation and treatment facilities had to reduce phosphorus discharges.

To comply, the city is installing an AirPrex recovery system (Centrisys) that will remove phosphorus from dewatered biosolids. Ramon Arguello, who supervises the Drake and Mulberry water reclamation facilities, is excited about the revenue stream that could result.

"Our goal of course is to get our nutrient concentrations down to where we meet the new phosphorus effluent limits, but in doing that we will eventually have the ability to harvest the phosphorus, with the potential eventually to produce and gather quantities high enough to make it marketable for sale," Arguello says.

More broadly speaking, Fort Collins is shifting from simply treatment and compliance to more emphasis on resource recovery. To that end, the city is installing a combined heat and power system with a pair of 220 kW engine-generators (Stateline Power Corp.) fueled with biogas from the anaerobic digesters. The electricity will help power the treatment facilities initially but will have the capacity to generate excess power for sale to the utility grid.

"We've always been focused on resource recovery as far as cleaning water and treating it to the point where it can be beneficially reused," says Arguello. "With the new regulations, we're very excited about finding even more ways to harvest energy and recover byproducts as a result of the process."

This level of involvement enables the operators to gain new knowledge and skills, and it creates buy-in as well. "When the team has invested so much time and energy in a project, they take on more ownership," Arguello says. "The community is better served, and the operators view their involvement as a personal investment in that facility. They become committed to supporting it and ensuring its long-term success."

The approach Arguello put in place to build on what the plant was already producing has created unexpected process improvements. The plant has achieved effluent quality and nitrogen and phosphorus removals much higher than expected. Arguello attributes that to the operators' involvement and the optimization of their talents.



Ramon Arguello (right) checks in with Jerry Yakel, maintenance technician II, as he lubricates a new Centrisys centrifuge dewatering system.

Capital improvement projects the team has undertaken from start to finish at the Drake facility include replacing chlorine with UV disinfection systems (WEDECO - a Xylem Brand), installing two new Centrisys/CNP dewatering centrifuges, and converting the treatment processes at the facility from conventional activated sludge to biological nutrient removal.

Also at the Drake facility, construction of an MagPrex phosphorus removal system (Centrisys/CNP) is under way and the design or redesign of the facility's headworks will begin in the near future.

SUSTAINABLE STAFFING

Like many municipal utilities, Fort Collins faces the effects of the silver tsunami. Arguello came on board with a group of operators who over 25 years developed their experience and knowledge together. They were a tightknit group, but all except Arguello have retired over the last five years.

Training for new staff needs to be approached differently than in past years, where the city relied on shadowing and mentoring to bring people along until they were confident and able to contribute independently.

Today Arguello's team is relatively new to the industry: his longest-serving staff member, David Coad, has been with the city for just five years. He is considering developing a more formal and structured training approach.

The same is true with recruitment. "My manager Jason Graham and I are considering changing our method from the typical job announcement that is advertised, applications received and candidates brought in for interviews, to a recruiting style where we sell the organization and the benefits of working for our facility to local schools and colleges and at job fairs," Arguello says.

"Because of competition to attract and retain good people, it is important that we educate job seekers about the advantages of a stable, recessionresistant field like wastewater."

MENTORED FOR SUCCESS

For his efforts, Arguello received the 2019 Plant Operator Award from the Rocky Mountain Water Environment Association. He was honored to be acknowledged but remembers and thanks those who helped him get his start.



Arguello believes in getting his operation team members deeply involved in the design and construction of plant improvements and upgrades.

"I'll always be grateful to the senior operator, Wendell Sturdevant, who took me under his wing," Arguello says. "Being a recent college graduate, I had quite a bit of book knowledge, but I needed so much more for this job.

"My mentor had been in the wastewater industry for over 20 years and had all of the needed practical experience under his belt. He was a patient teacher who dealt with this book learner and communicated effectively as to how I might use all that college learning and apply it to practical situations for my career." That mentor/apprentice approach led Arguello to create his own empowerment management model for his new team over the past few years.

He built a good team and achieved his organization's goals by following a simple formula: Channel people where they are strong. Understand that every person is different. Structure an environment where each member's strengths contribute most effectively to the work that's expected of the group. Support and empower the team and involve them as much as possible so they can evolve and someday fill your shoes, if that's what they envision for their future.

Arguello concludes, "Creating positive environmental impact for our communities now and in the future starts with engaging and encouraging operators today." **tpo**

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SPEAKER:



Julie Dawson National Sales Manager HF scientific, A WATTS Brand

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WIN-911 remote monitoring software uses a variety of communication platforms to send notifications from plant equipment to the operators responsible.



Alarming Efficiency

SOFTWARE HELPS WATER AND WASTEWATER FACILITIES EFFICIENTLY AND RELIABLY DIRECT ALARMS AND NOTIFICATIONS FROM SCADA SYSTEMS TO THE RIGHT PEOPLE

By Ted J. Rulseh

A larming is an essential function in water and wastewater treatment plant automation. But how can alarms be directed reliably to the right people and places? Which alarms should have priority? How exactly should alarms be delivered?

WIN-911 Software helps plants efficiently deliver SCADA alarms. It easily connects with industry-leading SCADA, HMI and control systems. Alarm subscriptions filter alerts into the software so that there is no need to maintain two databases. The configurable applications can accommodate any alarm notification workflow.

The latest iterations of the software series are designed to enhance reliability, security and flexibility in a full-time alarm notification system. Most recently, the mobile application has been updated with new capabilities. Greg Jackson, CEO with WIN-911, and Steven Rivas, product manager, talked about the offerings in an interview with *Treatment Plant Operator*.

tpo: What are the primary industries you serve?

Jackson: Our biggest user segment is in water and wastewater. We also have significant presence in oil and gas, pharmaceuticals, food and beverage processing, and data centers.

We use multiple notification methods. We support five ways to get an alarm or event notice out to the appropriate people." GREG JACKSON

CPO: What would you say is the chief advantage of your notification platform?

Jackson: We use multiple notification methods. We support five ways to get an alarm or event notice out to the appropriate people. We support both voice-over IP and analog phone. We also support email and SMS texting, and we have an announcer capability. While plants typically have a primary method for notification, it's a great practice to have a backup. So for example, if there is an issue with internet connectivity, they can still call out or use an SMS text message.

tpo: What is the value of that announcer function? **Jackson:** It's important in small to midsize cities and even in some larger facilities where the control room is hectic and people are multitasking. We can announce an alarm to the people in the control room over any computer speaker, or direct it to a public address or radio system.

CPO: What is the benefit of these modes of notification in operator productivity?

Jackson: We can replace a significant amount of operator rounds. It's still important for operators and maintenance technicians to make rounds periodically and inspect equipment, but our software helps them be more efficient.

LPO: Without this type of software, how would a facility typically handle alarm and event notification?

Rivas: They might have an operator or a security officer in a control room monitoring an alarm screen. When something happens, they follow standard operating procedures, which would involve going down a list and calling people manually. Or they might have auto-dialers, which are pieces of hardware tied directly into a PLC. That requires quite a bit of setup. We built our products to replace that or to work in conjunction with it. Instead of one dialer for one piece of equipment, they use one software for many pieces of equipment.

GPO: How do you handle alarm priorities and direct the right notifications to the right people?

Rivas: When you set up WIN-911, you don't have to import all your tags into our system, and so you don't end up maintaining two sets of alarms. We connect to the SCADA system and stream the alarms into our software. Then we set up filters to deliver only the alarms that the customer considers important. For example, maybe they only want to send high-priority alarms to WIN-911, because they don't want to bother the operators with low-priority alarms that don't require immediate action.

tpo: What is new about the mobile software platform?

Rivas: We released a mobile app for Blackberry in 2007-08 and a version for Android and Apple in 2012. The newest version we released late last year is designed to be more useful and secure. In addition to being able to receive acknowledge alarms, users now have chat capability that allows teams of people to collaborate around an alarm event. They can also access pieces of real-time information, such as tank levels and other parameters.

tpo: What was involved in developing that offering?

Jackson: Before we started work on the project, we asked some of our biggest customers to validate that the architecture we had created would work in their network environments. We're leveraging Microsoft Azure Cloud Services to facilitate the connection between WIN-911 and the mobile devices. It's a mobile app that runs on Android and iOS tablets or smartphones.

tpo: What automation platforms do your products interface with?

Jackson: Our native connections are for General Electric, Rockwell and Wonderware (AVEVA) products. For other SCADA manufacturers, we have an OPC connection that enables us to connect with essentially anything in the automation industry.

tpo: What is involved in deploying WIN-911 software in a facility?

Rivas: We simply install the software, point it at the SCADA system, set up the filters and set up the contacts. There are installations for facilities that have only a few people, and others that might have 100 or 200. That means the deployment time will vary, but typically it doesn't take more than half a day.

LDO: How are these software products offered for sale?

Rivas: It's a perpetual license. There is a one-time charge for the core product, and in addition we offer an annual support and maintenance agreement. Customers who stay current on that agreement also have access to the mobile app. **tpo**



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

WASTEWATER

By Rick Lallish

Membrane bioreactors are becoming a viable option for retrofitted waste treatment facilities or newly built facilities. What two types of MBR layouts are commonly used?

- A. Inward and outward
- B. Sidestream and inline (submerged)
- C. Aerobic and anaerobic
- D. Microfiltration and ultrafiltration

ANSWER: B. MBR technology is a combination of activated sludge and fixed-film processes. It uses a membrane filtration unit to perform the solid-liquid separation instead of a secondary clarifier. There are two types of layouts, sidestream and inline. Sidestream uses the process in a separate tank, and the inline units are placed directly in the aeration basin. More information can be found in the *Office of Water Programs, Operation of Wastewater Treatment Plants,* Volume 1, 8th edition, Chapter 5.

DRINKING WATER

By Drew Hoelscher

Under OSHA, what criteria determine whether a space is classified as a confined space?

- A. The space has limited means of entry and exit, is not designed for continuous occupancy, and is of a size and configuration so that it can be entered to perform work.
- B. The space has permanent entry and exit points, is designed for continuous occupancy, and is of a size and configuration so that it can be entered to perform work.
- C. The space is exposed to extreme temperatures, is designed to hold only one person, and is below grade.
- D. The space is exposed to open atmosphere, is designed to hold only one person, and is in a remote location.

ANSWER: A. Confined spaces are a common hazard in the water industry, so properly identifying these spaces is important to keeping personnel safe. Examples of concerning areas include valve or pump vaults, chemical storage bins, filters, and water storage tanks. Confined-space hazards, if not properly addressed, can result in serious injury or death. More information on identifying permit-required and nonpermit-required confined spaces can be obtained through 29 CFR 1910.146, https://www.osha.gov/lawsregs/regulations/standardnumber/1910/1910.146.

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**

A web- and smartphone-enabled engagement tool gives customers transparency and helps water department staff resolve issues. Customers can view their usage profiles through easy-to-understand graphs and can establish email or text alerts to potential leaks.

A Leap Forward

A MASSACHUSETTS TOURIST TOWN REAPS MULTIPLE BENEFITS FROM AN INFRASTRUCTURE-FREE ADVANCED METERING INFRASTRUCTURE

By Morrice Blackwell

he Massachusetts town of Orleans on Cape Cod is a hot spot for vacationers and long-term renters, especially in summer.

Seventy-five percent of the town water department's 5,200 customers are rental or vacation properties. So, for several months each year, many houses are empty, an ideal situation for water leaks to go undetected.

In the late 1990s, the town deployed the water industry's first-generation drive-by/walk-by radio-frequency automatic meter reading system. Then in the early 2000s, the town adopted the next-generation, two-way mobile meter reading technology.

Although both solutions functioned well, town leaders in 2017 looked to upgrade to an advanced metering infrastructure solution in order to ensure fair and equitable customer billing, reduce nonrevenue water by addressing leaks, and improve customer service and operational efficiency.

The town selected an infrastructure-free, cellular-based smart water technology solution. Completed in 2019, the system has lived up to it expectations.

FINDING THE SOLUTION

The decision to upgrade to AMI came after one customer inquired about a higher-than-normal water bill and asked how it could have been avoided. While work to address the leaks was already underway, the town needed to identify leaks faster and more efficiently.

In 2017, after issuing a request for proposals for a fixed-network meter reading solution, interviewing vendors and reviewing all options, the town selected a smart water solution from Badger Meter that included BEACON advanced metering analytics, ORION cellular endpoints and the EyeOnWater consumer engagement tool, which has smartphone and tablet apps.

Town leaders appreciated the system's web portal and smartphone or tablet apps, which give customers easy access to their water usage data, even when away for the winter. By leveraging the existing cellular network, the system offered flexibility, the latest technology, and 15-minute interval data without the need to manage network infrastructure. The timely information provides clear insight and understanding of the water system.

IMMEDIATE RESULTS

The town began work on the system in fall 2018, first deploying a starter kit of 10 cellular endpoints throughout the territory. The next morning, the water department saw the first readings in the cloud-based analytical software suite. One endpoint was reporting a 100 gph leak that resulted from a plumbing accident; it was quickly identified and resolved.

Over the next several months, key water department personnel received training on the system to ensure that it could be efficiently deployed for the summer season. The process, supported by Stiles Co. and engineering firm Weston & Sampson, started after Memorial Day.

Within three months, all cellular endpoints across the system were installed, and old meters were replaced with Recordall Disc Series positive displacement meters (Badger Meter). With nutating disc technology, the meters accu-



rately measure household flows, providing long-term accuracy. They also read across extended flow ranges, including low flow, which the town saw as beneficial to ensure accurate collection of all usage from residential customers.

Right away, the water department saw endpoints detecting houses with significant leaks. For instance, the system detected a 400 gph leak at a rental property where a hose was left running for days; a crew was dispatched to the home in 10 minutes to address the issue.

Beyond identifying leaks, the cellular solution helps the department manage personnel more efficiently. Previously, one team member went to locations with manual-read meters and another drove the town's dirt roads and driveways to capture radio reads. Each reading period took two to three weeks. These team members now spend time in the field addressing critical issues throughout the water system.

"We were putting out fires," says Susan Brown, water department assistant superintendent. "Now we can be proactive rather than reactive with our decisions."

GETTING BUY-IN

After implementing the solution, the water department began billing accounts quarterly instead of every six months, which is common practice in New England. The new meters deliver more accurate and reliable bills.

Of most help to customers is the web- and smartphone-enabled consumer engagement tool. It gives customers transparency and helps water department staff resolve issues for permanent and short-term residents, who are among the oldest populations in Massachusetts.

Customers can view their usage profiles through easy-to-understand consumption graphs. The tool provides a simple way to establish email or text alerts to notify customers of potential leaks. When customers ask questions, a customer service representative can help them understand the data and provide answers efficiently and with certainty.

"While we are still introducing the technology to customers, those who do have it love it," Brown says. "They think, 'I can't possibly have used this much water.' But we simply point them to EyeOnWater and show how and where they're using their water."

Today, the town is leveraging highly reliable and secure cellular networks to make meter reading and system management more efficient, scalable and interoperable for the long term.

Whether helping customers, reallocating resources to higher-priority activities or checking daily reads, the town has an efficient, accurate and analytics-based water system. The upgraded solution allows the water department to concentrate on the business of water, so that customers can enjoy the unique experience of Cape Cod.

ABOUT THE AUTHOR

Morrice Blackwell (mblackwell@badgermeter.com) is a senior solution architect with Badger Meter. **tpo** Skilled operators and innovative technologies make an unbeatable combination in water and wastewater treatment plants.

Explore the possibilities in this special section.

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Monitor Flow Rate Accurately With the Sonic-Pro MS-6 Chemical Feed Flowmeter

ndustry professionals require an instrument that monitors flow rate with extreme accuracy. Blue-White's Sonic-Pro MS-6 Chemical Feed Flowmeter satisfies both requirements. It has measurable flow rates down to 10 mL per minute (0.15 gph) and up to 10,000 mL per minute (158.5 gph). Blue-White's MS-6 flowmeter offers one of the lowest flow rates available.

The ultrasonic technology of the MS-6 flowmeter is an innovative addition to flowmeter offerings in the water

and wastewater treatment industries. The flowmeter applies transit time ultrasonic technology to offer a broad flow range, and implementation of this technology provides an immediate solution to a problem the industry has struggled with for years.

FLOWMETER FEATURES

Features of the MS-6 include a 4-20 mA output, frequency output, and high- and low-flow setpoints that can be used for no-flow alarms. In addi-

tion, the flowmeter has numerous warning functions to alert operators to problems in the system like air bubbles or empty pipe situations.

No-flow conditions can indicate there is a block in the chemical line or that the chemical tank is empty, and alarming to these no-flow conditions is critical at plants. While chemical controllers can also provide this feedback, the reaction time is slower because it takes time for the system to register a large drop in pH, and for the controller to signal an alarm. In contrast, the MS-6 communicates these problems instantaneously with the SCADA control system. This capability helps ensure minimal downtime as well as minimal loss of production at the plant.



ACCURACY IS PARAMOUNT

Accurately monitoring the amount of chemical being dosed into the system is crucial to ensure effective water treatment. An overdose or underdose of chemicals can adversely affect the quality of the treated water and leads to wasted chemicals, which also has a financial impact.

> With the high accuracy and functionality of the MS-6 flowmeter, plant operators and SCADA personnel are consistently provided feedback to optimize production.

With PVDF and PEEK wetted components, NSF 61 approval, and the necessary features to accurately monitor chemical dosing, the MS-6 is an excellent fit for drinking water applications.

MS-6 CASE STUDY

Heyward Incorporated, specializing in water and wastewater process equipment, has

a branch in Charlotte, North Carolina, which currently utilizes the MS-6 flowmeter. Heyward was using a gear flowmeter in a 20% cationic filter aid polymer neat feed application and experiencing gear flowmeter failure.

With the easy switch to the Sonic-Pro MS-6, there has been no flowmeter failure and the meter readings have consistently been accurate based on draw downs.

In addition, Blue-White manufactures a broad range of both diaphragm and peristaltic chemical dosing pumps perfect for precision pairing with the MS-6.



Blue-White Industries, incorporated in 1957, is located in Huntington Beach, California. The company manufactures all its products in the U.S., including most components, in its own factory. Product lines include chemical feed and dosing pumps, complete skid systems, chemical feed sensors, variable area flowmeters, digital paddle wheel insertion style flowmeters, mechanical diaphragm metering pumps and compact peristaltic dosing pumps. **714-893-8529 I sales@blue-white.com I www.blue-white.com**

No Lower Bearings, Sprockets, Bushings or Guides With Raptor FalconRake Bar Screen

he Lakeside Raptor FalconRake Bar Screen is an efficient, proven, cost-effective screen technology for inorganic solids removal providing protection to downstream equipment in municipal and industrial applications.

High removal efficiency and low headloss is achieved with multiple rakes continuously removing captured material. The Raptor FalconRake Bar Screen features a durable stainless steel chain-link design for solids removal without the need of lower bearings, sprockets, bushings or guides, thus eliminating any fouling or jam conditions in the channel.

The Raptor FalconRake offers a wide range of bar shapes and depths to ensure successful operation regardless of the application, creating an efficient, durable and dependable rapid debris-removal system.

DESIGN AND CONSTRUCTION

Product features include an all stainless steel construction to resist corrosion, and a low-horsepower energy efficient drive system. The unit requires minimal headroom above the operating floor.

The Raptor FalconRake offers bar spacing available from 1/4 inch, and features a variable speed to ensure quality cleaning and a durable cast stainless steel chain-link system.

Customers can optionally add a cover for odor control, an explosion-proof design or weather protection system, or teardrop-shaped bars for reduced headloss.

THE COMPLETE PACKAGE

The Raptor FalconRake Bar Screen can be used in tandem with the Raptor Wash Press to wash, compact and dewater captured screenings. The screen and wash press equipment controls can be integrated into one control panel for smooth and efficient operation.

LOW MAINTENANCE, HIGH PERFORMANCE

The Lakeside Raptor FalconRake Bar Screen operation is simple. As wastewater flows through the screen, solids are captured on the face of the bar screen. Multiple rake heads with teeth that penetrate the bar screen transport solids to the top of the unit where a debris wiper blade removes solids into a discharge chute. Materials then fall from the chute into a conveyor, washer/compactor or dumpster for disposal.

The low-horsepower, energy-efficient drive operates at low or high speed to ensure the most effective capture/solids removal in the wastewater stream. Maintenance, although rarely needed according to the manufacturer, is easily achieved at the operating floor level since no part of the drive system is located below the water surface.

The Raptor FalconRake offers efficient, economical performance for municipal wastewater treatment plants, pump stations, surface water intake structures and combined sewer overflows.





Cleaner Water for a Brighter Future*

Lakeside Equipment Corp. is an engineering and manufacturing company concentrating on helping to improve the quality of water resources. Lakeside started engineering water purification systems for municipalities and companies throughout North America in 1928. Today, the company operates globally. For more details on the design and performance of Lakeside's Raptor TalonRake Bar Screen, contact Lakeside Equipment Corp.

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PROFICIENCIES





Kohler Generators Taking Power to a Higher Output for Water Treatment Facilities

ohler Power Systems has connected with water treatment facilities all around the world with standby power from its leading Kohler KD series of large diesel industrial generators. These gensets are driven by powerful, technically advanced Kohler engines that are highly customizable to match the specific needs of operators.

Now, Kohler is taking power to a higher output with its latest launch — the KD3500 (3,500 kilowatts) and KD4000 (4,000 kilowatts) generators — which represents the largest standby generator in the marketplace, delivering high power density and performance.

The units feature a newly developed K175 103-liter, 20-cylinder Kohler diesel engine designed to provide extreme durability and ultimate reliability in a variety of emergency and prime applications. The compact and powerful diesel engines incorporate a modular design with common components, allowing for efficient servicing, reduced spare parts inventory and more streamlined technician training.

From a generator package design perspective, Kohler's approach is to also keep many of the components the same in the new models as their counterparts, including the control system, turbochargers, filters and fuel injection system — but just a bit larger to accommodate their higher outputs.

SUITABLE FOR WASTEWATER APPLICATIONS

The entire Kohler KD Series is ideally suited for modern wastewater sites. The extensive line-up offers multiple sizes – between 800 and 4,000 kilowatts – and options to ensure suitable performance for the most demanding applications.

Users can pair the Kohler KD Series generators with the company's new APM 603 controller for enhanced performance and monitoring features such as (+/0.25%) voltage regulation, dual fuel control, expanded inputs and outputs, a larger 7-inch display, and the ability to parallel as many as eight gen-

erator sets. They are backed by a comprehensive three-year warranty, a full complement of genuine Kohler aftermarket parts, and a 24/7 global service and support network.

"Consistent, reliable power is everything for water treatment plants, and our new KD3500 and KD4000 are the most powerful generators we've developed to match up the increasing power needs of these mission critical facilities," says Brad Meissner, product manager for Kohler industrial generators. "Kohler differentiates by providing a highly efficient solution that will deliver power whenever it's needed — a fully integrated power system designed, built and installed to meet the exact requirements of water treatment facilities."

Kohler Co. has been a global power force for a century, providing solutions since 1920. The company is committed to reliable, leading-edge products and comprehensive after-sale support. It provides complete power systems, including generators (portable, marine, residential, commercial and industrial), automatic transfer switches, switchgear, monitoring controls, and accessories for emergency, prime power and energy-management applications all around the world.

KOHLER IN POWER. SINCE 1920.

Kohler Co. was founded in 1873 and is headquartered in Kohler, Wisconsin. The company is one of America's oldest and largest privately held companies. With more than 50 manufacturing locations worldwide, Kohler is a global leader in the manufacture of engines and power systems, kitchen and bath products, and owner/operator of two award-winning hospitality and golf resort destinations in Kohler and St. Andrews, Scotland.

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Keller's non-fouling level transmitter solves tough measurement problem

n wastewater measurement, accurate readings are essential to ensuring proper pump operation. A failure in this area can result in unhygienic liquid waste overflow and costly repairs to pump mechanisms.

In Newport News, Virginia, several restaurants were built in an area serviced by the same municipal wastewater lift stations. These restaurants introduced heavy grease content to the wastewater and caused the municipality's existing level measurement equipment to foul and fail.

ANTIQUATED SOLUTIONS

Before development of the commercial district, Newport News Waterworks and Hampton Roads Sanitation District relied on a combination of mechanical floats and traditional submersible level transmitters. However, with the restaurants in operation, the increased volume of grease clung to both instruments and, as a result, the primary and redundant level measurement failed to properly transmit level data to the pump controller.

The accumulation of grease to the submersible level transmitter clogged the pressure ports that blocked the free flow of liquid and proper application of hydrostatic pressure to the sensing diaphragm. On the redundant float switch, which should trigger the pump in the event of a failed level transmitter, the accumulation of grease blocked the mechanical operation of the float ball. With the level transmitter and backup system inoperable, the affected lift stations failed, either reading too much wastewater or too little, thus causing the pumps to run continuously or not at all.

IDEAL SOLUTION

Several instrumentation companies offer non-fouling solutions with only minor variations of the existing and unsuitable solutions. These instruments use a Teflon-coated elastomer diaphragm, which is relatively weak and prone to puncture. Their answer is to use a bulky protective cage, consisting of a shield mounted on bolts and standoffs. However, these shields can collect rags, grease and biosolids in the wastewater, which leads to erroneous readings.

Newport News officials contacted Keller America, whose LevelRat provided a unique approach to wastewater level measurement.

The tougher Kynar diaphragm used on the LevelRat provides superior abrasion and puncture resistance relative to other wastewater level transmit-

ter solutions. This design also minimizes the 36 XKY profile, creating a sleeker design without the need for bulky shields. The result is a truly non-fouling instrument that provides superior operation in environments that would clog traditional level transmitters.

The LevelRat is specifically designed for extended service in lift stations and, thanks to Keller's guaranteed lightning protection, the unit is ideal for areas prone to chronic lightning damage. The LevelRat is assembled in the U.S. to customer specifications, including custom pressure ranges and cable lengths.

KELLER

Keller America is a leading manufacturer of level and pressure measurement instrumentation headquartered in Newport News, Virginia. 877-253-5537 | www.kelleramerica.com

How a Surface-Mounted Floodwall System Can Protect Your Facility

Planners, engineers and government officials are often faced with the need to implement facility flood-protection programs due to perceived risk or actual loss due to flooding. Frequently, these programs are directed towards asset relocation, less effective countermeasures or acceptance of losses. Meanwhile, surface-mounted floodwall systems provide more flexibility and offer a suitable approach.

HOW IT WORKS

A surface-mounted floodwall system consists of reinforced concrete vertical floodwall-spread footing segments constructed as a monolithic concrete pour connected and sealed to form a protective flood barrier for the interior facility or building. The wall is constructed on a shallow foundation, avoiding subsurface infrastructure. Integral spread footings distribute the loads to a 4-inch asphalt base course supported by an 8-inch compacted impermeable base fill layer.

A watertight concrete slide gate seals the wall, pro-

tecting the facility or building from flooding, and it reopens after the flood to allow access and operations to continue.

The protection provided by an RSA SMFS is effectively above and beyond that provided by local, state and federal flood-control systems. An RSA SMFS can be designed to meet most flood challenges or site-specific conditions faced by facility operators, government planners and engineers.

STRAIGHTFORWARD INSTALLATION

Installation of an RSA SFMS is a rational approach to flood protection, offering a solution if regional flood-control systems are inadequate protection.

The RSA Protective Technologies' SMFS is a practical solution to sitespecific, flood-protection needs. Construction is straightforward, as steel rebar cages and forms are combined for a monolithic continuous placement. For most soil conditions a shallow 12-inch excavation relieves the owner of design and construction fees for subsurface utility relocation. The system does not require costly pile design and construction.

The compacted 8-inch fill and 4-inch asphalt seal slab provide an impermeable structure beneath the wall. Along with the asphalt, a fillet seal along the wet side of the wall prevents water from interfering with the bearing surface of the wall footing and increases the hydraulic gradient.

The structural profile dimensions are adjusted using computer-aided techniques to maximize the

effectiveness and economic value. The base flood elevation remains fixed and the wall height and cross-section are adjusted to match existing grade. The base flood elevations are computer generated using advanced stormwater computer modeling.



Groundwater intrusion is expected to be minimal with respect to rainfall inside the perimeter of the wall. Some minor grading and installation of drop inlets at specific locations promote radial

sheet flow to the drop inlets. The drop inlets discharge to sumps with vertical turbines sized accordingly to provide a secure and reliable plumbing system. The captured rainwater is discharged back in the flood zone.

One or more concrete mechanical sliding gates can be installed for accessways. The concrete slide gate on roller wheel bearings is moved by an overhead motor, gear-and-pulley assembly. The weight of the concrete slide wall is supported by coated steel frames and the overhead gear-and-pulley assembly. An electric motor moves the slide gate into and out of the closed position. A backup manual crank is provided with a sprocket and gear ratio, allowing for operation by a single operator. The slide gate seals the system from flood intrusion at accessways, providing a complete floodprotection system.

RSA Protective Technologies, LLC

RSA Protective Technologies, LLC has been involved with large-scale civil Infrastructure inventions for over 19 years solving problems for municipalities and companies. RSA designers and engineers partner with the client's engineers to accommodate site conditions, and finally with the client's construction firms to ensure seamless, economical and timely installation.

909-946-0964 | rsaprotect.com
Alabama WWTP Upgrades to State-of-the-Art AquaNereda Aerobic Granular Sludge Technology

he Riviera Utilities Wastewater Treatment Plant at Wolf Creek features the Aqua-Nereda Aerobic Granular Sludge Technology and serves as a landmark installation. Located near the Gulf shores of southern Alabama, the City of Foley is a coastal community with southern charm. The area is a popular destination noted for its easy access to recreational water activities, toprated golf courses and a quaint historic downtown.

Operated by Riviera Utilities, the wastewater treatment plant serves the greater Foley area with a population of approximately 20,000. Riviera Utilities had been operating an outdated biological treatment system consisting of 35-year-old oxidation ditches. The existing oxidation ditches were designed to treat an average flow of 2.0 mgd.

Instead of taking the straightforward approach of adding an additional ditch to increase treatment capacity, Riviera Utilities had the desire to futureproof the plant and prepare to meet more stringent effluent requirements, including biological nutrient removal. Working with Aqua-Aerobic Systems of Rockford, Illinois, a new AquaNereda system was designed to provide treatment for an average flow of 3.5 mgd and peak flow of 6.0 mgd.



THE AQUANEREDA PROCESS

AquaNereda aerobic granular sludge technology is an advanced secondary wastewater treatment process that utilizes the attributes of granular biomass to provide biological treatment. The technology was highly appealing as an innovative approach to secondary treatment for a number of reasons, including:

- The innate BNR capabilities provided by the layered microbial community of the granules enables the system to meet future TN and TP limits.
- The high operating MLSS in excess of 8 g/L significantly reduces settling time minimizing system footprint by up to 75%.
- Up to a 50% decrease in energy use due to reduced equipment demand, smart aeration control, and improved substrate and oxygen utilization with granular sludge.
- The robust nature of the granules provide superior protection against plant upsets and toxic shocks compared to conventional activated sludge.

The AquaNereda technology at the Riviera Utilities Wastewater Treatment Plant consists of three biological treatment reactors capable of providing BNR for future total nitrogen and total phosphorus limits. Downstream polishing is performed by AquaDisk Pile Cloth Media Filters capable of achieving BOD and TSS concentrations of <5 mg/L. The plant has consistently met effluent requirements since startup in January 2020.



Aqua-Aerobic is dedicated to ensuring customer satisfaction. That commitment to producing quality equipment and process design and providing superior customer service has led to one happy customer in Foley, Alabama.

815-654-2501 | solutions@aqua-aerobic.com | www.aqua-aerobic.com



Vaughan Chopper Pump Eliminates Clogging Problems at Washington WWTP

The Aberdeen (Washington) Wastewater Treatment Plant main influent pumps were old and worn out nonclog-type pumps, highly susceptible to plugging and both electrically and hydraulically inefficient. The facility needed to be unclogged a minimum of once daily, which was exhausting the city's budget with excessive maintenance time and additional risk to the treatment plant operators.

The City of Aberdeen purchased one 60 hp, 1180-RPM model PE8N10CS-133 Vaughan chopper pump to see how the pump would work alongside the plant's older influent pumps. The rated performance was 3,300 gpm at 37 feet total dynamic head, and the pump did not disappoint.

"We are happy with the performance of the Vaughan chopper pump," Aberdeen's public works director explains. "It has eliminated the need for daily unclogging of pumps, which eliminates the safety risks involved with cleaning a clogged pump, and maintenance has been reduced to stan-

dard preventive maintenance as opposed to repairs. Also, we seem to have a lot fewer rags throughout our system, and fewer rags reduces wear on down-stream equipment and reduces the cleanup time when we take facilities down for maintenance."

DOING PRIMARY DUTIES

The Vaughan chopper pump is so effective at eliminating clogging problems and the associated costs compared to the older pumps that it is now used as the primary influent pump and the older pumps are rarely used, often being left in standby mode.

The Vaughan PE8N influent pump was installed in Aberdeen and the plant saw immediate results. On average, this area receives nearly 85 inches of rain each year. Aberdeen's Wastewater Treatment Plant averages daily flows of approximately 3.5 mgd with high flows slightly exceeding 16 mgd.

Thanks to the addition of the Vaughan chopper pump, previous routine plugging problems in the influent station have been eliminated. And with the elimination of annual maintenance costs of around \$36,500 per year, the return on investment for the pump was under 10 months.





Vaughan Co. Inc. is a pumping and mixing equipment manufacturer located in Montesano, Washington, that provides products for both domestic and international businesses and municipalities. Vaughan Co. focuses on producing quality pumps and mixers for tough applications within the municipal, industrial and agricultural markets. This focus on quality means the company takes time on each project to ensure that the pumps and/or mixers are properly sized for each installation.

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WIPE OUT CLOGS

Flushable wipes are clogging sewer systems across the country. Vaughan has the clear solution. Since 1960, Vaughan Chopper Pumps have delivered guaranteed performance in the toughest applications. Our Chopper Pumps easily handle difficult solids like disposable pads, wipes, duster cloths and diapers.

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- Try and buy program available upon request
- Non-clogging guarantee on all Chopper pumps

Wipe out your clog worries, contact Vaughan for more information.ChopperPumps.com360.249.4042info@chopperpumps.com





MagPrex Offers a USA-Based Nutrient-Recovery Technology

Six MagPrex (formerly AirPrex) nutrient-recovery systems are currently operational or under construction in the United States. MagPrex provides treatment plants with a high orthophosphate removal efficiency. "It's because of our USA installations — we raised the bar to deliver plantspecific results in municipal and industrial applications," says Gerhard Forstner, president of Centrisys/CNP. "We dissolved our Germany-based partnership with CNP Cycles to build on the strength of U.S.-based initiatives aggressively. Changing our name to MagPrex signifies our commitment to innovation and ensures the best results and value for our customers."

IMPROVING TREATMENT EFFICIENCY

Struvite precipitation can be detrimental to treatment plants. MagPrex prevents crystallization in downstream biosolids by forming struvite as it strips out CO_2 , elevates the pH and adds MgCl2 to augment Mg2+ in a controlled environment.

MagPrex fits between the anaerobic digester and the dewatering equipment. Struvite crystals, the converted orthophosphate within the digestate, can be harvested and used as fertilizer.

MagPrex removes struvite, significantly improves treatment efficiency, and:

- Reduces polymer consumption up to 30%
- Reduces disposal costs up to 20%
- Reduces phosphate recycle loads up to 90%
- Reduces maintenance costs up to 50%
- Doesn't require sodium hydroxide for pH change
- Generates revenue from fertilizer

"Our USA team works hard on the continuing development of MagPrex and the reuse of the struvite fertilizer," Forstner says. "We understand the diverse requirements of North American customers. As a U.S.-based company, we've addressed critical factors in wastewater and industrial applications by leveraging our extensive experience, unique process capabilities, and cost efficiencies."

Below are some examples of facilities using MagPrex.

Robert W. Hite Treatment Facility at Metro Wastewater Reclamation District in Denver

The 220 mgd RW Hite Facility is the world's largest struvite-recovery system from digestate. MagPrex reduced phosphorus recycle loads, struvite formation and poor dewaterability. Installation included eight Centrisys CS26-4 dewatering centrifuges. Combining MagPrex with the CS26-4s saved the plant up to 30% on polymer costs alone.

Drake Water Reclamation Facility in Fort Collins, Colorado

MagPrex reduced the phosphorus recycle loads, struvite formation and poor dewaterability at this 18 mgd facility. The incoming anaerobic digester's orthophosphate concentrations decreased by 30% after 12 days of operation. MagPrex effectively removed orthophosphate from the centrate stream and reduced digester struvite formation. Installation included two Centrisys CS26-4 dewatering centrifuges.

Central Valley Water Reclamation Facility in Salt Lake City

The 60 mgd facility goals included >85% orthophosphate removal and



struvite harvesting. Installation included five Centrisys THK350 sludge thickeners for primary and WAS sludge.

Fox River Reclamation District in Elgin, Illinois

The 25 mgd plant goals included bio-P sequestration for >85% orthophosphorus removal, maintenance of sludge dewaterability, and mitigation of high side-stream phosphorus load.

Little Patuxent Water Reclamation Plant, Howard County, Maryland, and Liverpool Wastewater Treatment Plant in Medina County, Ohio

After its first year of operation, Little Patuxent Water Reclamation Plant, a 25 mgd plant, and Liverpool Wastewater Treatment Plant, a 15 mgd plant, achieved up to 90% orthophosphate reduction from digested biosolids at both facilities.

Centrisus Chp

Centrisys is a U.S. manufacturer of dewatering centrifuges and sludge thickeners that provides global centrifuge service, repair and parts for all decanter centrifuge brands. CNP, a division of Centrisys, supplies nutrient recovery and advanced biosolids treatment systems with MagPrex and CalPrex for phosphorus recovery; PONDUS, a thermal hydrolysis process; and LIPP GmbH digesters and storage tanks.

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Myron L Co.'s 900 Series Is a Reliable, Flexible Answer for Water Quality

o say that the world of water quality is diverse is an understatement of some magnitude. It's much more than simply diverse — it's down right complex.

Whether your application is pool management, pharmaceutical manufacturing, maintenance of boilers or cooling towers, food production, brewing, printing, desalination, agriculture, aquaculture, wastewater management, or any one of a vast number of other industries, the quality of the water is a make-or-break, critical characteristic that determines success or failure. The kind of instrumentation required to meet the needs of this exacting and varied array of applications must be reliable and accurate. It must be simple to use. It also must be very flexible.

The Myron L Co. 900 Series Monitor/Controller was designed to meet those needs whether water is your end product, an ingredient, or a secondary but vital process component. The design includes a variety of inputs, measurement types, and several different types of control and data outputs, all of which can be combined and configured to operate in the most complex water-quality applications.

MULTIPLE CONFIGURATIONS

Because no two applications are exactly the same, the 900 Series' suite of signal inputs can be configured to display a variety of measurement types, including conductivity, resistivity, salinity, TDS, pH, ORP, temperature, mVDC, flow, pulse and percent rejection.

Need to interact with a remote sensor? The 900 Series includes a 4-20 mA current loop, two-wire transmitter input that can be defined and scaled to display measurements how you need them displayed.

Need to display information of multiple types and from multiple sources at the same time? The 3.5-inch resistive touch screen can be configured to display information for up to four different inputs simultaneously, each displaying a different measurement type.

Need to precisely define the cell constant of your conductivity sensors? You can do that. Is the cable length of your sensors an issue? The input set up can account for it.

The 900 Series' outputs also provide flexibility. The standard outputs include a 0-10 VDC recorder output and a single alarmable relay output. An optional output card adds more levels of functionality.

A 4-20 mA current loop output makes it a de facto transmitter, and an RS-485 digital data output gives it the ability to do real data logging.

Need to control several water tanks interactively based on conditional criteria while outputting relevant data to a digital storage device? Two additional alarmable relays make that possible. Alarm status is clearly displayed with attention-getting alerts.



EASY TO USE

You might think that with all of the possible combinations of inputs and outputs and control relays the 900 Series would be a complex instrument to operate, but the instrument's intuitive graphical user interface makes it simple to set up, simple to use and simple to adapt to your specific needs.

The Myron L Co.'s 900 Series is a flexible, high-level performer for an industry where flexibility and high-level performance are absolute requirements.

MYRON L COMPANY

The **Myron L Co.** was originally founded in 1957 as a research and development company, and since the 1960s, it has established itself as a leading manufacturer of quality conductivity and pH instrumentation for municipal, commercial and industrial water quality control, chemical concentration testing and process control.

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900 Series Multi-Parameter Monitor/Controller™





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😵 Bluetooth

ULTRAPEN

Seaman Paper Co. Achieves Significant Energy Savings With Hurst Hybrid S600 Wood-Fired Boiler

Seaman Paper Co. is a 61-year-old privately held paper plant located in rural Massachusetts. Under the guidance of George Davenport Jones III, loyal employees keep this historic facility operating 24/7, 365 days per year. Seaman Paper produces lightweight specialty papers including decorative tissue wraps, crepe streamers, food service tissues, SatinWrap and personalized printed papers.

A Hurst Hybrid S600 wood-fired boiler was just one of many elements of a comprehensive energy-saving initiative designed by Jones and implemented over a 10-year period. Changes in operations, equipment and fuels have resulted in significant annual reductions in both oil usage (nearly 1.7 million gallons) and electricity (2.6 million kwh). The annual savings is noteworthy as well, as up to \$1.5 million per year are saved in operating costs.

ENERGY-SAVING PROGRAM

Equipment and system changes include: steam reduction via thermo compressors, heat exchanger, recycling of effluent and boiler economizer; electricity reduction via T8 lighting, motion detectors and variable speed drives; and fuel substitution with the Hurst Hybrid S600 wood-fired boiler.

The Hurst Hybrid Model Super 600 was selected and equipped with a baghouse and a finned-tube waste heat-

recovery economizer. Initially, 23,709 barrels of oil were replaced by 15,002 tons of shredded pallet wood.

THE RESULTS

In June, 2008, the Massachusetts Office of Technical Assistance and Technology held a Cleaner Technologies Demonstration Site Event at Seaman Paper. The lunch and plant tour gathering was titled "Energy Efficiency Success at Seaman Paper" and was attended to capacity on two different dates by plant managers, corporate executives and elected officials.



The goal was to introduce and explain the methods and benefits of a sustainable manufacturing concern and to highlight the effort and success of Seaman Paper.

Gregory W. Smith of Global Energy Solutions was introduced as the project developer and fielded technical questions about solid fuel procurement and boiler installations. Smith, an exclusive solid fuel boiler agent for Hurst Boiler & Welding was able to share similar success stories of wood-fired boiler systems installed at other manufacturing facilities and institutional campus locations in the Midwest United States and elsewhere.



Hurst Boiler & Welding Co., Inc. has designed, engineered and serviced a complete line of solid fuel, solid waste, biomass, gas, coal and oil-fired steam and hot water boilers since 1967 for thousands of satisfied customers. Hurst also manufactures a complete line of boiler room peripherals such as blowdown separator surge tanks and pressurized feed-water tanks.

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BIOGAS BOILER

Methane Gas

Digester

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BUSINESS



"We added two 5,000 MMBtu/hr biogas boilers from Hurst to help heat the sludge before it enters the digesters," says Pippenger. "So we're using the gas produced in the digesters to heat the digesters."

> -Jeff Pippenger, Utilities Administrator. Eau Claire, Wisconsin Wastewater Treatment Plant

"The boilers burned 9 million cubic feet of biogas in the first 22 months, saving the plant about \$40,000 over natural gas fuel"





Transforming Design With Responsive Bar Screening Platform

ntil now, designing and specifying a headworks bar screen has focused on peak flow to determine the size of bar openings. This was necessary to prevent overflows. Duperon has envisioned the problem differently by asking "what if the design didn't need to focus on peak flows, because the bar screen itself adapted to them?"

Collections systems often include many miles of pipe. During low or average flows, solids settle throughout the system and grease forms a thick coating in the pipe that remains in place until an event dislodges it. Peaking events do just that, bringing enough force to scour the grease and debris from the channel, generating a significant solids event at the headworks. This is commonly known as a "first flush" event.

Operators prefer these solids be removed at the headworks before they enter the downstream grit systems and clarifiers in order to maximize plant efficiency. However, engineers must size bar screens with openings to meet peak flow requirements. So, there can be a tradeoff: a larger opening reduces effective solids collection during normal flow, potentially allowing solids to pass through and interfere with downstream equipment. What if one screen could maximize the efficiency in both conditions?

Duperon has been listening to end users and engineers for nearly 40 years. By studying the design dilemma of sizing bar screens, the Duperon research and development team has discovered that it is now possible to safely, effectively size bar openings for average flows without the risks of overflow or unscreened bypass.

A RESPONSIVE BAR SCREEN

The Duperon next-generation FlexRake bar screening system, the FlexRake IQ platform, has three unique characteristics that, together, provide four times the debris-removal capability in one system. First, the FlexRake IQ intelligently responds to changes in flow and head loss with increasing levels of speed.

Second, the scrapers, links and discharge components have been reengineered to carry the additional debris.

Finally, the link system itself has been designed to rapidly re-engage the scraper into the bar screen after flexing, allowing it to remove large debris commonly found in peak events.

Even after the heaviest solids have been removed, the hydraulic peak continues. To address the ongoing high flow, the new FlexRake IQ features the patented FlexRake IQ2 control logic, which automatically transforms the screen opening size to handle peak flow conditions. Then, once flows have returned to normal, the screen automatically transforms back to the finest opening and slowest operating speed.

The intuitive new FlexRake IQ physically and operationally adapts to changing flow characteristics without operator intervention. During average flows, debris capture is maximized using the finest appropriate screen. Then, heavy solids events are handled automatically, removing four times more debris than with current bar screen designs. Finally, when conditions require



a larger opening for maximum hydraulic capacity, the FlexRake IQ2 transforms the size of the bar opening.

Now, operators can have the benefits of fine screening without the risk of overflows. The FlexRake IQ with IQ2 from Duperon automates plant resilience with a smart design that delivers peace of mind.



Duperon Corp. is a leader in simple, adaptive screening technologies and provides solutions for coarse screening, fine screening, low-flow screening, ultrascreening, washing compacting and conveying.

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INTRODUCING THE FlexRake[®] IQ[™] Series

The **FINEST** screen opening for everyday conditions, with a new level of **ADAPTABILITY** for peak flows, and the

INTELLIGENCE to know the difference.



Duperon

Liquid-Only Sewers Offer A Cost-Effective Solution

iquid-only sewers (also known as effluent sewers) have proven to be a cost-effective solution for municipalities, new subdivisions and a variety of other areas in need of sewer. They use small-diameter, shallowly buried mainlines that follow the contour of the land and are easily installed with light-duty equipment, minimizing disturbance to the surrounding area.

Liquid-only sewers have been installed by hundreds of communities over the past several decades. Many of these sewers have now been providing reliable service for more than 35 years.

The following case studies provide examples that illustrate the benefits of liquid-only sewers.

GLIDE, OREGON: LIQUID-ONLY SEWER SETS NEW STANDARD

In the late 1960s, onsite septic tank and drainfield failures were common in the unincorporated community of Glide, Oregon. One after another, three different engineering firms attempted – and failed – to find an affordable solution. In 1973, the county health department enacted a moratorium on any further development in the area.

For the next couple of years, the county's Department of Public Works studied several options and compared both upfront and long-term costs for a system designed to serve about 2,300 equivalent dwelling units. The county researched gravity sewers, vacuum sewers and pressure sewers, including both grinder and liquid-only sewers.

When the evaluations were done, the department proposed a liquid-only sewer that could eventually serve 7,000 residents. It would be the largest of its kind in North America and would set a standard for innovative design by demonstrating that small communities have more wastewater options than traditional wisdom dictated.

LACEY, WASHINGTON: UNIQUE HYBRID COLLECTIONS SYSTEM FILLS NICHE

The City of Lacey, Washington, grew rapidly between 1980 and 2000. The city needed an affordable wastewater solution to support construction in the Urban Growth Area it shares with neighboring communities. Lacey chose an Orenco System liquid-only sewer, which discharges into the city's gravity sewer lines, creating a hybrid collection system. Now, more than 25 years later, the system successfully serves about 14,000 gravity sewer connections and roughly 4,600 liquid-only sewer connections.

Thomas Faye, senior maintenance technician (collections) for the City of Lacey, describes some of the benefits of this hybrid sewer system. "Lacey has approximately 70 miles of liquid-only sewer lines and they don't require lift stations. With liquid-only sewers, you get to dictate the shortest route to wherever you want it to go. I've been working with these systems for 15 years and they're very simple: economical to maintain, economical to install."



VERO BEACH, FLORIDA: AFFORDABLE LIQUID-ONLY SEWER HELPS CLEAN LAGOON WATERS

Along the Indian River Lagoon adjacent to Vero Beach, Florida, both residents and government officials were becoming increasingly concerned about excessive nutrient loads and pollution. About 1,500 homes in Vero Beach had septic systems, many of which were antiquated and failing.

The City of Vero Beach installed an Orenco liquid-only sewer consisting of directionally drilled, small-diameter mainlines and individual septic tank effluent pump (STEP) packages. Replacement of failed septic systems will result in fewer pollutants ending up in the lagoon. At full buildout, with an estimated 1,500 residences connected to the city's liquid-only sewer, water quality in the Indian River Lagoon is expected to improve considerably. Local officials are confident this will be a boon to the dolphins, manatees and other animals that make their home in these vital waters.



Orenco Systems has designed and built decentralized wastewater systems since 1981. Orenco's technologies are based on sound scientific principles of chemistry, biology, mechanical structure and hydraulics. As a result, the company's research appears in numerous publications, and its engineers are regularly asked to give workshops and trainings.

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Sustainable development ... meets the needs of the present without compromising the ability of future generations to meet their own needs.

Brundtland Report, United Nations, 1987

Preiss Liquid-Only Sewer

Resilient, secure, economically sustainable sewer infrastructure

- Lower initial capital costs*
- Typically no lift stations
- Common alternative to grinder pumps
- Reduced wastewater treatment costs*
- Shallow-buried systems
- Scalable/phaseable/surgical installation

*WERF Fact Sheets C1, C2, & C3, "Performance & Cost of Decentralized Unit Processes," 2010.

Every Prelos[™] Processor is engineered to be WATERTIGHT.

To learn more about Prelos[™] Sewer, contact an Orenco Representative at **(800) 348-9843**, **+1 (541) 459-4449**, or visit **www.orenco.com/prelos**.

PROTECTING THE WORLD'S WATER

The Origins of Vortex Separation

ydro International's products have evolved over the last 50 years from simple vortex overflows to the advanced hydrodynamic vortex separators of today.

Hydro's founding father, Bernard Smisson, designed the very first vortex overflow in England in the 1960s. Faced with space constraints while constructing a conventional side weir overflow, he developed a circular weir overflow configuration based on a vortex flow regime. As a result, hydrodynamic vortex separation technology was born.

In the early 1970s, Smisson was invited to America to advise the American Public Works Association and the Environmental Protection Agency, which resulted in a series of projects cul-

minating in the development of the swirl and helical-bend flow regulators/settleable-solids concentrators and the swirl degritter. He later returned to England to continue his pioneering research on vortex technology where he addressed the issues of high headloss and solids deposition and refined the design to further improve performance.

A PIONEERING DESIGN

The significance and simplicity of the swirl degritter - which harnessed the energy in a flow stream to separate solids in an all-hydraulic separator with no moving parts - was not lost on a young doctorate student-researcher in America. In the early 1970s, Dr. George Wilson, founder of Eutek Systems, now a part of Hydro International, was hired by the National Canners Association to develop a product to remove silt from vegetable process water to keep sediment out of the collection system. By literally turning the swirl concentrator upside down and accelerating the velocity, the TeaCup classifier — a high-energy rotary flow separator device with very high removal efficiencies for fine sand particles - was created.

TECHNOLOGICAL DEVELOPMENTS

Through continuous research and development, Hydro International's products have evolved from direct descendants of those first-generation efforts into the state-of-the-art water management technology solutions of today. You could say vortex technology is in the Hydro DNA.

Today, the company continues to study, test, model, optimize and innovate the application of vortex flow regimes. It conducts detailed investigations of low-, medium- and high-energy rotary flow regimes, optimal volute configurations and arrangements for flow modifying static internal components. Drawing on its deep understanding of the fundamentals of vortex motion has resulted in numerous technologies that address immediate and long-term needs in the water sector.

Hydro's two hydraulic test facilities enable the company to Velocity (m/s) experiment with full-scale prototypes for its entire product portfolio to continuously improve performance. Its firsthand knowledge and expertise in test protocols and methods have been utilized by regulatory agencies around the world to aid development of performance standards for stormwater and wastewater solidliquid separation processes and vortex flow controls.

As one of the earliest adopters of Computational Fluid Dynamics to model liquid/solids separation in the water industry, Hydro's CFD expertise allows it to assess flow patterns and velocities

within systems and treatment processes. Its CFD analyses are verified through lab testing and used to gain insights into complex fluid processes and assist in developing design equations for our products.

1.5

1.2

0.8

0.4

0

Hydro International collaborates with universities around the world on initiatives that include verification work and further its understanding of the science behind its technology platforms.

The proof, however, comes in real-world results. The performance of its technologies have been field verified by Hydro as well as independent agencies allowing the company to clearly state expected removal efficiencies. Its customers benefit from low maintenance technologies that require little power and, most important, achieve the promised results.

Hydro **S** International

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How a California WWTP Solved Its Debris Problem

he City of Ukiah, California, is a modest community of about 16,000 people set in the heart of Mendocino County. Construction of the city's wastewater treatment plant was completed in 1958 when the city had a population of around 9,000.

Since then, the population has grown by about 78% to a total of 16,000 residents. The plant's five pumps are equipped to handle 2.8 mgd of dry weather flow, and 20 mgd of wet weather flow.

THE CHALLENGE OF UNWANTED DEBRIS

The problem of solid non-organic waste became an issue. Plant Supervisor Alan Hodge notes that "if it can get flushed down a toilet or sent into a manhole or a drain, we get it. Gravel, rocks, toys, potato chip bags, garbage, you name it." Hodge reveals that when faced with this obstacle, they only had two solutions: manual removal or pump replacement.

Manual removal means sending in an operator to clear the debris. This is not only timeconsuming, but dangerous as well. The alternative

is to replace the whole pump once it has received extensive damage from clogging. Although it's safer than manual removal, it's very costly.

"With the pumps taking in so much trash they would invariably fail at least once a year," says Hodge. "They would fail and cause us to have to rebuild each one of those pumps literally once a year at the tune of about \$100,000 apiece. So right there is a half million dollars to rebuild five pumps almost every single year."

THE AQUALITEC SOLUTION

The solution was Aqualitec's Screentec bar screen: a vertical bar screen filter system designed to remove any solid objects from wastewater and protect pumps from clogging. Aqualitec's proprietary bar screen is vertically designed to fit headworks, pump stations, lift stations, wet wells and manholes.

A stainless steel rake collects unwanted debris at the bottom of the frame, which can then be ejected upwards and prepared for disposal. This product proved to be a great solution for Hodge. "Since the Aqualitec bar screen was installed, we haven't had to rebuild any of the pumps."

The Screentec Aqualitec becomes the first level of filtration used by wastewater treatment plants, and extends pumps' life cycle while also improving the quality of wastewater treatment. And with no moving parts at the bottom of the frame, it can safely be operated from the top.



AN AFFORDABLE, QUALITY SOLUTION

Screentec's versatile design meant that it could be easily installed in Alan's plant with minimal retrofitting needed. It also spared the danger of manual maintenance, while at the same time protecting expensive equipment.

"The only manufacturer that provided a bar screen that could be installed and accommodate this plant design was Aqualitec. I'm very happy that we have this bar screen," Hodge says. "That money is now allocated to training and maintenance issues with other equipment throughout."

The Screentec design proved to be a good investment. By getting rid of its clogging issues, the Ukiah Wastewater Treatment Plant was able to save over half a million dollars every year, according to Hodge. Aqualitec's solution meets the needs for reduced manual labor, lessens risk to operators, offers equipment reliability and increases protection of expensive pumps.



Aqualitec Corp. has been a worldwide leader in providing bar screens for pump stations and headworks to thousands of utilities for more than 30 years. **855-650-2214 l contact@aqualitec.com l www.aqualitec.com**

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Water Treatment Facility Reduces Dewatering Costs With 3DP Belt Press

A n increasing number of water treatment facilities are looking to process residual solids on site and are going through the steps of evaluating dewatering equipment and technologies. Residuals from water treatment plants differ in nature from solids at wastewater treatment plants and often require dewatering technologies with features and design elements that can properly handle the water treatment plant residuals.

THREE-BELT PRESS

The three-belt filter press offers a good option for these facilities to consider. With its history of

dewatering aggregate and minerals, as well as wastewater residuals, the belt press is able to blend the necessary dewatering features to achieve high-discharge cake solids and high solids-loading rates with low polymer dosages and low energy usage.

The use of an independent gravity belt in conjunction with a heavy-duty pressure section has proven to be a great combination for water treatment facilities, allowing them to handle ranges of thin-feed solids or variable solids characteristics due to fluctuations in incoming turbidity.



UTAH CASE STUDY

The City of Ogden (Utah) Water Treatment Plant struggled with solids dewatering, often operating multiple shifts and incurring high costs for polymer. The city replaced its existing dewatering technology with a 1.5-meter 3DP Belt Press.

The unit was installed and started in April 2019. The 3DP processed twice the flow rate, increased discharge cake solids to 30% (from 18-22%), increased solids capture to over 95%, reduced operating time by half, and reduced polymer consumption by over 75%.



BDP Industries is a leading supplier of dewatering, thickening and composting equipment with hundreds of installations throughout the world. The company's main products include belt filter presses, screw presses, gravity belt thickeners, rotary drum thickeners, and in-vessel composting systems. **518-695-6851 l www.bdpindustries.com**

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Delta Hybrid Compressor Prioritizes Efficiency, Reliability

erzen's Delta Hybrid rotary lobe compressor is an innovative solution in compressor technology, and it's among the most efficient machines by far in the vast 25 to 100 percent control range. The Delta Hybrid brings together the benefits of blower and compressor technology in one single unit with energy savings of up to 15 percent.

DESIGN AND FEATURES

Some of the key features of the Delta Hybrid are exceptional energy efficiency, reduced life-cycle costs, increased range of applications and pressures, high levels of reliability and long service life, reduced maintenance needs, and processed air 100 percent free of oil and absorption material.

Its flexible modular design means that the Delta

Hybrid can be designed or retrofitted for all rotary lobe compressors and belt-driven motor sizes within a range of nominal widths if a standard solution won't do the job.

There's no absorption material to interrupt operation. Absorption materials can cause wear or reduce operational safety. To solve this, Aerzen's research and development team came up with a solution: A discharge silencer completely free of absorption material. It decreases noise purely by rerouting airflow, guaranteeing that downstream process systems won't be contaminated. In sewage treatment technology, this avoids clogs in the aeration system, and with them operational constraints and high maintenance costs.

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AllMax Software Releases Antero CMMS Version 7

A ntero CMMS Version 7 from AllMax Software has been released. Brand-new features include asset mapping, asset criticality scoring, improved workflow and work-order management, and procedure scheduling for detailed plant inspections and rounds.

Improvements have been made to the Reporting, Calendar and Equipment sections, ensuring users have access to their most critical asset and maintenance information in order to make informed, data-driven decisions.

Users can manage assigned work orders and procedures. They can also customize the calendar and dashboard to show the information critical to completing work. Work orders can be printed, flagged for review or completed.

Mapping gives users important location and equipment status information. My Work is designed for the user to access, manage and complete work quickly and efficiently.

ENSURE WORK GETS DONE

Designed to improve workflow. Maintenance managers can control the distribution, assignment, and completion of work orders and procedures. Custom statuses allow for easy review and management. Work orders that require attention or further review from management can be quickly addressed.



Antero accurately tracks your maintenance data, allowing you to streamline your maintenance program to save time, effort and money — all while giving you the peace of mind that your equipment is being maintained efficiently and effectively.



AllMax Software has specialized in O&M data management since 1994. Its mission is to provide and support data management software solutions designed for maintenance, wastewater, water and pretreatment professionals. 800-670-1867 | www.allmaxsoftware.com





Penn Valley Pump Helps Michigan Sanitary District Pull Thick Sludge

alien River Sanitary District Sewer Authority is a municipal wastewater plant located in southwestern Michigan that serves a population of 30,000 with a daily average flow rate of 3.0 mgd.

GRSD had two centrifugal chopper pumps that were used to transfer co-mingled waste activated sludge and primary sludge from primary clarifiers to either a primary digester or a thickener tank. These centrifugal pumps operated well when the sludge was thin, but did not perform as well when the sludge was thick.

Both pumps had a dedicated suction line that was approximately 85 feet in length and 6 inches in diameter. The pumps had a flooded suction of approximately 11 feet, but were required to pull a maximum suction lift of approximately 4 feet when draining the clarifiers.

DESIGNING A REPLACEMENT

Over time, transferring co-mingled waste and

primary sludge became too thick for the centrifugal chopper pumps. GRSD decided that the pumps needed to be replaced, so they hired an engineering company to help with the design of their pump replacement project.

Through this partnership, GRSD learned about Penn Valley Pump and installed two 6-inch PVP Model 6DDSX76CNU 10 hp pumps. These pumps have been flawlessly operating since startup in February 2020, with timers turning the pumps on and off multiple times throughout the day. By pumping out high- and low-sludge concentration levels with no operator involvement, GRSD has been able to save valuable time and money each month.



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Up to 10 times longer run time and up to 70% less maintenance than rotary positive displacement pumps.

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Penn Valley Pump Company, Inc. has developed and manufactured Double Disc Pumps for the municipal, industrial and chemical industries for the past 40 years. The company has created a range of positive displacement solids-handling pumps that provide durability, reliability and performance.

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QUALITY VALVES

public water system or treatment works.

Flomatic, founded in the U.S. in 1933, offers a full range of AIS-compliant ball check valves to meet your needs. As a manufacturer under a certified ISO 9001-2015 and ISO 14001-2015 quality and environmental systems program, Flomatic works with United States foundries that can meet its standards and offer a broad selection of high quality materials and grades of ferrous castings.

"This allows us to produce only high quality valves, built to last, so we can meet your needs and surpass expectations," says a company spokesperson.



Flomatic Valves is a leading manufacturer of valve products with over 85 years in the business. The company's dedication to manufacture high quality valves built to last is its number one priority. 800-833-2040 | www.flomatic.com



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Bright Technologies' Dewatering Equipment Helps Overcome Disposal Problem

fficials at a wastewater utility in Louisiana recently faced a sludge disposal problem and knew they couldn't afford to pay for 5,000-gallon tankers to haul it to a land application site.

But by using dewatering equipment by Bright Technologies, the utility was able to make a stackable, dry-solids cake that allows it to haul 30,000 gallons worth of sludge in a single 30-cubic-yard container.

Since roll-off trucks are less expensive and more fuel-efficient than semi tankers, each load costs less than a single tanker would have otherwise.

One of the key equipment features the utility praised is the sludge-retention manifold of looping pipes, which gives the polymer contact time and gentle mixing before it's introduced to the press. This is a unique feature to Bright Technologies skid-mounted belt press systems.

BELT FILTER PRESS DEWATERING

Bright Technologies offers complete belt filter press dewatering systems that are skid or trailer mounted. The company designs and manufactures



the skid equipment package for high throughput, low maintenance and superior cake solids.

The skid-mounted dewatering systems are designed with long-term value and ease of operation in mind. A stainless steel frame and roller construction are included as standard features. An Allen Bradley touch-screen and programmable logic controller integrate the press and support equipment to accomplish unattended operation and easy integration into SCADA systems.



Bright Technologies, a division of Sebright Products

Inc., manufactures high-quality recycling equipment as well as equipment for dewatering and solidification of wet materials. The company also offers integrated recycling and solids waste-disposal solutions through Sebright Products including hydraulic compactors, cart dumpers and custom waste carts.

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Belt filter presses featuring innovative features that provide high performance in a compact high value package.





Bright Technologies offers complete Belt Filter Press dewatering systems that are skid or trailer mounted. We design and manufacture the skid equipment package for high throughput, low maintenance, superior cake solids and ease of operation.

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Since 1946, Komline-Sanderson has supplied reliable equipment solutions that are easy to maintain and exceed expectations.

- The K-S Kompress Belt Filter Press is ruggedly designed and used for dewatering municipal biosolids and industrial sludge. It is easy to maintain and exceeds production goals.
- The K-S Biosolids Drying System operates with full integration of all components. The company has successfully installed systems for more than 20 years, which illustrates the equipment's durability and the company's commitment to supporting customers over the long haul.
- The K-S Gravabelt gravity belt thickener is available for very small to extremely large flows and includes Roto-Kone performance enhancing technology. With several models available, the unit can meet specific requirements and exceed performance expectations.
- K-S Plunger Pumps continue to perform after 40 years of operation. These rugged pumps are the workhorse of the industry.

K-S employs highly skilled and technical field service engineers who know the equipment and listen to and respond to customer needs and concerns, which results in installations that perform well. The company provides factory-made original equipment parts and filter fabrics for belt filter presses, gravity belt thickeners and more, and it works with customers to ensure that equipment exceeds expectations. The company's experience ranges from simple one-machine

installations to complex multistep processes and systems. Reliability, ease of operation, rugged design, proven performance and superior customer service are hallmarks of Komline-Sanderson installations.

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Colorado Springs Utility Optimizes Process With Wireless Instrumentation System

he J.D. Phillips Water Resources Recovery Facility is located in the heart of Colorado Springs, Colorado, with commercial, industrial and residential areas located nearby. Odor control is immensely important for the facility, and as a result, it is entirely covered, including the activated sludge basins.

One challenge for facilities with covered basins is the need to run conduit for instrumentation, which can be difficult and expensive with concrete walkways. Shaun Thompson, environmental specialist at J.D. Phillips WRRF, was searching for an alternate solution to conduit installation and found YSI's IQ SensorNet system for wastewater process monitoring and control. The IQ SensorNet system can manage up to 20 sensors on a single network, offers wireless communication options and allows operators to view all data on a single controller.

By adding an IQ SensorNet wireless module to the online instrumentation network, communication cabling between the measuring location and a single controller is eliminated.

A VERSATILE, AFFORDABLE SYSTEM

Because of its wireless capabilities, YSI's IQ SensorNet solution was suitable for Shaun's facility, and they installed a system with 18 sensors across the aeration basins. With the IQ SensorNet system, the facility is monitoring DO, nitrate, ammonia, ORP, COD, BOD, TSS and orthophosphate.

The data from these sensors is transmitted wirelessly back to the main controller and then output to the PLC via Ethernet/IP.



Installation and modification of the online monitoring system is easy and affordable, with the ability to add or move sensors at any time. Thompson also utilizes several sensors experimentally, and can easily move them between locations to troubleshoot operational issues. With YSI IQ SensorNet, Thompson found a quality solution for process optimization and troubleshooting to meet his facility's unique challenges.



YSI, a Xylem brand, has designed and manufactured sensors, instruments and solutions for water quality monitoring for over 70 years, and offers a full range of water quality instrumentation designed for municipal water.

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perators looking for a complete line of piping/ducting system expansion joints like rubber and molded PTFE expansion joints, braided flexible hose assemblies and low-torque sealing gaskets may look into Proco Products.

Also available from the company is the Series 700 ProFlex rubber duckbill check valves, which are commonly used in the water and wastewater industry. Rubber check valves are a cost-effective way to control back pressures from wastewater treatment plants, outfalls and tidal operations.

ASSOCIATION INVOLVEMENT

Proco is involved in several technical and trade organizations, including the Fluid Sealing Association, Rubber Expansion Joint Division and Non-Metallic Ducting Expansion Joint Division.

One of Proco's own, Rob Coffee, vice president of sales and marketing, is currently the FSA president and serves on technical committees to ensure its continued development of proper expansion joint design for industries served.

Proco is also a member of the Association for Hose and Accessories Distribution, Water Environment Federation, American Water Works Association and the Cooling Tower Institute.





Proco Products Inc. maintains one of the largest product stocks in North America with more than \$2 million in inventory. The company is a global leader in the design and supply of piping/ducting system expansion joints, offering a complete line of products to suit a variety of applications. Customers can contact Proco for pricing and availability for the appropriate expansion joint or check valve. **209-943-6088 I sales@procoproducts.com I www.procoproducts.com**





Enviro-Care Helps Wisconsin WWTP Retrofit a Multiangle Screen

The City of Beaver Dam is located in southcentral Dodge County, Wisconsin, and attracts tourists year round. The wastewater plant receives a significant food-based industrial load and is subject to the usual wetweather flows.

After doing extensive upgrades to other parts of the plant, it was time to replace the aging headworks bar screens. The plant could trace high maintenance costs and clarifier sludge pump failures directly to the high volume of debris passing through the bar screens. The screen evaluation team rated high capture as the top priority for the new screens.



Beaver Dam's screen evaluation process was complicated by hydraulics. Inclined screw pumps lifted the wastewater to the headworks and limited the hydraulic grade line. This meant that the new screens had to fit into the current channel footprints. There was no money in the screen budget for civil work. They could not do both.

INSTALLING A MULTIANGLE SCREEN

The evaluation team overwhelmingly favored the FSM FilterScreen perforated plate belt screen. However, the standard 75-degree single-angle screen that fit the channel could not handle the storm flow.

Enviro-Care proposed the FSM FilterScreen multiangle screen. The wetted section of this screen sits at a 30-degree angle which significantly increases the exposed surface area. The screen then transitions to a 75-degree transport area.

This 30-degree angle can provide up to a 100% increase in capacity relative to a 75-degree screen. With this screen configuration, Beaver Dam could reach a one-screen peak flow of 11.1 mgd with no civil work, solving the problem.

Beaver Dam purchased a second FSM multiangle FilterScreen less than a year later. To eliminate the cost of constructing a bypass channel, Enviro-Care proposed adding a hydraulic lift to the second FSM screen.



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Aqua Caiman Articulating Rake Screens Provide Robust, Low-Maintenance Option for Advanced Screening

uilding off over 40 years of in-channel screening experience, Parkson's Aqua Caiman in-channel articulating rake screen was designed with the operator in mind, providing a low-maintenance and robust option for headworks screening, protection of pumps and downstream processes, and onsite pretreatment. Parkson's line of three Aqua Caiman screens are made in the U.S. and suitable for both municipal and industrial applications.

The original design features a robust frame and cross supports, bar shapes optimized for reduced headloss, and discharge heights up to 30 feet. A series of rakes attached to chain links form a flexible belt assembly to lift and remove large solids with ease and without the need for lower bottom bearings or sprockets.

All models allow for chain adjustment without a hoist, and units in a vertical inclination additionally include the True-Grip chain-retention system for additional rake engagement, and the Expulsionator deflector system for aid in solids removal from the rakes.

VERTICAL MOUNTING

The new Aqua Caiman Vertical screen was designed to accommodate applications where channel requirements are tight and require steep or vertical mounting, or where additional rake engagement force is desired for removing solids from bar racks. The unit mounts vertically at 85 or 90 degrees with discharge heights up to 50 feet and can be used in new or existing deep channels.

HEAVY SOLIDS HANDLING

Also new, the Aqua Caiman HD screen is even more robust, designed to handle high flows and heavy solids with ease. The unit features a heavy-duty frame and chain links, with bar openings from 1 to 4 inches to accommodate removal of large objects, and a discharge height up to 50 feet. It is suitable for combined storm flow, trash rake and other high-flow applications.





Parkson Corporation is a supplier of equipment and solutions for potable water, process water, and industrial and municipal wastewater applications. Parkson designs, engineers and assembles products that provide customers with advanced screening, biological, filtration and biosolids management solutions.

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PROFICIENCIES

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olorimetry is one of the most reliable forms of water analysis and is used to test for a wide array of analytes. The target analyte causes the sample solution to change color proportionally to its concentration in the solution, and that change can be measured visually or instrumentally.

Analysts have traditionally prepared reagents in bulk from scratch from individual chemical components kept on hand. Test procedures have involved making multiple volume and mass measurements with training required to master these techniques.

Colorimetric water analysis test kits offer advantages to the analyst in that they save time, are appropriate for field applications, and are generally user-friendly. Relatively unskilled staff can be trained to make accurate determinations using premixed liquid or solid reagents delivered in kit packaging. Colorimetric test kits are among the simplest, quickest and most adaptable means by which water analysis may be performed in a host of environments and conditions.

POPULAR USES

One common application of colorimetric testing is to spot check systems between reporting periods to document whether processes remain under control. Colorimetric test kits are also used alongside online analyzers to verify their performance. Many colorimetric test methods have been reviewed by the U.S. Environmental Protection Agency and accepted for monitoring drinking water and wastewater. Examples include chemical oxygen demand and chlorine.

Colorimetric test kits continue to be practical tools for analysts. Their low cost, convenience, flexibility, accuracy and efficiency appeal to users in all industries. As testing needs evolve, colorimetric water analysis will continue to be an indispensable mainstay in the range of testing options.

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The SpillSafe IBC Tote Scale helps you comply with EPA spill containment requirements. A two-part epoxy-powder-coated solid steel platform with integral restraint clips securely holds the polyethylene spill containment pallet. Four IP67-rated shear beam load cells located outside the spill containment vessel provide the highest accuracy weight measurement possible.

The scale comes with the Force Flow Performance Guarantee and a fiveyear warranty to ensure your investment continues to meet your chemical monitoring needs, year after year.

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Force Flow manufactures chemical monitoring and control systems for chlorine, sodium hypo-chlorite, fluoride, polymer and other water

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Reliability Is Paramount for VF-100 Volumetric Feeder

A s an operator, you want all the features you can get in a dry chemical feeder to ensure good accuracy, reliability and long life. Eagle Microsystems' VF-100 volumetric feeder offers all this in a durable, user-friendly build.

EASY MAINTENANCE

There is no lubrication, greasing or oiling required; and there are no belts, gears, sprockets or chains to maintain. The VF-100 is a hassle-free product designed specifically to meet the requirements of the water and wastewater treatment industry.

Features of the VF-100 include a rugged drive for reliable operation, feed rates from 0.04 to 17 cubic feet per hour; an electronic SCR speed control; stainless steel construction; gravimetric control option; and a two-year warranty.



Eagle Microsystems has been an active industrial weighing specialist for nearly half a century. Founded as manufacturers representatives, the company has grown into a full-service developer of high-quality mechanical and electronic scales.

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Clean Up Polymer Spills Quickly With Rhino Dirt

R hino Dirt was launched in 2017, providing major industries a faster and more cost-effective way to clean up oil, gas, coolant, paint, ink and other nasty liquids. Recently, a whole new industry opened up when Rhino Dirt was successfully tested on polymers.

Wastewater treatment plant operators know first hand how difficult it is to clean up a polymer spill. But with Rhino Dirt, spill cleanup will never again be a frustrating, time-consuming event, according to company CEO and co-founder Tom Viscount.

"Rhino Dirt literally sucks up thick, sticky polymers in minutes, leaving no slippery residue," he says. "Our four-pound bag completely absorbs up to two gallons of polymers. Simply grind it in, sweep it up with a broom, and the job is done. No high-pressure water hoses and no hours of waiting around. Rhino Dirt will also take polymers off shoes, tools, uniforms — even hands."

SAVE MONEY ON CLEANUP

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plant PROFICIENCIES

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3 EurusBlower

Eurus Blower Inc. is a subsidiary of Shandong Zhangqiu Blower Co. Ltd. the largest manufacturer and seller of positive displacement blowers in Asia. **630-221-8282 l info@eurusblower.com l www.eurusblower.com**



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plant PROFICIENCIES

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mixes the tank contents. The mix system can be used for anaerobic digestion, biosolids storage, blending tanks, excess flow tanks, septage or leachate anoxic zones CSO handling aerobic digestion assisting second.

ate, anoxic zones, CSO handling, aerobic digestion, assisting secondary treatment and biosolids holding ponds.

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The SLC series manure spreaders are available in 2,600- to 5,000-gallon trailer and 3,200- to 4,100-gallon truck capacities, and truck and trailer configurations.



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NIGHT



Solar panels outside the Home Farm Water Plant in Shrewsbury will save about \$11,000 in electricity costs.

Right Time for Solar

A READY-MADE SITE AND A NEW STATE GRANT PROGRAM PRESENTED THE PERFECT OPPORTUNITY FOR A MASSACHUSETTS TOWN TO INVEST IN RENEWABLE ENERGY

By Steve Lund

he timing was right for a solar energy project at the Home Farm Water Plant in Shrewsbury, Massachusetts.

For one thing, the plant had been rebuilt so that it could treat for manganese. The rebuilding left an old foundation that became the stage for a solar array. That saved the cost of removing the old foundation.

On top of that, the state had set aside \$4 million in grant money for energy efficiency or renewable power projects at water and wastewater facilities. Shrewsbury secured a \$200,000 grant, about 88% of the cost for a 59.2 kW solar array. The town share was \$27,525. The 160-module array, completed in June, is expected to produce 75,582 kWh per year, less than 5% of demand, but a savings of almost \$11,000 a year in electricity costs.

"The timing was perfect," says Dan Rowley, superintendent of the Water and Sewer Division. "Now we have a brand-new plant and a new solar array, and everything is working out well. They added another 4 or 5 inches of concrete to the old foundation slab and trimmed it out to build the solar array."



TOWN OWNED

Many water and wastewater treatment plants have solar arrays built under power purchase agreements with solar development companies. Under those arrangements, the plants can buy the power at a fixed rate for a number of years without having to invest to build the solar panels. That wasn't an option for Shrewsbury, which has its own power utility. Although the town had to pay for the solar array, the system is simpler than under a power purchase agreement, since there is no need for infrastructure to connect to the power grid or for batteries to store power.

"We have five variable-frequency drive motor starters. There's a lot of power usage," Rowley says. "There is no storage needed. We use the power immediately. There's no grid connection, no separate meter. It gets used up right in the building."

Shrewsbury, population 37,000, is about 40 miles west of Boston. The 7 mgd (design) water plant pumps about 4 mgd in summer and about 3.1 mgd for the rest of the year, drawing from eight wells. There are six water storage tanks, three pressure zones and 207 miles of mains.

MANGANESE REMOVAL

Before the rebuilding, completed in the fall of 2018, the plant's product water was approaching the limit for manganese. "Over the years, it just kept building up and getting worse as the town grew," Rowley says. "The more we pumped the wells, the more manganese we pulled out. It got to the point where we were right at the limits."

The town chose biofiltration for manganese removal. "Biological treatment is kind of new in this part of the country," Rowley says. "I believe this is the largest biological filter plant this side of the Mississippi. It's working great. Our manganese now is almost nondetectable."

The rebuilding brought other changes. The previous water treatment process used chlorine gas for disinfection; the new process uses liquid sodium hypochlorite, which is safer to store and safer for the workers.

Rich Fox, assistant superintendent of the Water and Sewer Division and chief plant operator, is pleased with the change, calling chlorine gas "scary stuff. Now that it's gone, we'll never have it back."

The plant used to keep fluoride as a liquid but now uses powdered fluoride. The liquid was easier to use, Fox says, but the powdered form is safer. "I think they've geared everything toward operator safety, which is good," he says.

QUICK PAYBACK

The solar power presents no problems for the operators. It works when the sun shines, and the power produced can be monitored on a website that the public can view. It shows daily and yearly power output and pounds of carbon dioxide emissions prevented.

If the solar array continues to perform as in the early months, the payback on the town's investment will be less than three years. Without the \$200,000 state grant, the payback would be about 23 years.

But the financial impact was not the only consideration, Rowley says: "The big part is doing what's right for the environment. Every little bit helps." **tpo**

Tube-in-Tube Heat Exchangers Offer Quality Heat Transfer, Low Headloss

A concentric tube-in-tube heat exchanger is a design that utilizes counter-flow circulation in one direction and sludge flow in the opposite direction.

This counter-flow tube-in-tube arrangement provides superior heat transfer with low headloss.

The Walker Process heat exchanger includes a sludge tube, and the end castings are removable for cleaning without draining the waterside. The end castings include built-in water backflushing connections.

These exchangers comply with ASME pressure vessel code requirements and are stamped with the ASME "U" symbol. Special high-pressure units are available for use with egg-shaped or large-depth digester tanks.

Controls include nonflow restrictive temperature sensors and glass tube or dial thermometers to measure inlet and outlet sludge temperatures, along with a thermocouple and Resistance Temperature Detector (RTD) for remote indication of control.



Walker Process Equipment's office and manufacturing plant are centrally located in Aurora, Illinois, and set up to produce parts/assembly for the major components of its product lines.

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How Portable Flow Instruments Can Benefit Your Plant

ccurate flow measurement is critical for process control or regulatory compliance, and portable flow instruments can prove beneficial in many circumstances.

For instance, when operational or process changes are made, it sometimes results in flow rates that don't match the installed instrument's optimal performance range. A portable instrument provides a stopgap measure until a permanent solution can be procured, according to Joe Incontri, director of marketing for KROHNE Inc.

"If flow rates are steady, data can be manually entered into a monitoring or control system," he says. "Otherwise, real flow data can be used to procure a new permanent flowmeter that matches the actual process requirements. Using real data from a portable instrument avoids over- or undersizing instruments based on faulty process engineering data."

Verifying that a flowmeter is performing properly is a good idea, even if it's not required for compliance, says Incontri. "Where existing flowmeters need verification, use of a portable instrument avoids the need to take an existing flowmeter offline or shut down a process since the portable unit can be installed on the existing pipe next to the target meter."

A portable meter also provides flow data at the proposed point of measurement to help inform the purchase of a permanent flowmeter.

Portable instruments also help identify problems at treatment plants since they're equipped with data loggers. Correlating the data with the time of upset may reveal pertinent issues leading to resolution.

KROHNE

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TALKING WATER GARDENS PROVIDES EFFLUENT COOLING AND AN ATTRACTION FOR BIRDWATCHERS AND OTHER NATURE ENTHUSIASTS IN ALBANY, OREGON

By Jeff Smith

PLANTSCA

uring July 2020, more than 5,000 people visited the wastewater treatment facility in Albany, Oregon. The main attraction was the 40-acre constructed wetland that cools up to 7 mgd of effluent from the activated sludge facility to meet regulatory requirements.

"Just think how unique it is that so many people would want to visit any part of a wastewater treatment plant," says Joe Deardorff, natural treatment specialist for the city. But it's not just any wetland. Named Talking Water Gardens, it's a cascading series of nine ponds (cells) that provide habitat for wildlife, space for recreation and a laboratory for education.

Created in 2011 in response to the listing of salmon and steelhead trout on the endangered species list, and to meet state Department of Environmental Quality's discharge temperature guidelines, the wetland was an alternative to more expensive cooling towers.

FRESH START

Rather than add to an existing pond structure that was part of a defunct plywood mill, the city started over and hired a landscape architect to design 40 acres of emergent wetlands. "Most of the facility functions like a wildlife preserve, but several sections are managed as Japanese healing gardens," says Deardorff.

Large boulders, two 20-foot waterfalls, trickling water and crooked trees give the area a pleasing appearance. Some trees were left standing from when the wetland was flooded. Now dried, they provide perches for raptors. Primitive stop logs serve as control structures for water elevation through the cells.

PHOTO ABOVE: Talking Water Gardens is a cascading series of ponds that provide wildlife habitat and a laboratory for education.

"It presents a really tranquil area that benefits a whole lot of people," Deardorff says. All the vegetation is native and supports native fauna. Cattail, bulrush, wapato, duckweed and Mexican water fern are the workhorses for cooling.

An ongoing project to install native trees and shrubs increases canopy cover for reduced sun exposure over the water. White alder, cedar, ponderosa pine, Oregon white oak and ocean spray complement coyote brush and black twinberry in that effort.

SPACE FOR WALKERS

More than 2 miles of gravel walking trails, some on tall berm plateaus and others at the water level, welcome visitors to the Talking Water Gardens. Amenities include benches at preferred viewpoints and doggy-bag stations. Notable wildlife includes great egrets, herons, bald eagles, otters, minks and beavers. Two federally listed threatened species, the western painted turtle and the western pond turtle, nest and bask in the gardens.

"That's another really cool benefit to the gardens," says Deardorff. "We are supporting one threatened species by controlling the temperature affecting the salmon and steelhead in the river, but we're also providing habitat for a whole different threatened species." The gardens are a hot spot for birdwatchers, too, and especially as a destination for the Audubon Society's Christmas bird count.
We are supporting one threatened species by controlling the temperature affecting the salmon and steelhead in the river, but we're also providing habitat for a whole different threatened species."



Trickling water and crooked trees give the area a pleasing appearance and atmosphere.

A chain-link security fence separates the wetlands from the 12.3 mgd (design) Albany-Millersburg Water Reclamation Facility. Scott LaRoque, plant superintendent, says summertime flow averaging 5 mgd is pumped into the wetlands with two 16-inch Pentair Fairbanks Nijhuis vertical turbine pumps.

There it is mixed with 2 mgd of effluent from a nearby metalworking firm, Allegheny Technologies, that was a financial partner in the construction of the treatment plant in 2009. Once mixed, water is split for gravity flow through four separate cooling trains as it makes its way through the wetlands for two days of retention time before outfall at the Willamette River.

"We adjust the flow occasionally to allow newly planted species to get established before we bring the water levels back up," says LaRoque. "We don't want to drown the emergents before they've had a chance to get out of the water."

GROWING ATTRACTION

Each year, invasive species are removed and new seed mixes are tried in different areas. "Every year we draw down the water, then wait to see what sprouts out there the following season," LaRoque says. "It's a whole different approach than operating a conventional treatment plant."

Bicyclists are allowed on the garden trail but are not encouraged. Last year a decorative bike rack was installed at the entrance to encourage visitors to park and walk. Mounted on an 8-foot square concrete pad, the rack resembles elements of the gardens, such as a heron, dragonflies and bulrushes, all creatively flame-cut into the structure.

The number of visitors to the facility keeps increasing, says Deardorff. Formal tours of the plant and the gardens are given to students from grade schools and high schools each year. Colleges use the facility in their environmental education programs. A local watershed council uses it for programs about ecology and water quality.

"We've had many international visitors, too, from countries like Guatemala, Thailand, Vietnam, China and Mexico, just to name a few," Deardorff says.

worth noting

people/awards

Improvements to the **Loveland (Colorado) Water Reclamation Facility,** including a new collections system and digester facility and step-screen technology were recognized by the American Public Works Association as a 2020 Project of the Year.

Packing long-term water resilience and other sustainable solutions into a small footprint earned the upgrade of the **Paso Robles (California) Wastewater Treatment Plant** a 2020 Wastewater Project of the Year recognition at the Global Water Awards.

The **Anacortes Wastewater Treatment Plant** again received an Outstanding Performance Award from the Washington Department of Ecology for achieving full compliance with its permits.

The **Fairfax County (Virginia) Wastewater Management Program** won a 2020 Utility of the Future award from the National Association of Clean Water Agencies.

Tim Smiley, the superintendent of the Glasgow Water Co.'s Barren River Lake plant, received a 2020 Operator's Meritorious Service Award from the Kentucky/Tennessee Section of AWWA.

Tidewater Utilities received a 2020 Superstars in Business Award from the Delaware State Chamber of Commerce Small Business Alliance.

The **Georgia Association of Water Professionals** received the Clean 13 Water Heroes Award from the Georgia Water Coalition for filling a gap in training to address nonpoint source pollution.

Kenneth Rollins of the Leesburg Department of Utilities Water Supply Division Water Filtration Plant received an Excellence in Waterworks Operations/Performance Award from the Virginia Department of Health.

The **Town of Gate City water treatment plant** received the Gold Standard Award from the Virginia Department of Health.

The Prince William County (Virginia) Service Authority's **H.L. Mooney Advanced Water Reclamation Facility** received its 11th consecutive Platinum Peak Performance Award from the National Association of Clean Water Agencies for having a perfect compliance record.

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events

Dec. 3

Chesapeake WEA Collections Systems Committee Seminar, virtual. Visit www.chesapeakewea.org.

Dec. 9-10

Chesapeake WEA Stormwater Seminar, virtual. Visit www. chesapeakewea.org.



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Federal Screen Products engineers long-lasting and unique strainer baskets for water application needs. The baskets are fabricated individually for specific applications with stainless steel wedge wire and custom-made flanges and housings. The combination of high-quality materials, accurate slots and maximum open areas ensure optimum design for low-wear characteristics, resulting in longer service life. The strainer baskets are a great option for multiple applications where perforated baskets don't provide a sufficient open area and where mesh-weave baskets aren't suitable for the required pressure differential. Designed to meet a variety of OEM replacement needs and pressure designs, baskets are available in high-nickel alloys for use in highly corrosive environments, with slot sizes ranging from 0.001 to 0.625 inch. Federal Screen specializes in supplying various types of strainers, including those used in self-cleaning, automatic backwashing and in-line Y and T strainers. 905-677-4171;

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Asahi/America CPVC ball and check valve

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product spotlight water

Underdrain offers backwashing feature

By Craig Mandli

The use of an underdrain enables utilities to collect filtered water during the filter run, and distribute air

and water during the backwash cycle. Providing cleaner filters mean longer filter runs and higher water efficiency, more product water and less waste. This lowers operating costs per gallon of filtered water — creating a benefit to cost-conscious utilities. The **Leopold Type 360** is a bolt-down **underdrain system** for water treatment filtration rehabilitation projects that actually flows backwash water in a 360-degree pattern, increasing efficiency by up to 20%.

"The industry challenged us to create an underdrain that combines efficiency, straightforward installation and individually serviceable laterals," says Matt Schomaker, regional sales manager for **Xylem Treatment**. "The Leopold Type 360 underdrain is completely different than anything else on the market. Our game-changing, bolt-down underdrain design allows for longer filter runs, higher efficiencies, uses less backwash water and extends media life."

With an uplift resistance above 15 psi, the Leopold Type 360 can withstand most unexpected events, such as water hammer. It has 0.2 mm slots and orifices on the top, sides and bottom of the underdrain block to effectively clean the filtration media from every angle during the backwash process, completely eliminating media dead zones due to gaps in backwashing coverage. By washing 100% of the media in



between each lateral, the Type 360 underdrain increases filter run times, reduces backwash water consumption and extends media filter life, resulting in lower operating costs and more energy savings.

The unit is compatible with all standard flume and air configurations, and with lateral lengths over 40 feet, it is suitable for long filter runs and retrofits of existing filters. The modular underdrain blocks are easy to handle and snap together for quick and simple installation. Custom hold-down brackets secure the laterals and simplify installation and service of individual underdrains. Its reinforced polymer construction provides strength against the elements while reducing the overall equipment weight for easier transportation and installation. The polymer matrix is 100% corrosion-free to ensure a maximum filter lifetime. A self-cleaning feature removes sediment buildup in the underdrain over time.

According to Schomaker, the Type 360 underdrain solves current water challenges for biologically active filtration systems, indirect and direct potable reuse applications, new drinking water applications addressing the EPA's LT2 rules regarding contaminants of emerging concern, and the rehabilitation of existing media filters. **855-995-4261;**

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seals, as well as ball check valves with CPVC bodies and EPDM or FKM seats and seals meet the requirements of NSF/ANSI/CAN Standard 61 – Drinking Water Components. Available with socket, threaded or flanged end connections, the Type-21 ball valves are pressure rated up to 230 psi and are full vacuum rated in all sizes. The ball check valves may be used vertically or horizontally, have a minimum shut-off of 5 psi and all sizes are rated for full vacuum service. **800-343-3618**;

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product spotlight

wastewater

Chopper pump reimagined for wastewater conditioning

By Craig Mandli

The amount of grease and rags that make it into the wastewater system has made wet wells problem areas at many treatment facilities. Those materials can form what almost looks like a floating iceberg, often clogging headworks infrastructure. Fortunately, **Vaughan** has a solution for the problem in its **Submersible Chopper Pump**.

When used as a conditioning pump, the pump is fitted with a nozzle to provide high-velocity mixing, and is placed in the problem wet well on a portable stand. Recirculating the wet well contents through a Chopper pump chops and mixes not only the grease and debris that can accumulate as a floating layer, but also chops and resuspends heavier debris that can accumulate on the wet well floor.

"It helps break down rags, mix in floating scum layers and settled solids to create a homogenous mixture that's easily pumped out of a sump or collections pit," says Derek Vaughan, the company's business development manager. "This fits many applications from lift stations to tanks used for various types of solids-handling tanks. It can also be found in other industries such as pulp and paper."

Because the pump is mounted on a portable stand, it can easily be used in multiple applications at a single job site, facility or municipality. In wastewater treatment facilities, it can be used for conditioning applications including lift stations, influent stations or channels, basins or holding tank, and for digester clean-out or homogenization. According to Vaughan, the pump is a great fit for today's waste stream.

"It's a good fit because of how prevalent the new sewage is in today's wastewater," he says, "New sewage is more rags, baby wipes, Swiffers and scum layers from grease, and this product helps mitigate the costs associated with these issues, including vacuum truck fees and bypass pumping fees."

The pump is designed to save users from cleanout cycles and maintenance. By resuspending and removing floating solids, the pump reduces the need for vacuum truck clean-outs. Where existing large pumps are clogging frequently, the conditioning pump can be placed in the wet well to chew up rags and solids so that the existing pump can operate freely.

"It's an overwhelming success," says Vaughan. "We have saved customers up to \$100,000 per year in certain cases by lengthening clean-out cycles in their wet wells."

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Submersible Chopper Pump from Vaughan



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CAS DataLoggers OdaLog gas data loggers

CAS DataLoggers introduces OdaLog portable gas data loggers, from Thermo Fisher Scientific, for wastewater odor and hydrogen sul-

fide control. OdaLog instruments are used extensively in the wastewater industry to record the level of hydrogen sulfide and other gas emissions in pumping stations, manholes and sewer lines. The loggers are designed to survive the humid and corrosive conditions found in these areas while recording ppm gas levels. OdaLog provides the latest sensor technology and weatherproof seals to prevent damage. All three OdaLog models now include Bluetooth communications and are supported with the OdaStat software, an easy-to-use application for configuring the devices and downloading stored data.

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



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